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.
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Message from the Agricultural Research Council (ARC) Council

On behalf of all the Governing Council of the Agricultural Research Council (ARC), it gives me a great pleasure to present these few introductory remarks, by way of an endorsement of the ARC Annual Report for the 2012-13 financial year. Council is satisfied with the veracity and accuracy of the information contained in this annual report, in the associated performance information, and in the audited financial statements of the organisation for the financial year, 1 April 2012 to 31 March 2013. We take this opportunity to thank the Minister for granting us the space to get on with the task at hand, without any undue interference from her office.

The current Council took office in June of 2010, and we are currently in the final year of our term of office. As such, this will be the last annual report we have the pleasure of presenting to the Executive Authority, the Minister of Agriculture, Forestry and Fisheries, the Honourable Tina Joemat-Pettersson, MP, and through her offices, to Parliament. We therefore wish to take the opportunity to thank the Minister for the opportunity to serve and for the confidence displayed in all of us as a collective. We also wish to thank the Minister for granting us the space to get on with the task at hand, without any undue interference from her office.

The year under review here also represents the first year of a shift toward the implementation of the new organisational strategy, adopted by Council in February 2012. The new strategy introduces a fundamental move from the twelve semi-autonomous, regionally based institutes, as the core management structure of the ARC, to one based on the core national programmes of research, development and technology transfer. While some of the institutes will remain centres of excellence and focus in their particular niche areas, institutes now become physical centres where any combination of the national research programmes may find expression. The logical consequences of this may include the broadening of the ARC’s physical footprint, with the possible establishment of additional research and development (R&D) centres throughout the country. These centres could be established either to respond to emerging new research priorities, or to more readily meet the needs of regions such as Limpopo, KwaZulu-Natal, Northern Cape and Eastern Cape, where the ARC does not currently have a significant institutional presence.

Another significant change, already manifest in the work reported in this annual report, is the shift towards a more balanced approach in the prioritisation of the R&D needs of large-scale commercial agriculture, and that of developing small-holder farming. For us, this is no either or. It is imperative that the ARC maintains, and in fact extends and improves the work it does in support of our commercial agricultural sector. Much of this will be evident from the work reported here. It is, however, equally important that the ARC focusses on some of the particular and specific
challenges experienced by small-holder, emerging and developing farmers. It is of course true that much of the scientific output reported on here is scale-neutral. New fruit cultivars, veterinary medications, plant protection technologies, water harvesting and irrigation systems, etc., all have potential application regardless of the scale of cultivation. However, small-holder and resource-poor farmers do have specific research needs which will not be addressed, unless a targeted effort is made to identify these and to bring the weight of our intellectual resources and innovative abilities to bear on them. These and other related strategic changes will be rolled out and reported on over the next few years to come.

Council is satisfied with the performance of the organisation against the pre-determined performance objectives and targets. While the overall performance in terms of meeting the set targets may not appear satisfactory in percentage terms, we are confident that the targets that were predetermined were ambitious, and we are also of the view that we have set too many targets. In any case, the 103 targets set are not of equal weight or heft in determining organisational performance. Council has already started a process of reviewing these targets, with a view to reducing the number and focussing on those that are mission-critical for organisational performance. We will continue this process with a view to ensuring that the eventual set of determined targets are achievable, but also ambitious, stretching the organisation to ever improving levels of excellence. In terms of financial management, the ARC has now achieved its sixth consecutive unqualified audit report from the Auditor General. This is an achievement that continues to inspire confidence and pride in the organisation. Moreover, with the exception of some remaining areas of weakness, the quality of the audit outcomes have continued to improve year-on-year. Finally, I take this opportunity to thank all those in the organisation that has made the performance reported in this Annual Report possible. In addition to the Minister, we also wish to thank our colleagues in Department of Agriculture, Forestry and Fisheries (DAFF), under the leadership of the Director-General, for the on-going mutual support and collaboration. Council also expresses its appreciation to all stakeholders and partners, agricultural commodity groups and representative organisations, research and other collaborators, donors, funders and clients. Last, but proverbially not least, we wish to record our thanks and appreciation to the Portfolio Committee on Agriculture, Forestry and Fisheries for the intense but professional exercise of their oversight role. Council, along with the entire ARC, has benefitted from the incisive, probing and reflective questioning and critical comment.

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Mr Jonathan Godden
Chairperson of Council
ARC Council
(Since June 2010)

Prof S Vil-Nkomo
Deputy Chairperson and Chairperson of the Human Resources and Remunerations Committee of Council

Ms W Jansen van Rijssen
Member

Prof T Mayekiso
Member and Deputy Chairperson of Research, Development and Evaluation Committee of Council

Prof S Vil-Nkomo
Deputy Chairperson and Chairperson of the Human Resources and Remunerations Committee of Council

Ms W Jansen van Rijssen
Member

Prof T Mayekiso
Member and Deputy Chairperson of Research, Development and Evaluation Committee of Council

Mr JWA Godden
Chairperson

Mr JH McBain
Member Council representative on the Audit and Risk Committee

Dr J Chitja
Member

Prof T Mofokeng
Member
Additional Member: Prof M Karaan – Member (June 2010 to May 2012)
ARC Structure

ARC Executive Management Committee

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

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

Dr Mohammed Jeenah
ARC Executive Director:
Research and Development
Ph.D

Mr Frans Monkwe
ARC Chief Information Officer
B.Com and MBA

Dr Shadrack Moephuli
ARC President and Chief Executive Officer
Ph.D

Ms Anati Canca
ARC Executive Director: Technology Transfer
M.Sc
On behalf of the employees and Council of the Agricultural Research Council (ARC), we hereby submit to Parliament, through the Executive Authority, the Honourable Minister of Agriculture, Forestry and Fisheries: Ms Tina Joemat-Pettersson, this annual report, associated performance information, and the audited financial statements of the organisation for the financial year ending 31 March 2013.

The ARC has delivered its output 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 output described in this annual report is in accordance with the pre-determined objectives that are contained in the Business Plan for the financial year 2012/13, as approved by Council, and tabled in Parliament by the Honourable Minister of Agriculture, Forestry and Fisheries: Ms Tina Joemat-Pettersson. 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 Committee.

An analysis of performance for this reporting period (2012/13) indicates that the ARC succeeded in delivering on the predetermined output and in many instances exceeded the set targets per strategic objective. Performance was achieved within the allocated, albeit limited resources (people, finances, equipment, infrastructure, etc.) available to the organisation.

Disseminating Scientific Solutions for Agricultural Development

South Africa’s agriculture success lies in the effective use of the innovative systems approach in the interactions with resource poor smallholder farmers. Through scientific training, the farmers were encouraged to innovate and adapt the use of conservation agriculture, wetlands management, grazing management, soil health, integrated pest management and sustainable natural resource use. For example, the ARC has expanded the roll-out of rainwater harvesting methods in the Limpopo River Basin as part of the global Challenge Programme on Water and Food. This effort affects more than 15 villages in four countries, namely Botswana, Zimbabwe, Mozambique and South Africa.

Skills development is vital for successful agricultural development, particularly for increasing yields and productivity. During the reporting period, the ARC embarked on many training initiatives in various areas. In collaboration with Cotton SA, at least 800 small-scale farmers were trained on the best production methods for cotton. Also, the ARC has successfully trained more than 4 075 livestock farmers in animal recording for performance improvement, increased productivity and ultimately better income.

Communication is essential to the success of all farmers, particularly when such information enables timely decision-making for good agricultural practice. During the reporting
period, the ARC expanded on the use of mobile communication technology to disseminate information to producers in their own language (e.g. Sesotho and English). Text messages on soil testing, soil conditioning (acidity), suitable cultivars, budgeting, planting time, weed control, visual examination of wheat, irrigation and harvesting were regularly disseminated to more than 400 smallholder resource-poor farmers. This service has been highly appreciated by the farmers, suggesting a greater demand for expansion into other crops and throughout the country.

Smallholder resource-poor farmers often lack access to good quality bulls, which leads to low reproduction rates and slow growth of their herds. In response, the ARC has enabled animal genetics and cutting-edge breeding techniques such as artificial insemination and embryo transfer have been applied to cows belonging to South Africa’s resource-poor smallholder farmers. To date, at least 328 farmers in Limpopo, Eastern Cape and KwaZulu-Natal have been empowered through the improvement of reproductive performance of their herds.

**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. The research and development initiatives at the ARC continue to provide indicative contributions towards South Africa’s knowledge-based economy. The number of peer-reviewed scientific journals has improved significantly and exceeded set targets. In the year under review, research collaboration across the spectrum of strategic objectives has increased and diversified, as demonstrated by the greater number of peer-reviewed scientific journals by external authors, that exceeded targets. The number of peer reviewed journal articles again exceeded the 200 mark. Further, the increased number of publications with ISI rating (impact factor) higher than 2.0 suggest improved quality of science and publications. These outcomes are particularly 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 to 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 approaches. In order to mitigate climate change, the ARC has a number of breeding Programmes, such as low chill apples, which can grow in new areas at different temperatures. Another example is the development of water efficient maize cultivars that are high yielding under drought conditions. To date, the result has been the development of maize cultivars that have a 20% to 30% higher yield under moderate drought conditions. This is an important achievement for ensuring food security.

Food security is an essential element of a peaceful, developmental society. The ARC has continued its research aimed at contributing towards “ensuring food and nutrition security”. By collaborating in the Borlaug Global Rust Initiative (BGRI), ARC researchers have made important scientific breakthroughs that could potentially lead to the development of wheat cultivars that are resistant to multiple plant pests and diseases. Specifically, the ARC has identified several breeding lines that are resistant to stem rust UG99 and the Russian wheat aphid. Further, researchers have identified several breeding lines with quality characteristics that are important for agro-processing and consumer needs. These achievements will enable the ARC to develop new cultivars incorporating genes for pest and disease resistance while enhancing quality characteristics, which would result in increased yields.

The ARC continues to provide technical advice, data and information to 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 isi-Xhosa.

The ARC has continued to provide diagnostic services to identify and characterise disease outbreaks within the country and throughout the
African continent. This is achieved through the organisation’s reference laboratories for important diseases such as African Horse Sickness (AHS), Bluetongue virus disease, Rift Valley Fever and others on behalf of the World Organisation for Animal Health (OIE).

Effective management of zoonotic diseases is important for public health. Rift Valley Fever can be classified as a zoonotic disease. Following recent outbreaks in the period 2009 to 2010 of Rift Valley Fever in South Africa, there were more than 200 people infected, 26 of these were fatal. The ARC researchers have characterised the genetic diversity of the different virus strains that caused the Rift Valley Fever following the disease outbreaks. This information will be used to develop appropriate vaccines for effective use against the virus.

**Our People, our 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 conclusion of wage negotiations with organised labour without interrupting productivity. Further, the number of labour disputes and disciplinary cases remained relatively low, with little adverse impact on the organisation. Such an atmosphere enabled all employees and management to place greater effort in ensuring good to excellent individual performance as reflected by the organisation’s performance information.

During the year under review the turnover rate remained low at 2.9%, suggesting a stable organisation with an effective retention strategy. Exit interviews suggest that a significant number of resignations were due to uncompetitive remuneration offered by the ARC, other opportunities elsewhere and career development. However, South Africa lacks critical mass of highly skilled scientists, engineers and technicians. Therefore, any resignations of skilled scientists at the ARC are likely to significantly impact on the organisation’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 Programmes that are both short term, and long term. For example a number of staff members are enrolled for studies to obtain various degree qualifications, from bachelors to doctoral level. Further, the ARC successfully obtained increased funding from AgriSeta to expand the number of employees on ABET during the financial year.

The ARC’s Professional Development Programme (PDP) remains a key instrument for capacity building. In the year under review more than 50 students participated in the PDP at various levels along with their mentors. Performance and progress of the students has been good and on target in most instances. Graduates from the PDP were subsequently granted employment within the ARC at various levels, from researcher to technician. Although the ARC has implemented a development Programme, this is very inadequate to address the national critical skills shortage. Significant and sustained investments are required to effectively address the shortage of scientific skills within the country and at ARC.

**Managing our Finances for Effective and Sustainable Success**

Effective, efficient and transparent management of finances is an important indicator for organisational sustainability and success. The ARC continues to strive towards ensuring that its customers and the shareholder derive optimal value from the utilisation 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 recognised 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 organisation’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 the financial year 2012/13. 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 predetermined 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 the financial year 2012/13 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 organisation has pulled through on income to the extent that the ARC managed to perform its functions with 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 organisation 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 MTEF period. It is estimated that the ARC’s ageing infrastructure (obsolete equipment linked to specific research laboratories), capital replacement and maintenance costs require a 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 organisation. 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 organisation’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 Committee and Council on the effective and efficient use of resources at the disposal of the 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 the 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 its support, advice and commitment to the success of the ARC is extended to Government, mainly through the Departments of Science and Technology (DST) and DAFF. On behalf of all who are employed at the ARC, Executive Management hereby thanks Council and the Audit Committee for exercising their fiduciary duties with the 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 Ms Tina Joemat-Pettersson, the Portfolio Committee for Agriculture, Forestry and Fisheries for the contribution and support towards the success of the 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
Overview

During the year ending 31 March 2013, the ARC received funding from National Treasury for the Economic Competiveness and Support Packages, and contracts were also signed with the Department of Rural Development and Land Reform, which contributed to the ARC’s increased Parliamentary Grant and External Income. This increased revenue was accompanied by a concomitant increase in costs that had to be incurred to deliver on these new initiatives.

The ARC realised a surplus of R89 million for the year ending 31 March 2013, a 28% decline from 2012 surplus of R124 million. Included in the surplus is the Parliamentary Grant – Baseline Capital of R71 million (2012: R155 million). Operationally, ARC had a very good year reporting a surplus of R89 million after providing for an impairment of Land and Buildings of R29 million. This was made possible by tight cost control measures and external income growth.

The ARC continued to work very hard in increasing other streams of revenue, in order to reduce reliance on the Parliamentary Grant (PG). PG grew by 12% while other revenue streams grew at a higher rate of 13%. This is a good achievement taking into account the challenges facing the global and domestic agriculture sector.

The ARC’s revenue is spent on research and development Programmes, technology transfer, infrastructure, as well as support services. The ARC has processes, policies and guidelines which supports effective utilisation of funding in line with the PFMA, National Treasury guidelines and applicable accounting standards.

Revenue

The ARC’s revenue is up 13% to R1 104 million (2012: R978 million). ARC derives revenue from Parliamentary Grant, external income and interest on short-term investments.
Parliamentary Grant (PG)

PG increased by 12% to R747 million (2012: R666 million). The ARC’s PG is received from the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Science and Technology (DST). The PG is made up of two components:

- **Operational PG**, which is funding from DAFF and DST, designed to finance the operational activities. Baseline Operational PG increased by 32% to R677 million (2012: R511 million). The contributions from DAFF and DST are R627 million (2012: R464 million) and R49 million (2012: R47 million) respectively. The funding from DAFF includes R43 million for Economic Competitiveness and Support Packages (ESCP). ESCP of R67 million was allocated for the year, ring-fenced, in a bid to make the agriculture sector more competitive, however, only R43 million was recognised as revenue and R24 million rolled over to the following year, as related projects were still in progress.

- **Capital PG**, is funding from DAFF designed to finance capital expenditure. For the year under review, Capital PG declined by 12% to R176 million (2012: R199 million). Revenue recognised for the period is R71 million (2012: R155 million). GRAP 23 requires ring-fenced funding for specific assets to be recognised as revenue only when the conditions relating to the construction of an asset have been met. This relates to the construction of the foot-and-mouth disease (FMD) factory, which is due for completion at the end of the 2015/16 financial year. Therefore the R105 million (2012: R44 million) has been disclosed in note 11 of the annual financial statements as a deferred revenue grant.

**External Income**

External income is up 13% to R333 million (2012: R294 million). External Income is derived through projects contracts, research and development contracts, income from intellectual property, and sales of farm products. The 13% increase was driven by the growth in research material, research services and advisory services. A number of long-term contracts were signed in the current year with the Department of Rural Development and Land Reform, from which revenue will be recognised as and when the agreed milestones are met.

**Other Income**

Other income mainly comprises interest received from short-term investments as a result of having invested income received in advance from both government grants and funding for projects from private sector clients. Interest income is up 29% to R23 million (2012: R18 million). Over the past couple of years, the ARC has been prudent in the management of its cash resources 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 continuously review the operating cost, especially focusing on its costing model to ensure that project costs do not spiral out of control over the lifecycle of the projects. Total Operational Expenditure increased by 19% to R1 015 million (2012: R854 million), driven by the 18% increase in personnel costs and R29 million impairment of assets.

- **Personnel Costs**
  Personnel costs increased by 18% to R612 million (2012: R518 million). The growth is driven by a 7% annual salary increase,
a 33% wage increase for farm workers, absorption of long-term temporary labourers into permanent employees at a higher rate and an increase in manpower due to the Economic Competitiveness and Support Packages and projects from the Department of Rural Development and Land Reform.

**Operating Cost**
Operating costs are mainly research-related costs such as consumables and stock feeds, administration and maintenance of infrastructure. Operating costs increased by 12% to R351 million (2012: R312 million), driven mainly by an increase in utilities and energy, namely a 16% ESKOM price increase and a 20% hike in diesel prices. Research consumables linked to the ECSP projects also contributed to the increase in costs.

**Depreciation**
Depreciation and impairment cost increased by 127% to R53 million (2012: R24 million) driven by the R29 million impairment of land and buildings. During 2013 a complete valuation of land and buildings was carried out by professional valuators. This is an exercise that the ARC undertakes every five years. The last valuation was carried out in 2007. The results of the valuation revealed cumulative conditions of impairment resulting from land and buildings that are either not in use or have not been adequately maintained over the years. The impact of years of underfunding have also contributed to the deterioration of the land and buildings over the years, which has resulted in impairment of land and buildings during the year under review.

**Cash-flow**
ARC’s cash position increased to R497 million as at 31 March 2013, from an opening balance of R457 million at the beginning of the financial year.

![Graph showing cash position](image)

The growth in the cash position is driven by several factors. The ARC received R105 million, from DAFF, for the construction of the Foot-and-Mouth Disease (FMD) factory which is still in the design stage. An amount of R67 million for Economic Competitiveness and Support Packages was also received during the year. R24 million of this amount has been rolled-over to the following financial year to complete the projects.

**Cash Shortage**
Although the cash-flow statements shows a cash balance of R497 million as at 31 March 2013, when all cash commitments are factored into the cash balance, the true state of affairs is a cash shortage of R20 million. This is a result of years of underfunding.

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash surplus/(Cash shortage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>(163)</td>
</tr>
<tr>
<td>2010</td>
<td>(145)</td>
</tr>
<tr>
<td>2011</td>
<td>(129)</td>
</tr>
<tr>
<td>2012</td>
<td>(83)</td>
</tr>
<tr>
<td>2013</td>
<td>(20)</td>
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The cash shortage has however reduced by R143 million over the last 4 years through prudent cash management.
## AGRICULTURAL RESEARCH COUNCIL - TEN YEAR REVIEW

### STATEMENT OF FINANCIAL PERFORMANCE

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<tr>
<td><strong>Total Income</strong></td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
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<td>Parliamentary Grant</td>
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<td>326</td>
<td>463</td>
<td>434</td>
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<td>533</td>
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<td>Baseline Operational - DAFF</td>
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<td>257</td>
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<td>356</td>
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<td>373</td>
<td>373</td>
<td>373</td>
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<td>Baseline Operational - DST</td>
<td>26</td>
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<tr>
<td>Baseline - Capital</td>
<td>27</td>
<td>39</td>
<td>39</td>
<td>41</td>
<td>43</td>
<td>60</td>
<td>57</td>
<td>106</td>
<td>155</td>
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<td>External Income</td>
<td>212</td>
<td>219</td>
<td>197</td>
<td>235</td>
<td>266</td>
<td>256</td>
<td>293</td>
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<td>Investment Income</td>
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<td>6</td>
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<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Other Income</td>
<td>0</td>
<td>-</td>
<td>22</td>
<td>0</td>
<td>27</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Expenditure</strong></td>
<td>R'000</td>
<td>R'000</td>
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<td>R'000</td>
<td>R'000</td>
<td>R'000</td>
</tr>
<tr>
<td>Personnel Costs</td>
<td>284</td>
<td>316</td>
<td>396</td>
<td>416</td>
<td>416</td>
<td>467</td>
<td>490</td>
<td>511</td>
<td>518</td>
<td>612</td>
</tr>
<tr>
<td>Operating Costs</td>
<td>199</td>
<td>219</td>
<td>241</td>
<td>269</td>
<td>289</td>
<td>296</td>
<td>265</td>
<td>282</td>
<td>312</td>
<td>351</td>
</tr>
<tr>
<td>Depreciation</td>
<td>18</td>
<td>17</td>
<td>20</td>
<td>11</td>
<td>13</td>
<td>14</td>
<td>18</td>
<td>19</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td><strong>Net Surplus/(Deficit)</strong></td>
<td>6</td>
<td>6</td>
<td>14</td>
<td>8</td>
<td>12</td>
<td>(16)</td>
<td>58</td>
<td>59</td>
<td>124</td>
<td>89</td>
</tr>
</tbody>
</table>

### STATEMENT OF FINANCIAL POSITION

| Property, Plant and Equipment | 376 | 381 | 397 | 523 | 608 | 649 | 649 | 666 | 729 | 784 |
| Investments                  | 1   | 1   | 1   | 2   | 2   | 2   | 2   | 2   | 2   | 4   |
| Current Assets (Excluding Cash) | 67   | 73   | 129 | 77  | 95  | 82  | 93  | 76  | 84  | 87  |
| Cash Resources (Net of Bank Overdraft) | 103 | 152 | 153 | 97  | 59  | 35  | 73  | 163 | 457 | 497 |
| **Total Assets**             | 547 | 608 | 680 | 699 | 764 | 768 | 818 | 908 | 1,273 | 1,372 |
| Capital and Reserves         | 382 | 382 | 382 | 382 | 382 | 382 | 382 | 382 | 382 | 382 |
| Non-Current Liabilities      | 31  | 289 | 230 | 309 | 326 | 87  | 71  | 72  | 115 | 213 |
| Current Liabilities          | 134 | 134 | 252 | 184 | 164 | 180 | 188 | 217 | 416 | 327 |
| **Total Equity and Liabilities** | 547 | 608 | 680 | 699 | 764 | 768 | 818 | 908 | 1,273 | 1,372 |

### CASH-FLOWS

| Net Cash-flow from Operating Activities | 32  | 72  | 32  | 7   | 36  | 56  | 129 | 384 | 150  |
| Net Cash-flow from Investing Activities | (10) | (22) | (31) | (63) | (42) | (60) | (17) | (39) | (110) |
| Cash and Cash Equivalents at Beginning of Year | 81  | 103 | 152 | 153 | 97  | 59  | 35  | 73  | 163  |
| **Cash and Cash Equivalents at end of year** | 103 | 152 | 153 | 97  | 59  | 35  | 73  | 163 | 457  |

### RATIO ANALYSIS

#### Profitability and Asset Management

| Asset Turnover | 1.2 | 1.2 | 1.5 | 1.3 | 1.2 | 1.2 | 1.3 | 1.2 | 1.1 | 1.0 |
| Return on Net Assets (%) | 1.6% | 1.3% | 3.4% | 1.5% | 2.0% | (2.7%) | 9.3% | 11.3% | 31.1% | 16.2% |
| Current Ratio | 0.5 | 0.5 | 0.5 | 0.4 | 0.6 | 0.5 | 0.5 | 0.4 | 0.2 | 0.3 |
| Operating Margin (%) | 1.3% | 1.1% | 2.2% | 1.2% | 1.7% | (2.2%) | 7.1% | 6.9% | 13.0% | 8.2% |

#### Performance

| Revenue per Employee (R'm) | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 |
| Net Surplus/(Deficit) per Employee | 0.3% | 0.2% | 0.5% | 0.3% | 0.5% | (0.6%) | 2.6% | 2.7% | 5.7% | 3.5% |
| Personnel Costs as a % of PG | 101% | 97% | 86% | 96% | 92% | 99% | 92% | 87% | 78% | 82% |
| Personnel Costs as a % of PG (Exc Capex) | 105% | 104% | 92% | 117% | 112% | 125% | 113% | 116% | 112% | 97% |
| Personnel Costs as a % of Total Expenditure | 57% | 57% | 60% | 60% | 68% | 60% | 63% | 63% | 61% | 60% |
| External Revenue as a % of Total Income | 43% | 40% | 30% | 33% | 36% | 34% | 35% | 31% | 30% | 30% |

### Ratio Definitions

- **Net Assets**: Total assets excluding cash and current liabilities
- **Asset Turnover**: Revenue divided 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
Capital Expenditure

For the financial year ending 31 March 2013, the ARC was allocated R176 million by National Treasury for capital expenditure, which is a 12% drop from 2012’s allocation of R199 million. Included in the R176 million capital expenditure allocation is R105 million, which is for the foot-and-mouth disease (FMD) factory currently under construction. The balance of R71 million was utilised for acquisitions and replacements of fixed assets. The capital commitments of the ARC amounted to R32 million as at the end of the financial year.

Financial and Internal Control Environment

The ARC annually reviews its materiality framework in order to improve internal control systems, which are designed to provide reasonable assurance against material losses and misstatement of financial results. The materiality framework is intended to help the ARC manage all significant risks, thereby safeguarding and preventing misuse of assets. The principal features of the ARC’s internal financial controls comply with the PFMA and the ARC Enterprise Risk Management (ERM) Framework.

Overall, the finance function has adequate policies and procedures in place to uphold the organisation’s integrity. In addition to the generic role of ensuring compliance with the legal requirements, e.g. statutory reporting and fulfilling minimum standards expected by the Auditor-General, the Finance Division of the ARC endeavours to increase value by contributing and engaging more proactively with all organisational processes and be known for continued integrity and reliability.

Supply Chain

The ARC strives to achieve its strategic objectives by ensuring that the required goods and services are delivered at the right time, quality and price, while adhering to the guidelines laid down by National Treasury and the ARC’s internal policies and procedures. In applying the best sourcing strategies, the ARC also pays attention to government initiatives by consistently implementing broad-based black economic empowerment in the awarding of all contracts with a rand value of R30 000 and above. During the year under review, BBBEE spending amounted to R190 million of the ARC’s total procurement of goods and services, compared to R72 million in 2011/12. These figures are based on total procurement values of R388 million and R248 million for 2012/13 and 2011/12 respectively. The increase is mainly due to the change in the calculation of the BBBEE scores as well as the increase in volume of transactions. The major challenge remains the procurement of goods of a specialised nature, especially those of the scientific services and equipment that are required by the ARC.

Irregular Expenditure

During the year under review irregular expenditures to the value of R1.1 million were identified. These were as a result of non-compliance to the ARC’s supply chain management policy and procedures as well as the Public Finance Management Act and Treasury regulations. Management is investigating these incidents of non-compliance and necessary corrective measures will be taken.

Unauthorised Expenditure

No unauthorised expenditure was incurred during the year under review.

Fruitless and Wasteful Expenditure

No fruitless and wasteful expenditure was incurred during the year under review.

Conclusion

The ARC has made efforts in stabilising its financial position as reflected in the reduction of the cash shortage over the past few years. The funding for the maintenance of the infrastructure remains a big challenge going forward, if further impairments of the land and buildings is to be avoided in future.
Submission of the Annual Report to the Executive Authority

On behalf of the Council of the Agricultural Research Council (ARC), we hereby submit to Parliament, through the Executive Authority, the Minister for Agriculture, Forestry and Fisheries (DAFF), the Hon. Ms Tina Joemat-Pettersson, this annual report, associated performance information, and the audited financial statements of the ARC for the financial year ending 31 March 2013.

Statutory Basis

The ARC 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 ARC are to conduct research, drive research and development, drive technology development and transfer (disseminate), 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 ARC’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 ARC 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 ARC research, technology development and technology transfer for contribution towards a better life for all and conservation of natural resources. The ARC maintains and manages a combination of the classes in alignment with its mandate as indicated below.
## Animal Production, Improvement and Health

Includes the full value chain from 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, 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

### Plant Voucher Specimen Collection and Vegetation Database

The maintenance of a domestic animal genetic resources information system to organise information regarding indigenous breeds in such a way that it is easily accessible.

### National Forage Gene Bank

### 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 exists since 1950.

### Exotic Diseases Division, Onderstepoort

This division is responsible for the diagnosing of FMD and ASF and the manufacture of FMD vaccine. 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 and therefore significant public health.

### Blood Vaccines Production Unit

This unit produces blood that contains the parasites for use as a vaccine against redwater, heartwater and gall sickness. All these diseases severely limit production.

### National Tick Collection

### National Helminth Collection

<table>
<thead>
<tr>
<th>Serum bank (virology)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insect collection (entomology)</td>
</tr>
<tr>
<td>Diagnostic services (reference laboratories for Rift Valley, blue tongue, African horse sickness, lumpy skin disease and African swine fever).</td>
</tr>
</tbody>
</table>

### 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 (ROO) specimen database
- National weeds list
- Ecology literature index
- Autecological database containing miscellaneous information about plant species
- ARC/INFO database, which contains map coverage and Acoks’s sampling site localities. The Acoks maps database has been made available to SA-IGIS and includes information from other floristic data sets
- 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.
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 equipment and implementation of test facility
- Renewable energy demonstration centre
- Agro-meteorological network, databanks and information systems
- Land type and other surveys with associated databases and sample collections
- NOAA satellite image database for natural resource and disaster management
- 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

Crop Production, Improvement and Protection

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 as well as industrial crops.

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 unadapted material.

<table>
<thead>
<tr>
<th>Grapevine, deciduous fruit, yeast and alternative crops gene bank</th>
<th>Tropical crops gene banks, indigenous plants and vegetable gene banks</th>
<th>Indigenous plants and vegetable gene banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein seeds and summer grain gene banks</td>
<td>Small grain gene banks, wheat, barley, oats, rye, triticale, durum and tropical crops gene banks</td>
<td>Tobacco, cotton and fibre crops gene banks</td>
</tr>
</tbody>
</table>
Utility of the National Assets

It is important in the national 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, amongst which are:

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

2. Research
   - Natural resource inventories such as soil, water, climate and vegetation databanks as well as weather stations for climate inventories and collection of data.
   - 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.).
   - Provide a resource for training.
   - They make an important contribution to scientific studies, biodiversity replenishment, sustainable development and production, food security and pest invader identification.

3. Emergency systems
   Gene banks serve as the basis for resuscitating agricultural production, following natural disasters. They are:
   - Important for biodiversity
   - Important for food security.

Organisation and Facilities

The ARC 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 ARC are distributed in accordance with agro-ecological zones, which enables specific focus on particular commodities. The ARC’s research and development capability is organised as follows:

   - Animal Production
     - animal production
     - animal health
   - Natural Resources Management
     - soil, climate and water
     - biosystematics and integrated pest and weed management
   - Mechanisation and Engineering
     - engineering
   - Agro-processing, Food Technology and Safety
   - Biotechnology

Additionally, the ARC has a technology transfer unit which focuses on transferring research output to stakeholders such as farmers, both smallholder and commercial, as well as communities. Supporting core business divisions, the ARC has got functional divisions, namely human resources; marketing and communications; finance; information technology and communication; facilities management; risk management; internal audit and all these groups operate from its main office in Pretoria.
Research and Development

Introduction

The Financial Year 2012/13 was the first full year after the implementation of the new ARC strategic plan. In an effort to increase efficiencies and to place a greater emphasis on the full value chain, the Council adopted a programmatic approach.

The Programmes are:
- Crop Production, Improvement and Protection
- Animal Production, Improvement and Health
- Natural Resource Management
- Mechanisation and Engineering
- Agro-processing, Food Technology and Safety
- Smallholder Agricultural Development

Working on National Priorities

At the beginning of the FY2012/13, in its continuous efforts to align with government priorities, in particular those of DAFF, as well as of the National Research and Development Strategy, the ARC identified the following five strategic objectives:

1. Sustainable Use and Management of Natural Resources
Conservation and sustainable use of natural resources are critical for agriculture to contribute towards ensuring food and nutrition security, economic growth, wealth creation and a developmental society. Research and development at the ARC has contributed towards conservation and sustainable use of natural resources by improving our understanding of the impact of climate variability and change on agriculture and how best to utilise our natural resources.

2. Enhanced Nutrition and Food Security
The ARC continues to contribute towards the attainment of food security, quality nutrition and food safety for all. The intended outcome of the ARC’s research is to enable South Africa’s population to achieve food security.

3. Improved Ability of the Sector to Manage and Mitigate Agricultural Risks
The ARC continues to successfully develop and transfer technological solutions that enhance the ability of the agricultural sector to mitigate the effects of natural risks to production and productivity.

4. Improved Efficiency and Competitiveness of the Sector
To achieve sustainable economic growth in a developmental society requires a competitive agricultural sector capable of creating employment among the rural poor communities. The ARC continues to contribute towards enhancing the competitiveness of the agriculture sector through innovation and technology transfer initiatives.

5. Transformed Agrarian landscape
The ARC focuses on agricultural farming systems research (AFSR) as its best research modality for supporting and developing smallholder agriculture. One of the factors that has hampered growth in the smallholder farming sector, has been the lack of focus on farming systems. At present most of the work has been centred on the choice of the commodity and ensuring appropriate yields. The ARC’s new focus on smallholder farmers prioritises ‘Farming Systems Research’ into the totality of the constraints and appropriate technical and socio-economic solutions.

The launch of the National Development Plan (NDP) by the South African Government has and will have a major impact on the development of the agriculture sector. The critical areas identified in the NDP reveal a high concurrence with the ARC Programmes and strategic objectives. The plan identifies agriculture as one of the five critical areas that would be important for the growth of the South African economy and to reduce poverty. Within agriculture,

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The ARC’S expertise has also been recognised by the DST-NRF professional development Programme. The ARC has received more than R6 million from the Programme for the training of doctoral fellows.
the role of Research and Development is highlighted, especially within the areas of climate change, smallholder farmer development, agro-processing and biotechnology. The critical requirement of water resources has also been articulated in the plan.

During the Cabinet Lekgotla, held in January 2010, the South African Government adopted 12 key outcomes. The work of the ARC addresses four of the 12 key outcomes:

- Outcome 10: Environmental assets and natural resources that are well protected and continually enhanced.
- Outcome 4: Decent employment through inclusive economic growth.
- Outcome 7: Vibrant, equitable, sustainable rural communities with food security for all.
- Outcome 2: Long and healthy life for all South Africans.

Ensuring that the ARC develops its research capacity

The ARC continues to improve its research capacity and expertise. Another seven ARC researchers have been rated by the National Research Foundation, bringing the total to 31 rated researchers.

The ARC’s expertise has also been recognised by the DST-NRF professional development Programme. The ARC has received more than R6 million from the Programme for the training of doctoral fellows. In addition to the continuing support of these fellows into their second year, a further R2,74 million has been allocated to the ARC to increase its pool of expertise.

The challenge now is to identify and recruit suitable researchers. This scheme also strengthens the ARC’s interactions with universities to develop joint Programmes so that the students gain appropriate qualifications.

Improving on its research output

In the year 2012/13, the ARC has continued on its path of ensuring that its research is of the highest quality. After a very successful year in 2011/12 where the peer-reviewed research publications had seen a 34% increase, this year more than 200 peer-reviewed journal articles were produced. This continues the trend of increasing the number of publications since 2008/09. There has also been a shift in publishing articles in journals with higher impact factors.

The ARC has had another successful year with its research providing new cultivars to the agricultural sector (30 new Plant Breeders’ Rights) to improve yields and mitigate the effects of diseases and a changing environment.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of peer-reviewed journal articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007/2008</td>
<td>160</td>
</tr>
<tr>
<td>2008/2009</td>
<td>144</td>
</tr>
<tr>
<td>2009/2010</td>
<td>183</td>
</tr>
<tr>
<td>2010/2011</td>
<td>199</td>
</tr>
<tr>
<td>2011/2012</td>
<td>269</td>
</tr>
<tr>
<td>2012/2013</td>
<td>231</td>
</tr>
</tbody>
</table>

Research Highlights

In this section, the ARC’s research highlights will be illustrated, firstly, in terms of a multi-disciplinary approach to address the global challenge of climate change and, secondly, in terms of the ARC’s new programmatic approach.

In order to mitigate against climate change the ARC breeding Programmes have been developing new apple cultivars that can grow in new areas.
CLIMATE CHANGE
Climate change is a serious threat to South Africa’s key objective of food security, sustainable agricultural production, rural development and macroeconomic growth. The agricultural sector has a significant effect on exacerbating climate change impacts. In response to climate change challenges, the ARC has adopted multi-disciplinary approaches, including:

- Mitigation strategies
- Modelling of the impact of climate change on the agricultural sector and
- Monitoring the spread of disease.

**New Apple Cultivars for Limpopo Province**

In order to mitigate against climate change, the ARC breeding Programmes have been developing new apple cultivars that can grow in new areas. Six apple selections bred for low chill requirements at Drostersnes in the Western Cape and evaluated in warmer areas of Limpopo Province, have been earmarked for possible commercialisation. Consequently, application for registration for Plant Breeders’ Right will commence soon. This work seeks to address the issue of climate change and that the production areas could change because of the increase in temperature.

**Producing Drought-Tolerant Maize for Africa**

The increase in global temperatures will have an impact on the rainfall patterns as well as the amount of rain that our region will receive and this will result in, among others, dire consequences such as drought. In order to mitigate against drought, the ARC has been involved in the Water Efficient Maize (WEMA) project with international partners for the past four years to produce higher yielding maize varieties during the times of drought. This would be important to ensure food security in the country and region. The first phase of the project has been completed with the identification of conventional hybrids that have a 20% to 30% higher yield under moderate drought conditions. These hybrids will be released, royalty-free, to smallholder farmers in South Africa in 2014. The project has been highly successful and the international funders have agreed to fund the project to the value of $50 million for the next three years.

**Climate Change set to Cause Water Shortages in the Limpopo River Basin**

Under the ‘business-as-usual’ scenario, it is predicted that climate change will result in less rainfall and water shortages in the Limpopo River Basin. This will obviously have a negative effect on agriculture and food security in the region, which will be further exacerbated by rising temperatures.

These are the findings of a project called ‘Tropical Systems from the Southwest Indian Ocean into Southern Africa: Impacts, Dynamics and Projected Changes’, which was completed by the ARC for the Water Research Commission (WRC).

The three-year project considered the influence of tropical systems (cyclones, storms and depressions) from the Southwest Indian Ocean (SWIO) over the Limpopo River Basin. Due to the semi-arid nature of this area, variation and change in time of significant rain-contributing synoptic...
systems, are very relevant to the agricultural community. A wide range of climate datasets were examined from 1948 to 2012 to appreciate the climatology of these systems over the past few decades, while simulations of an Atmospheric Global Circulation Model were scrutinised to appreciate the projected change in occurrence under anthropogenic forces towards the end of the 21st century.

The major research findings documented in the final report include the fact that while less than 10% of the annual rainfall in the region is produced by tropical systems from the SWIO, the latter are responsible for all the major rain events.

The findings concerning the effect of projected climate change on these systems indicated that future circulation patterns under the “business as usual” scenario, will cause their tracks to be displaced northwards from the current situation, with a concomitant decrease in rainfall over the Limpopo River Basin.

Maize yields for both commercial and small-scale farmers are expected to drop by up to 60% within the next century if farmers continue to rely on rainfed production. A staggering 96% of farms could be negatively affected by climate change.

Researchers came to these conclusions after assessing the potential impact of climate change in the maize-producing regions of Bloemfontein and Thaba’Nchu. Growers will have to adopt new strategies including crop suitability assessments and soil-water-nutrient conservation technologies or switch to crops more suited to the changing environment. Past (1980 to 2009) and future crop productivity (2030 to 2059) was simulated for the region, using historical and projected future weather data. Yield was simulated over different weather, soils and management scenarios for multiple years to provide distribution of yield, enabling economists to recognise the “winners and losers”. Results indicated that future mean yield could decrease by 20% and showed wider seasonal variability.

The commercial farmers will experience a 20% decline in future yield, whereas the smallholder farmers will experience much higher yield declines of about 60%. To maintain the current yield, farmers need to adopt new technology. If small-scale farmers adopt new technologies, it will result in increased yield of (>12%).
The TOA-MD model also indicated that small-scale net return per farm income will increase, whereas commercial farmers’ net farm return will decrease in future. Overall farm return will decrease in the region and this will have major implications for food and nutrition security in the region. In conclusion, the main idea of this integrated assessment is to link climate, crop and economic models to assess the impact of climate change on food production.

**Partnerships to Combat Climate Change**

The ARC also collaborated with Japanese researchers on another Southern African climate prediction study. The Department of Science and Technology (DST) allocated funds to the Applied Centre for Climate and Earth System Science (ACCESS) to enable South Africa to participate in the project. ACCESS is a consortium comprising the South African Weather Service (SAWS), the CSIR, the ARC and the Universities of Pretoria and Cape Town.

Japanese counterparts include the Japan Agency for Marine Earth Science and Technology (JAMSTEC) and the University of Tokyo. ACCESS partners work together to deliver a range of output aligned to the Global Change Grand Challenge (GCGC) pioneered by DST.

Through the project, high-tech equipment, such as high performance computers and automatic weather stations were donated to the partners, and capacity building remains a key focus.

**New Disease Outbreaks**

New disease outbreaks have also been identified in this financial year. In the previous annual report we identified a number of diseases that were seen for the first time or after an absence of decades.

The Diagnostic Centre (DC) focuses on laboratory-based isolation and identification of plant diseases and pests (biotic disorders), as well as other plant disorders affecting growers (commercial, small-scale and emerging), and offers them control measures to eliminate or reduce their problems. During the period January to March 2013, two new disease associations were made.

**New Disease Associations Found for Radish and Garlic**

ARC researchers determined that a disease named scurf can affect radishes, and that another, known as *Embelissia* bulb canker, can affect garlic. Both diseases are caused by fungi. Crops like potato, carrot and beetroot are also hosts to scurf, so none of these crops can be planted in an infected field. Scurf is caused by a *Streptomyces* bacteria.

*Embelissia* bulb canker is caused by *Embelissia allii*. The disease is usually cosmetic, but it can infect cloves, which in turn can attract secondary fungal infections by *Fusarium* and *Penicillium*. These fungi cause the cloves to rot, destroying the bulb. The *Embelissia* bulb canker finding will be reported as a first for South Africa, and further research could establish if the *Fusarium* and *Embelissia* fungi co-exist on South African garlic.
A New Sweet Potato Disease Discovered in Empangeni

A serious new disease affecting sweet potatoes, never seen in South Africa before, was discovered after two studies in Empangeni. Researchers have named the disease Anthracnose. It is caused by a fungus known as *Colletotrichum magna* and can kill whole plants. Researchers are still verifying exactly how virulent this fungus is and how it affects sweet potato crops.

An invasive fruit fly, *Bactrocera invadens* has also been identified in the Limpopo area and Mpumalanga. It has been accepted that the invasive fruit fly has now firmly established itself in the northern fruit-growing regions of South Africa. DAFF has been informed of the fruit fly invasion and the Department, in cooperation with the producers, have started with chemical control actions. Research is continuing to find a more sustainable solution to the problem.

New Fungal Pathogen in No-Till Farming

Mitigation strategies continue to receive attention at the ARC. In last year's report, we highlighted the success of conservation agriculture technologies. However, the results from this year remind us of the constant challenge between new agricultural practices and the emergence of new threats such as fungal pathogens. The ARC's research undertaken in 2011 clearly demonstrated that crown and root rot of no-till maize can dramatically depress growth and grain yield, with losses as high as 19% recorded.

The ARC recently undertook further research to determine the role and importance of different soil-borne diseases, and to evaluate the effects of possible management strategies on the impact of these diseases. Recent results suggest that soil-borne diseases are caused by a complex of pathogens that can affect plants at all growth stages. This information is crucial to developing a management strategy for soil-borne diseases that will contribute to the sustainable production of no-till maize.
CROP PRODUCTION, IMPROVEMENT AND PROTECTION
The Crop Production, Improvement and Protection Programme focuses on productivity, competitiveness and sustainability of commercial agriculture to ensure national food security and welfare. The Programme has two research areas, namely field crops and industrial crops. Research on field crops includes a wide range of grains, vegetables, indigenous ornamental plants, medicinal plants, deciduous fruit and grapes, tropical and subtropical fruits and niche crops such as herbal teas. Research on industrial crops will focus on fibre crops such as cotton and hemp.

**Citrus and Subtropical Crops**

The work on citrus and subtropical crops is mostly done on the ARC’s campus based in Nelspruit, Mpumalanga, where the growth of said crops is highly favoured due to the regional climatic conditions, as well as several other research farms in the region and in other selected provinces. The ARC here provides sustainable and appropriate technologies for production and postharvest handling of citrus and subtropical crops in order to enhance food security and nutrition, global competitiveness and wealth creation by addressing national priorities through its research agenda and related activities. Post-harvest technologies include agro-processing and export protocols, thus catering for both the commercial and developing agricultural sectors of South Africa.

**Deciduous Fruits and Grapes**

The ARC in Stellenbosch, Western Cape, mostly conducts research, development and technology transfer on deciduous fruit, grapes, alternative crops (e.g. berries, figs and olives), indigenous herbal teas and regional medicinal plants. Research involves a number of disciplines, namely soil and water science, viticulture, horticulture, post-harvest and wine technology, plant protection and cultivar development.

Post-harvest activities include wine and brandy production, cold storage and other forms of shelf-life extension (drying, canning, juicing and jam production). The major portion of research and development is focused on food security and mitigation of agricultural risks, as well as the sustainable use of natural resources. Unique facilities include a winery, cannery, irradiation facility and rooms for cold storage, as well as for controlled atmosphere storage. The ARC here is also the custodian of grapevine, deciduous fruit and wine yeast gene banks that preserve genetic resources for breeding purposes, training and comparative descriptions.

**Vegetable, Medicinal and Ornamental Plants**

The ARC at Roodeplaat, north-east of Pretoria, conducts innovative, need-driven and environmentally-friendly research, technology development and technology transfer on commercial vegetables, African leafy vegetables, medicinal and ornamental plants. Research involves a variety of disciplines, including crop science, crop protection, breeding, genetics, biotechnology and agronomy. The aim is to enhance food and nutrition security, crop productivity, competitiveness, sustainability as well as wealth and job creation.

**Summer Grains and Oil and Protein Crops**

The work on summer grains and oil and protein crops is done mainly at the ARC campus in Potchefstroom in the North West province of South Africa. The related industries are extremely dynamic and closely follow international supply and demand trends. As a result of access to highly productive maize hybrids and the supportive research and development, the South African maize industry is one of the few field crops industries which are competitive in the international export market. Similarly the demand for canola products are at an all-time high, while we are at the initial stages of a South African biofuel industry as well. The ARC here has realigned its excellent national scientific knowledge base and facility infrastructure to address the research and development as well as technology transfer necessities of these dynamic industries and their participating smallholder and commercial producers.

**Small Grains**

While its main campus for small grains is situated in Bethlehem, Free State, the ARC does research and development as well as technology transfer in all nine provinces of South Africa. The ARC’s activities in this area are dedicated to increase the competitiveness of the wheat, barley, oats, durum and triticale industries in South Africa and in the process enhance household food security and proper nutrition by means of local production with a special emphasis on the maintenance of our scarce natural resources and as important, to create much needed job opportunities in especially the rural agricultural areas. The current importation of more than 50% of our annual wheat consumption, 100% of our rice needs and 35% of
our barley requirements, necessitates dedicated research and development interventions to negate our dependency on these imports. In the area of small grains, the ARC forms part of a well-established and functional local and international scientific network to access all new and relevant scientific developments.

**Industrial Crops**

The ARC has served the cotton and tobacco industries of South Africa proudly for more than five decades from its main premises in Rustenburg, North West. Recently the local and international demand for products of industrial crops such as hemp, flax, kenaf and sisal have increased significantly and therefore warrant renewed research and development interventions from the ARC. Most importantly, the relevancy of these industries to the South African economy as well as its competitiveness cannot rely only on local production of the mentioned commodities, but should also invest in value-adding product development in South Africa.

The ARC is currently investigating new opportunities for especially the smallholder producers in fields of silk production in an endeavour to increase and broaden the income base of the relevant producers.

During the financial year 2012/13, under the Crop Production Programme, the ARC carried out several initiatives to increase agricultural productivity and enhance food security. Outlined below are some of the significant highlights that demonstrate the ARC’s contribution to the improvement and production of crops.

**Three New Citrus Cultivars Released to Industry**

The citrus breeding Programmes have produced a number of citrus cultivars that have been released to clients. Virus-free citrus material, including the ARC’s Sonet, African Sunset and Valley Gold cultivars, was also supplied to a commercial company for establishment under contract in similar facilities in Chile and Peru.

**Larger and Tastier Litchi to Improve Competitiveness**

Consumer demands for bigger, tastier fruit and producer needs for varieties that are more profitable and can ensure market access, drive the fruit breeding and selection Programme. A new litchi seedling selection that can produce fruit nearly twice the size of ‘normal’ litchis was identified by the ARC this past harvesting season.

The fruit has a very small seed, weighs in at an average of 43 grams and, in Nelspruit, the fruits can be harvested a week earlier than the standard ‘Mauritius’ cultivar, which weighs only 24 grams. And they taste good too – a major advantage in the industry. The next step will be to determine the litchi’s yield potential for producers. Researchers are already working on propagating the seedlings.

**Pineapple Producers can Save Millions by Spraying to Reduce Winter Flowering**

New research into effective pineapple spraying could save producers a total of over R8 million every year.

The Queen Pineapple cultivar supplies 90% of the South African fresh market demand, but the plant’s natural flowering cycle must be artificially controlled to ensure year-round production. The key is to suppress winter flowering using a chemical known as an ethylene biosynthesis inhibitor. Researchers previously determined that a fortnightly spray reduces natural flowering to fewer than 2%.

Unfortunately, this method is very expensive, so researchers conducted a series of trials to find a more cost-effective solution. They investigated the effect of plant size and planting time on the efficacy of the treatment, as well as the frequency of application and the importance of control during a long winter. They found that they could reduce the application rate from 6 kg/ha to 4.8 kg/ha and still achieve a 98% reduction in flowering.

These research results will make a huge financial difference for pineapple growers in northern
KwaZulu-Natal, where natural flowering occurs during the winter months. Suppressing natural flowering will prevent the over-production of fruit in December/January that usually results in lower market prices. The technique can also result in improved crop management, a decrease in harvesting costs and better fruit quality.

New Faster, Cheaper Technique to Analyse DNA

Researchers have developed a cheaper, faster and simpler way to genotype, or genetically identify citrus cultivars. Traditional genotyping can take up to 24 hours and involve complicated DNA extraction methods. The new method can produce results in just three hours, directly from the leaf tissue and it is up to 60% cheaper.

The method was developed as part of the ARC’s Citrus Improvement Scheme (CIS). Before entering the CIS gene bank, the new cultivars must be accurately identified using DNA.

This is because small genetic variations do not always affect the physical visible characteristics of the plant. If the plants are not properly genotyped, the ARC could face the costly consequences of jeopardising its intellectual property and distributing the wrong cultivars to industry. To avoid this, the ARC is working with Citrus Research International to create a genotype database for citrus cultivars.

Ready-to-Eat Avocados, Every Time

With the right pre-harvest climatic and horticultural techniques, South African avocado orchards can generate high quality export fruits that are ready-to-eat every time.

Researchers found that avocados harvested during the drier months of the season experience a water-related stress that slows ripening. The effect is even worse when a dry winter harvest is followed by a particularly wet summer. But proper orchard management practices, particularly in terms of soil water and phosphorous content, can result in more even post-harvest ripening. This finding is set to bolster South Africa’s image as a competitive avocado exporter.

Rural Economies to Benefit from Indigenous Fruit Trees

At least 11 indigenous fruit trees have been identified as candidates for the production of jams, jellies, juice, frozen yoghurt, ice cream and even liqueurs. Many of these products have already received the thumbs-up from professional tasters and the ARC is currently optimising propagation techniques and refining the final products. The fact that the natural distribution of these indigenous fruits in Limpopo, Mpumalanga and the Eastern Cape is still low, means there is opportunity for small-scale agro-processing that would cater for niche markets.

For rural communities, this opportunity means economic growth. The ARC is actively encouraging this growth through training workshops geared toward helping communities establish small-to-medium agro-processing enterprises.

Vhembe Fruit Farmers Now Supplying Local and International Markets

A total of 181 black farmers in the Vhembe District of Limpopo now participate in an ARC capacity building Programme. The region’s subtropical climate allows fruit and vegetables to be produced all year round, and the quality of the current produce is so high that some farmers have even started exporting.
The Programme, which is supported by DAFF, the Limpopo Department of Agriculture (LDoA) and Subtrop (Subtropical Fruit Growers Association), hopes to help curb the 53% unemployment rate in the region by turning smallholders into commercial farmers. The farmers were assisted in establishing a legal entity known as the Vhembe Subtropical Fruit Co-operative Ltd. Crops included under this entity are mango, citrus, avocado, banana, litchi and macadamia nuts and nearly 130 000 plants have been established to date.

**South African Mangos and Litchis Clean and Ready for Export**

Through thorough inspections for moth larvae in mangoes and litchis, the ARC has found the fruit to be clean and ready for export. Inspections were necessary after the litchi moth and the false codling moth were classified as pests of quarantine importance by the US Department of Agriculture (USDA), meaning that fruits containing them cannot be exported to America.

In the case of litchis, surveys of nearly 55 000 fruits over the last three years revealed no moth pupae whatsoever. It was also determined that mango is not a natural host for the false codling moth after no naturally infested fruit were found in orchards or pack houses, despite the wide occurrence of the moth. These two findings have opened the door to new markets for the South African fruits.

**Over 400 People Trained in Table and Raisin Grape Production**

Response to a need for formal training of workers in the labour intensive table and raisin grape industries, the ARC, the Cape Institute for Agricultural Training at Elsenburg and the South African Table Grape Industry (SATI) introduced a modular course in table and raisin grape production. The course presented in the Northern Cape in 2013 saw 35 trainees receive certificates. This brings the total number of persons, many from previously disadvantaged communities, trained by the initiative since 2001 to 416.

**Winery Wastewater Could Curb Vineyard Water Challenges**

Winery generate on average between three and five litres of wastewater for every litre of wine produced. To comply with requirements for sustainable wine production and in view of the increasing scarcity of water for agriculture, due to increasing demands for human consumption and the effects of climate change, research has focused on ways to reduce and recycle winery wastewater. Preliminary research done in Rawsonville, Western Cape, indicates that using wastewater to irrigate vineyards does not affect the chemical or sensory properties of wine. Cover crops, i.e. Babala in summer and oats in winter, could remove excessive potassium, but did not have any effect on sodium...
in the soil. Although irrigation of vineyards with winery wastewater had almost no effect under the given conditions, negative effects might be more prominent in heavier soils or in regions with low winter rainfall. These aspects are being addressed in ongoing, parallel studies.

**Eighteen New Fruit Varieties on the Market**

The deciduous fruit and table grape breeding Programmes aim to provide farmers with varieties that satisfy changing consumer demands and enable producers to gain access to more profitable (i.e. early season) and niche markets. In 2012, four new seedless table grapes and fourteen new stone fruit cultivars were released to the industry as a result of ARC breeding Programmes.

The grape varieties are Sundela, Rosidawn, Scarlet Dew and Black Velvet. Scarlet Dew has already been exported in commercial quantities. This cultivar has an excellent taste and will likely be preferred over other early-ripening, red, seedless grapes.

The stone fruit cultivars include apricots, nectarines, peaches and plums. They produce fruit at a time during the season when few other commercial cultivars are able to do so. They also serve as replacements for old, outdated cultivars and have better fruit and tree characteristics than other commercial cultivars.

**Bio-Fumigation: Using Mustard and Canola Crops to Control Parasites and Weeds**

Soil fumigants and soil-applied nematicides used to control harmful nematodes, as well as herbicides used to control weeds have been shown to be detrimental to soil health. This prompted research on alternative, ecologically-sustainable methods to control these pests and weeds. Mustard and canola crops appear to effectively suppress ring nematodes and the winter weeds of the Western Cape. Although some of the crops did allow the problemweed known as ryegrass to become dominant, grass-specific post-emergence herbicides are available to control this species when necessary. These are promising results in a study that aims to find cover crops that can double as bio-fumigating agents against weeds and nematodes, while having a positive effect on grapevine performance and soil quality.

The mustard and canola crops did not have a negative effect on other biological activity in the soil, even after four years.

**Microbial Enzymes More Active in Straw Mulch and Compost**

Maintaining and increasing soil fertility is a cornerstone of sustainable crop production. Microbial activity in the soil is often used as an indicator of soil fertility and health. Research has shown that mulching and composting cause changes in the chemical composition and acidity of soil and this, in turn, has a positive effect on microbial activity.

It was found that the microbial enzymes, β-glucosidase and urease, which play an important
role in soil fertility, had the highest activity in top soil layers after repeated applications of straw mulch over an underlying layer of compost in apple orchards.

**Higher Yields for High-in-Demand Honeybush**

Thanks to the ARC’s honeybush breeding Programme, better-performing seed is now commercially available and farmers can expect higher yields than what they currently obtain from wild seeds.

Farmers who have already bought four kilograms of the new seed, will be able to plant 30 hectares of land with honeybush. The crops are expected to yield five tons per hectare, which equates to R750 000 for the industry. Trials will begin in 2013 to determine the exact increase in yield compared to wild seed, but researchers estimate it to be at least one extra ton of wet material per hectare. In addition, the seedlings are of a higher quality and more of them survive compared to seedlings from wild plants.

Since the honeybush industry at present has been unable to meet demand for this uniquely South African tea, these new developments will help to grow the industry and make it self-sufficient. Funding received from the Medium Term Expenditure Framework (MTEF; Project 282047) and the Department of Science and Technology (DST; Project 282048) will also stimulate growth by establishing more seed orchards in communities and by forming SMMEs. DST funds are also used to establish new plantations and 200 grams of the improved seed has been sown on a hectare in Bereaville.

**Environmentally-Friendly Chemicals for Export Apples**

A research team tested several environmentally-friendly alternatives to the often harmful, commercially-available chemicals that are used to stimulate bud break and flowering in apple trees. These chemicals, known as rest-breaking agents, are necessary in South Africa because our warm winters are not cold enough for apple production.

Over four years, researchers evaluated safer treatments on two apple cultivars in Elgin. They found that success depended on the product and the time of application, and that none of the treatments compromised yield. This research is vital to ensure that South African export fruit complies with stringent international regulations regarding chemical usage.

**Beautiful Fruit Without use of Chemicals**

Post-harvest disorders that develop during cold storage can result in huge economic losses for producers and exporters. Granny Smith apples, Red Delicious apples and Packham’s Triumph pears are the most susceptible to browning, which occurs during long-term cold storage and is known as superficial scald. A four-year study has determined that post-harvest brown discoloration of apples and pears can be prevented without the use of a chemical called diphenylamine. After decades of use, this chemical has now been withdrawn from the market in the EU, forcing researchers to find alternatives.
A new preventative measure known as dynamic controlled atmosphere (DCA) has proved successful at preventing scalding during trials. The technique involves storing the fruit at oxygen levels just above the point at which certain bacteria are able to break down sugars, known as the anaerobic fermentation point, and it is continuously monitored using fluorescence technology.

DCA is also appealing because it extends fruit storage time and uses existing technologies with the ability to alert operators of equipment malfunctions.

Rooibos Compound may have Anti-Diabetic Properties

A phenolic compound found only in rooibos tea, known as aspalathin, exhibited anti-diabetic properties during laboratory and animal-based studies. Researchers from the ARC and the Diabetes Discovery Group of the Medical Research Council observed a reduction in blood glucose levels, as well the inhibition of alpha-glucosidase, an intestinal enzyme responsible for the breakdown of complex carbohydrates.

The research was published in an international journal and received a large amount of media interest, following a press release by the South African Rooibos Council.

New Yeast Strains Show Potential for Commercial Wine Production

Winemakers are constantly looking for yeast strains that are tailor-made for the production of premium wines from specific grape cultivars grown under different geographic and climatic conditions (“terroir”). The ARC has been developing two new wine yeast strains over the last few years and a first glimpse into their performance in the 2012 harvest of Merlot, Cabernet Sauvignon and Shiraz revealed them to be viable commercial candidates.

The two strains, known as N15 and N16, were isolated from Shiraz grapes a few years ago, along with 26 others. During trials only these two showed potential as commercial yeasts and in 2009 they were cultured and dried by an international yeast manufacturer. During the 2010 and 2011 harvests, these dried yeasts consistently produced typical red wine varieties equal to those produced by leading commercial yeasts.

Unseen Pests and Diseases Shorten the Productive Lifespan of Grapevines

Subterranean pests of grapevines like nematodes and grapevine trunk disease caused by fungi, are not visible with the naked eye and producers are often unaware of their presence in vineyards. These pests and diseases reduce yield and productivity and drastically shorten the productive lifespan of grapevines. Given the high cost of establishing a vineyard, this has serious financial implications for producers. Accurate diagnosis
and identification of these pests and diseases, as well as sustainable management strategies, are paramount to maintain profitability in the wine grape industry.

**Longer Rotation Cycles in Grapevine Cultivation Needed to Prevent Nematode Damage**

Two research projects have determined that the current one-year fallow period between replanting of stone fruit orchards and vineyards is not enough to reduce parasitic ring nematodes levels.

The distribution of the microscopic worms was found to depend primarily on the availability of host plant roots and numbers high enough to cause root damage can even occur at a depth of 1 metre. Ring nematode numbers did not fluctuate significantly between the various seasons because there were enough roots to serve as a food source year round. Ring nematodes are very hardy creatures, able to survive droughts and intense heat without the presence of host roots for at least 12 months. This implies that the standard fallow period of one year currently implemented by industry may be too short to reduce ring nematode levels to below economically damaging levels before replanting a susceptible crop.

**Millipedes and Ants Spread a Harmful Grapevine Fungus**

Millipedes and ants can carry spores of a fungus known as *Phaeomoniella chlamydospora*, which causes a devastating grapevine trunk disease that shortens the productive lifespan of grapevines. It is highly likely that other fungi are spread in similar ways by the same or other arthropods. ARC researchers recommend pruning wound protection with a registered product as a preventative strategy.

These insights came out of a study in which a total of 10,875 arthropod specimens, belonging to more than 31 families, were collected in two Western Cape vineyards. Fungal spores were isolated from the surfaces of arthropods, which included mainly millipedes, ants, spiders and beetles. Both millipedes and ants were shown to transmit the fungus spores onto pruning wounds and cause infection. Millipede faecal pellets were also identified as potential sources of infection. This information will assist the grapevine industry in managing trunk diseases.

**New White Rot-Causing Fungi Discovered in South African Vineyards**

Researchers have isolated ten previously unidentified species of a fungus from South African vineyards. Like other members of the *basidiomycete*-type fungi, the newly discovered species cause ecsa, a grapevine disease characterised by white rot-like symptoms on the trunks of the plants.
These new species were discovered during a survey of South African vineyards that sought to investigate the causes, effects and distribution patterns of ecsa. All ten species were able to cause disease, possibly by releasing their spores into wounds on the grapevine. The scientists observed that the release of spores, or sporulation, occurred at a high rate from the fourth week of May until the end of September, tapering off as summer approached. Farmers are encouraged to protect pruning and all other wounds on grapevines in order to prevent infection.

ARC’s Sweet Potato Varieties in the Spotlight Again

The ARC’s sweet potato research resulted in a number of publications and community empowerment initiatives over the last year. Of particular interest is the orange-fleshed sweet potato, which is enriched with provitamin A. The crop is set to play an important role in curbing malnutrition, since in South Africa, 64% of one to nine-year-olds and 27% of women of childbearing age are currently vitamin A-deficient.

Thanks to the Gauteng Department of Agriculture and Rural Development, over 120 000 cuttings were distributed to communities in Hammanskraal, Soshanguve, Winterveldt, Mamelodi and Ekangala. In total, 370 000 cuttings from the sweet potato nursery at the ARC in Roodeplaat went to smallholders, governmental programmes and NGOs in various provinces. This is twice the number of cuttings that were distributed in the previous season.

The ARC, in partnership, established five sweet potato production units in the Amathole and Nelson Mandela Bay Districts of the Eastern Cape.

With the support of sweet potato nurseries the DST, the ARC and the Medical Research Council also jointly published 2 000 copies of an updated manual with a wealth of nutritional as well as agriculture information for implementing vegetable garden programmes to address vitamin A deficiency.

Sweet Potato Blight in South Africa

Continuing research at the ARC has already identified four different fungal varieties associated with a leaf and stem spotting disease of sweet potato, known as Alternaria blight.

Elsewhere in the world, a fungus known as Alternaria bataticola is most often behind the disease, but no critical studies have ever attempted to identify other causal agents. Without this knowledge, researchers and growers are not properly equipped to control the disease.

ARC researchers are now in the process of identifying such blight-associated fungi. One previously unknown Alternaria species has been discovered and, along with Alternaria bataticola, two other species named Phoma tropica and Peyronellaea americana were able to cause sweet potato blight. Researchers plan to confirm the identities of the fungi through DNA sequencing.

ARC and McCain Foods SA Sign Landmark Agreement on Superior Potato Clones

In a first for the ARC and the South African food processing industry, McCain Foods SA has signed a material transfer agreement (MTA) to evaluate six enhanced ARC potato clones in the field and in the factory. The clones were selected for their superior processing qualities.

Two of the clones have been earmarked for agro-processing projects aimed at uplifting underdeveloped rural areas and the ARC is in the process of obtaining Plant Breeder’s Rights for them.
Better Farming Practices can Increase the Productivity of Indigenous Vegetables

Many indigenous South African vegetables have good vitamin and mineral content and could thus contribute to food security and health. Unfortunately, the crops remain under-utilised and their performance under different farming practices is still poorly studied. A key question is whether crop nutritional value depends on water and soil nutrient management, especially in terms of nitrogen (N), potassium (K) and phosphate (P), which might be lacking in the soils used by rural communities. These minerals are present in nitrogen fertilisers.

Preliminary results indicate that while different watering regimes have no real effect on the yields of indigenous vegetables, Amaranthus and spider flower, nitrogen fertiliser makes a significant difference. For Shona cabbage, researchers determined an optimal combination of water and fertiliser. These and other results will be confirmed during the 2013/2014 season.

First Glimpse into the Drought Tolerance of the Taro Root Crop

Researchers have gained new insights into the drought tolerance of one of the oldest crops known to man. The taro root crop is common in the tropics and subtropics but, although many believe it to be one of the least water-efficient crops, little is really known about its tolerance to drought.

A study by the ARC recently evaluated the growth, yield and water-use of three South African taro varieties known as Dumbe Lomfula, KwaNgwanase and Umbumbulu. The crops were planted in a rain shelter at Roodeplaat, Pretoria, and were exposed to different irrigation regimes.

Umbumbulu was found to be 113% more water-efficient than KwaNgwanase and it was better able to regulate the amount of water it lost through openings or pores in the leaves known as stomata. Compared to the other two varieties, Umbumbulu also experienced only a moderate reduction in growth parameters, such as plant height and leaf numbers when water availability decreased. These findings can now be used by researchers to differentiate the three taro crops based on their potential tolerance to drought.

Indigenous Vegetables High in Micronutrients

Indigenous vegetables are high in nutrients like calcium and provitamin A, making them ideal candidates for the production of nutraceuticals. Nutraceuticals are plant food products that offer specific health benefits.

The ARC researchers are investigating the nutritional value of a number of crops, including the spider flower, cowpea and Amaranthus. They determined the quantities of different minerals and nutrients within the plant and looked at the effects of fertiliser on the nutrient quantities. Many of these vegetables are consumed in rural communities and they stand to benefit most from farming practices that would increase the nutritional value of the crops. The ARC will provide farmers in these communities with technical support throughout the project.

Open Pollinated Tomato Cultivar Produces More for Less in Closed Hydroponic System

The ARC’s Rodade tomato cultivar could compete favourably with more expensive hybrids in terms of yield, input costs and growth time. Studies have shown that the right pruning, combined with high density planting in a soil-free system, generates a high yield with a shortened growth season of 12 weeks.

Researchers evaluated nine cultivars planted at different densities in a closed hydroponic system,
where nutrients are obtained from water, rather than soil. High-density planting did not affect the mineral content of the fruit. The higher yield and shorter growth period of the Rodade cultivar, combined with high-density planting, translates into significant cost savings for hydroponic growers.

Using Biotechnology to Breed Crop Sapp for the Future

Conventional plant breeding to obtain varieties with desirable characteristics such as drought tolerance or resistance to pests and diseases, takes years to yield new varieties. However, by using advanced biotechnology techniques to insert desirable genes into existing varieties, this process can be speeded up significantly. Getting such new varieties to producers sooner, holds great benefits for food production and food security.

Researchers Insert Drought-Tolerance Gene into Potato

A gene that promotes drought tolerance has successfully been incorporated into the potato cultivar BP1. The gene is activated by dry conditions and works by stimulating the plant’s natural drought responses. Greenhouse trials are now underway to confirm that this genetic modification does in fact confer drought tolerance to the plants.

The research project was initiated in 2012 and will assist in the development of the emerging potato farming sector in South Africa. South Africa is classified as a water-stressed country, so biotechnological enhancements like these are vital to protect crops and increase yields.

Potatoes are highly nutritious and production times are short, so it is an ideal crop for population-dense regions. Roots and tubers already feed over a billion people in the developing world.

Resistance to Viral Infections through Genetic Engineering

The ARC researchers have successfully incorporated a viral-resistance gene into the flowering plant *Ornithogalum*. The plant is very important to the South African flower industry, but it is also very susceptible to the *Ornithogalum* mosaic virus.

The gene product interferes with the virus’s ability to produce its outer protein coat. Researchers are now in the processes of multiplying plants that were successfully modified so that their response to the virus can be evaluated in greenhouse trials. For the industry, a success in this regard would reduce income losses associated with deformed flowers.

High-Definition Video Training for Small-Scale Farmers

2012 saw the start of a project dedicated to training small-scale farmers on how to deal with vegetable pests. Extension officers that act as intermediaries between farmers and researchers will be able to use high-definition videos to assist emerging farmers. The training can be done by extension officers during capacity-building workshops or farm visits.

Working Towards Safer Maize

The ARC has been working with the University of Stellenbosch to find maize varieties that are resistant to ear rot. Ear rot disease is caused by a *Fusarium* fungus that produces toxins. According to the World Health Organisation, these mycotoxins may cause cancer and other diseases in humans and animals. Maize is highly susceptible to ear rot and, since it is one of the most important crops in South Africa, it is vital that researchers find ways to prevent infection.
Surveys have found that different *Fusarium* species occur in different regions, depending on the climate, and that the different species produce different mycotoxins. More surveys are needed to determine the potential threat of mycotoxins to humans and animals under both commercial and subsistence farming systems. However, researchers have identified several maize lines that are resistant to a species called *Fusarium verticillioides*, which produces a mycotoxin known as fumonisin. This fungus occurs in the warmer, drier maize production regions. The maize lines have been monitored in five different regions over two seasons and they retained their resistance to ear rot. This means that the environment does not have a large effect on the genes responsible for resistance. Further tests are in progress and, along with scientists at the University of Nairobi in Kenya, researchers are screening even more maize lines for resistance to other ear rot-causing pathogens in South Africa and Kenya. All of these maize lines will be used in a mycotoxin resistance breeding Programme and in host (maize)-pathogen (fungus) studies to find out exactly how the maize plants are able to resist infection.

Even more collaborations are underway with Northwest University, Stellenbosch University, the University of the Free State and various international institutions on a number of other mycotoxin-related projects. These projects focus on environmental factors, on the maize itself and on the management of the fungi. They are not just valuable for the consumer in terms of healthy, safe-to-eat maize, but also for skills development, as evidenced by a multidisciplinary team of researchers and students, including four Ph.D., four M.Sc. and four Honours students.

### Resistance to Stem Borer Moths Restored in the Majority of South Africa's Maize Crops

In 2012, more than 70% of the total area of maize in South Africa was planted using genetically modified cultivars. The cultivars contain a gene that produces Bt-toxin, a chemical poisonous to the destructive insects that feed on the plant, but not to the plant itself or to humans and animals. Maize, genetically modified to produce Bt-toxin, has been grown in South Africa since 1994, but by 2004 it became clear that certain moth species, namely the African stem borer (*Busseola fusca*) and the spotted stem borer (*Chilo partellus*), had developed resistance to the toxin.

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**Nomakorinte Nzondayipheli** shows the jam they make in Nkanunu village and says “The ARC came to us and opened our eyes. They have shown us how to live – I can sell jams and now buy school resources for my children!”
The ARC helped to identify two new Bt genes that have now been combined and are known as MON89034. They produce two different toxins, each with their own mode of action against the insects. The maize hybrids containing these genes were recently commercialised and over 1 million hectares of this new version of ‘Bt-maize’ was planted in South Africa during the 2012 season.

The success of this project demonstrates the important role the ARC continues to play in South Africa’s insect resistance management strategy. Within this ‘high-dose-refuge’ strategy, it is important to have a ‘high dose’ of Bt-toxin in the plant to control the target pest, as well as an area of non-Bt maize that acts as a ‘refuge’ for the pests. This ‘refuge’ area ensures that the insects survive without developing resistance against the toxin, allowing for cross-breeding with any that may have become resistant. A lack of suitable refuge areas in the past may be one of the reasons why the moths began surviving prior to the introduction of MON89034.

Royalty-Free Maize Hybrids Adapted to New Climate Conditions to Reach Smallholders by 2014

Two of the ARC maize breeding projects are generating high-yielding plants that can tolerate moderate drought conditions and low soil nitrogen levels. The new hybrids are set to benefit smallholder farmers, most of whom are rurally-based women who do not have access to irrigation systems or fertiliser.

The two projects, Water Efficient Maize for Africa (WEMA) and Improved Maize for African soils (IMAS), use conventional breeding and genetic modification to develop new maize plants that require less fertiliser and water. Fertiliser is a nitrogen source for plants, but it is also a contributor to greenhouse gases when not used judiciously. This means that low nitrogen maize hybrids could contribute significantly to mitigating climate change.

But unfortunately, climate change is already a reality for South Africa according to Dr Kingston Mashingaidze, Programme manager for plant breeding. During the 2012/13 summer season, the major maize producing areas of the Free State and North West Province experienced a severe drought with maximum temperatures above 30°C.

Drought is a serious threat to food security at both national and household levels. The new drought-resistant maize hybrids are therefore important for food security in South Africa. The drought-tolerance gene used in the WEMA project has been declared safe for humans, animals and the environment by the European Food Safety Authority (EFSA).

The WEMA and IMAS projects are international private-public partnerships and the resulting plants will be both low cost and royalty-free.

“WEMA and IMAS experimental hybrids are far better than the hybrids currently sold to smallholder farmers by local seed companies. This is a clear sign that we are making great progress and we are on target to release and register our first hybrids in 2014. Farmers should start growing our hybrids during the 2014/15 summer season,” says ARC maize breeder, Dr Godfree Chigeza.
The new varieties should allow farmers to harvest enough for their own households plus a surplus that can be sold for income. A more reliable harvest could also give farmers additional confidence to invest in their farms and improve their farming practices.

The WEMA project partners are the ARC, the African Agricultural Technology Foundation (AATF), Monsanto (as the private partner), the International Maize and Wheat Improvement Centre (CIMMYT) and the national agricultural research systems of Kenya (KARI), Mozambique (IIAM), Tanzania (NARO) and Uganda (NARO). The IMAS project partners are ARC, CIMMYT, KARI and Pioneer Hi-Bred International, a DuPont company (as the private partner).

The partners each contribute their technology, time, and expertise to the projects. The major funder for both projects is the Bill and Melinda Gates Foundation. Other funders are USAID for both projects, and the Howard G. Buffett Foundation and Monsanto for the WEMA project.

New Oleic Acid-Rich Groundnut Cultivar Promises Higher Yields and Longer Shelf Life

The ARC has just released a new high-oleic acid groundnut cultivar called ARC-Oleic2. This new cultivar outperforms its predecessor, SA Juweel, in terms of yield and disease tolerance. It also has a much longer shelf life than standard groundnuts and provides health benefits similar to those of olive oil.

The ARC’s groundnut breeder seed services, the entire groundnut industry of South Africa, and new varieties have created new market opportunities. KanoSel, a new red-skinned groundnut with added Resveratrol, has great potential for sale in street markets and in the health-conscious sector.

Improving African Maize and Legume Productivity

The ARC has gained new insights into maize and legume farming in other African countries as part of a project that aims to reduce risks and improve productivity.

SIMLESA was launched in 2010 and focuses on Ethiopia, Kenya, Malawi, Mozambique and Tanzania, though the benefits of the project are expected to spill over into other neighbouring countries. The aim is to improve maize and legume productivity by 30% and to reduce the expected downside yield risk by 30% for approximately 50,000 farmers within ten years.

The ARC participated in a series of capacity-building workshops around Africa, which focussed on the concepts and practices of conservation agriculture and innovation platforms. The workshops provided a great opportunity for international networking and the South African team received an award for excellence in training.

SIMLESA is funded by the Australian Government and the Australian Centre for International Agricultural Research (ACIAR), and it is managed by CIMMYT. The project represents collaboration between farmers, agri-businesses and researchers that will contribute to better crop management practices, improved maize and legume varieties and, ultimately, food security in the region.

New Wheat and Oats Cultivars Bode Well for Food Security

In the last few years, the ARC has developed and commercialised nine new wheat cultivars and three new oats cultivars. Currently, 13 of the 47 wheat cultivars recommended for dry-land or irrigated production in South Africa, originate from the ARC.

Wheat provides 20% of the daily global protein and energy requirements, and it is the second most important crop in the developing world. Its robust genetic make-up also means that it can grow in many different environments and resist many diseases and pests.

Over the last half-century, wheat breeders from the ARC have harnessed this genetic potential to produce numerous well-adapted and high-yielding commercial cultivars. Although wheat production in South Africa recently witnessed a steep decline in hectares harvested, the national grain yield remained stable.
All nine new additions to the ARC wheat cultivar list originate from dedicated breeding Programmes that combine international germplasm, or seeds, with those that are adapted to local conditions. The dry-land cultivars Kwartel and Ratel have excellent disease resistance and were released for production in the winter rainfall regions. Hartbees, Koonap, Selati and Senqu are intermediate and winter-growth types suited to the summer rainfall region. Umlazi is a new arrival, promising to follow in the footsteps of its high-yielding predecessors in the regions where wheat is grown under irrigation.

Two new oats cultivars were commercialised for production in the Western Cape. They are known as Simonsberg and Towerberg and are suitable for both livestock grazing and grain production.

Since wheat production in South Africa faces strong competition from imports, as well as the challenges of rising production costs and fluctuating weather patterns, the ARC will continue chipping away at the enormous genetic potential locked up in its genome. Local wheat production is key to ensuring food security for the country.

**Developing Wheat Crops Resistant to New Strains of ‘Black Rust’**

Since 2005, the ARC has been actively involved with the Borlaug Global Rust Initiative (BGRI) to develop wheat crops resistant to black rust. The disease is caused by a fungus and can turn a healthy-looking crop into nothing more than a tangle of black stems just a few weeks before harvest. Yield losses of 70% or more have been reported. Black rust had actually been under control for the last five decades, thanks to the breeding of resistant cultivars, but in 1999 a highly virulent strain of the fungus, called Ug99, was found in Uganda. Ug99 gradually spread within Africa and Asia and the ARC recently identified four races of the new strain in South Africa.

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The BGRI is a community of researchers dedicated to tracking the movement of Ug99 and to developing resistant plants for countries like Kenya and Ethiopia at immediate risk. Wheat cultivars and breeding lines developed by the ARC, are now regularly screened for rust-resistance in Kenya, and the ARC provides the Global Cereal Rust Monitoring System (GCRMS) with reliable surveillance information on an annual basis.

The re-emergence of Russian Wheat Aphids

Researchers are trying to learn everything they can about a new variant of a destructive insect known as the Russian wheat aphid (RWA), which has made a reappearance in South Africa’s wheat crops.

Until recently, this pest was under control as farmers grew wheat cultivars bred to resist aphid invasions. But Free State farmers reported aphid damage in 2005 and again in 2012. The ARC researchers soon identified a new genetic variant of RWA which has adapted to overcome the crop’s man-made defences. The insect could become a serious threat to wheat production if scientists do not stay ahead of the constant adaptation strategies employed by both insect and plant.

This is why the ARC is now studying all aspects of the biology and ecology of the RWA, as well as the effect of environmental factors on both the insects and the wheat plants. Researchers also monitor the insects in as many diverse geographic locations as possible to determine the distribution of different biotypes. Finally, and most importantly, the ARC is assisting breeders in the ongoing development of RWA-resistant wheat cultivars.

**Knowledge Transfer: Minimising Risks and Maximising Return**

Every year, the ARC ensures that its research reaches farmers by producing a range of booklets that serve as best-practice guides. These ‘production guidelines’ are published in four languages (Afrikaans, English, Xhosa and Sesotho) and separate publications are available for dry-land and irrigation areas.

The information contained in the booklets enable farmers to minimise their risk, while maximising their returns. Some risks, like unpredictable rainfall patterns, are unavoidable, but the key is to empower farmers to control the things they can, like using cultivars that produce a higher yield and using better soil cultivation, fertilising, disease control, pest control and harvesting techniques.
The ARC research on small grain production in South Africa has focussed on increasing the gap between income and expenses for decades and it is this information that is being transferred to producers.

**Moth Pheromones to Protect Barley Crops**

The ARC has begun developing a model that would allow barley farmers to predict future moth outbreaks themselves.

Back in 2010, and for the first time in South Africa, a sudden major outbreak of the Cosmopolitan moth (*Leucania loreyi*) cost barley growers in the Northern Cape about R8.5 million. The moth larvae, being voracious night feeders, stripped all leaf material from the plants and, because the stems are very soft, the barley heads ended up on the ground, out of reach of a combine harvester.

That meant farmers only became aware of the problem after harvesting had started. The only way to stop such an outbreak is to detect the moths on arrival, before they lay their camouflaged eggs on the plants. The ARC immediately began searching for moth pheromones that could be used to attract the pests. In the 2011 growing season they successfully employed pheromones to monitor growing moth numbers, which enabled farmers to take action before another outbreak.

Now, the ARC is monitoring moth numbers continuously to determine their flight patterns. Researchers will use this information to create a model that farmers could use on their own to forecast future outbreaks. In the meantime, the ARC will continue to warn farmers if high moth numbers occur during critical periods in the crop growing season, which will avoid unnecessary spraying – an economic and environmental must.

**Waging Biological Warfare Against Insect Pests**

The ARC is in the process of concluding its research on using microscopic worms called nematodes or eelworms, as biological pesticides against insects. Other microbes, like fungi, viruses and bacteria can also be used to kill insects that damage food crops.

It is vital to find environmentally-friendly, safe, biological alternatives to chemical insecticides to ensure food security, environmental protection and human and animal health. In addition, insects often develop resistance to chemicals. By 2009, a total of 8,639 cases of insect resistance were reported worldwide, involving 333 compounds and 557 insect species.

The ARC’s insect pathologists look for possible bio-insecticides on dead or diseased insects and in soil samples. These are tested against problematic insect pests to find out if they will be suitable. A large collection of fungi and nematodes have already been secured for further development as biological insecticides.

“I observed a hunger for knowledge on crop production practices,” says Ms Annelie de Beer, researcher at the ARC and part of the Maize-Legume-based Cropping Systems for Food Security in Eastern and Southern Africa (SIMLESA) project team.
Fungal diseases are highly infective against soft-bodied insects such as aphids and worms. Within the insect, tiny fungal spores can inhibit its feeding instinct, induce organ failure or produce poisons. The fungus may then exit the dead insect and continue to grow on its outer surface, where new spores can form to infect other insects.

Nematodes are known for damaging plants, but some are actually beneficial in that they kill soil pests like cutworms and beetles. These beneficial nematodes are called entomopathogenic nematodes and they often carry insect-killing bacteria. The bacteria are able to gain access to the insect via the nematode, while the nematode feeds on the digestive by-products of the bacteria. This symbiotic relationship can be exploited to kill insects within 48 hours and researchers are in the final stages of developing a way to mass produce these entomopathogenic nematodes.

**Kenaf: The Fibre Crop of Choice**

Kenaf came out tops in a recent feasibility study that compared the suitability of various crops for the South African bio-composite industry. The ARC conducted the study as part of the CSIR’s Bio-composite Centre of Competence (BCC) initiative, which hopes to realise the potential of a fully developed local bio-composite industry: a market for 10 000 to 15 000 tons of fibre per annum and about 15 000 upstream and downstream jobs. It is estimated that the industry could be worth R300 to 350 million per annum for fibre production, and R2 to 2,5 billion per annum for final products.

More than a hundred potential plant species were compared to determine the most suitable crop, including bamboo, ramie, jute coir, flax, hemp and sisal. One of the reasons that kenaf came out ahead, is the presence of a unique commercial processing site for the crop in Winterton, called Sustainable Fibre Solutions (SFS).

Kenaf is a summer crop with climatic requirements similar to those of cotton. It grows quickly, taking only four to five months to reach a height of 3,7 to 4,3 m. The dry stalk yield of kenaf is between 10 to 12 tons per hectare and each stalk contains 35 to 40% fibre.

The fibres can be used to manufacture bio-composites in various industries, including construction (decks, window frames and moulded panel components), automotive (rear seat backs, door panels, headliners, headrests and boot liners), packing (package trays) and aerospace (cabin and cargo bays of commercial aircraft). The next step is to optimise the cultivation practices for this crop under South African conditions. The ARC is currently conducting research to determine the best practices and cultivars.

**Ensuring the Production of High Quality Tobacco through Research and Technology Transfer**

The ARC helped commercial and small-scale farmers to produce 16,5 tons of dried, cured tobacco in the 2012/2013 season. Researchers provided the farmers with constant technical support and chemical analyses on thousands of soil, plant and water samples. The ARC’s personnel also took part in regional farmers’ days to share the valuable information generated by their research, which covers optimal farming techniques and

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Empowering Local Communities to Grow Cotton

Approximately 800 farmers have been empowered to make a success of cotton production through the combined efforts of the ARC and Cotton SA. In addition, 17 farmer collectives were trained in all aspects of cotton production this past season through the ARC mentorship Programme.

Cotton is highly resilient against drought, making it an ideal crop for smallholder farmers in African countries. In Tanzania, for example, 18 million people farm cotton. In the 2010/2011 season, Africa produced 5% of the world’s cotton, which equates to 700 000 tons. South Africa contributed a mere 85 tons of this, but rural farmers are beginning to see the market potential of this crop.

Most smallholder farmers produce maize, sunflower, soy bean and sorghum crops under rain-fed conditions. Unfortunately, inconsistent rainfall often limits crop yields and quality. Cotton, being drought tolerant, can provide farmers with at least some income when other crops fail. As an example, in the 2011/2012 season, the Nkangala District of Mpumalanga had a mere 180 mm of rain. Farmers planted both cotton and maize, but the maize succumbed to heat stress while the cotton spikes remained viable. When a small amount of rain fell again later in the season, the cotton sprouted again.

However, many farmers do not have the knowledge to grow these crops effectively. One farmer was only able to produce a few hundred kilograms of seed cotton from an estimated yield of over two tons. This farmer, along with many others, is now being mentored by ARC to realise the potential of cotton production in South Africa.

ARC Biotechnology Platform: Plant Genomics

The sunflower genomics programme was developed as part of an international consortium effort to characterise the genomic diversity of sunflower, and to use this information for the development of molecular breeding programmes for this important crop. As the result of the collaboration within this consortium, we have access to the unpublished sunflower genome sequence, and the genomic data from more than 150 varieties and related species. This is allowing them to explore the genetic variation found for genes in oil production and flowering time, which will then be used in sunflower breeding.

Biotechnology: Crops

One of the challenges of crops that are propagated vegetatively through grafting, or from tubers, is that they accumulate viruses. In many cases the diseases that result are thought to be caused by a single viral species. However, the work in Stellenbosch has shown this is frequently not the case. Many diseases have multiple viruses present, and often the same viral species are present in a number of disease states which were thought to have been caused by different viral species. We have obtained similar data for viruses in sweet potato, in this case finding both DNA and RNA viruses in mixed infections with a range of symptoms, which had previously been characterised as specific diseases thought to be caused by a different virus in each case. These studies have major implications for the diagnostic analysis of plant virus infection, as it becomes clear that comprehensive tests for a much wider range of viruses will have to be developed. These will be developed as a future outcome of this research, using the high throughput DNA sequencing technology now available at the ARC.
ANIMAL PRODUCTION, IMPROVEMENT AND HEALTH
Research and Development: Animal Production, Improvement and Health

The Animal Health, Production and Improvement Programme conducts research in animal health and production. These activities also cover secondary production processes, including harvesting (stress minimisation, abattoir practice, milking practices), post-harvesting, value adding (processing and packaging) and product development. The Programme works on both production and companion animals. This Programme works in conjunction with the smallholder and emerging farmers Programme through Agricultural Farming Systems Research (AFSR). The Programme focuses on animals such as cattle, poultry, pigs, sheep, goats, horses, dogs, ostriches, game and wildlife.

Animal Production

Animal production work is done at the ARC premises based in Irene, with several satellite stations strategically positioned throughout the country. The ARC carries out primary and secondary research, development and technology transfer with respect to animal breeding and improvement, rangelands and nutrition, and food science and technology to improve productivity and sustainable resource utilisation.

In addition, the ARC here serves as the custodian of national assets such as the conservation of animal, forage and bacterial culture collection genetic resources, including databases and DNA banks associated with them.

The country’s Livestock Recording and Improvement Schemes and associated database, the Integrated Recording and Information Systems (INTERGIS), are also managed by the ARC on behalf of the DAFF.

Animal Health

The ARC has the responsibility of ensuring that animals in the country are healthy. The ARC work on animal health is done from Onderstepoort, an internationally-recognised centre of excellence. At this campus, the ARC conducts research aimed at enhancing the control and surveillance of diseases that affect production animals. Accordingly it focusses largely on improving and developing vaccines and diagnostic tools. The resulting technologies and services are aimed at benefitting both commercial and resource-poor farmers. A secondary mandate is to provide an analytical service to the National Residue Monitoring Programme which ensures that red meat exports comply with the requirements of the importing countries.

A number of significant initiatives were undertaken by the ARC within the Animal Production Programme in the 2012/13 financial year. Described below are noteworthy achievements that demonstrate the ARC’s contribution to the full value chain within the animal production, aimed at improving and protecting livestock.

Over 4 000 Smallholder Farmers Now Involved in Animal Agriculture Programme

The Kaonafatso ya Dikgomo (KyD) Scheme aims to develop rural communities by accelerating the participation of smallholder farmers into mainstream industries. Work at ARC in the last few years has demonstrated that with appropriate technologies, information and training, the smallholder livestock farmers can increase their income from farming.

We have demonstrated that with the appropriate animal recording, farmers can sell a greater percentage of their herd without depleting the herd. The pilot study has demonstrated a four-fold increase in the number of animals that can be sent to the market. Farmers were also able to charge a two-fold higher price for the animals when armed with the correct market information.

The scheme now boasts 4 075 participating small-scale livestock farmers who together own nearly 60 000 cattle. The Programme covers the whole spectrum of animal agriculture and will expand to incorporate more smallholder farmers.

Improving the Reproductive Performance of Rural Cows

The Assisted Reproductive Technologies (ART) Project has so far empowered 328 farmers in Limpopo, KwaZulu-Natal and the Eastern Cape to improve the reproductive performance of their cows. Approximately 80% of the cattle owned by these farmers have been artificially inseminated as a part of this project.

The process involves manipulating the reproductive
hormones of a herd’s females so that they are all fertile at the same time. After this, the cows are artificially inseminated. The three-year project intends to put through the Programme a total of 2 200 cows owned by smallholder farmers from eight provinces.

**Improving Citrus Tree Leaves for use in Animal Feed**

The ARC researchers are investigating ways to improve the fermentation of citrus leaves for use as an alternative feed source for ruminant animals, specifically cattle and sheep.

The milk and meat production of these animals is very low under the resource-poor farming conditions present in much of South Africa, especially during the dry season. The animals are often fed on poor quality forages or they are simply under-fed because farmers cannot afford the feed.

Ruminants can, however, digest leaves like those of the citrus tree. South Africa is a major producer of citrus and some smallholders have access to their own trees. The ARC researchers have investigated whether whey or a certain bacteria can be used to improve the conversion of citrus leaves into fermented ruminant fodder, known as silage. Whey appears to be the better option and future studies will investigate other additions, such as molasses, to further increase the fermentation qualities of the leaves.

**New Insights into Beef Quality and Taste**

Even after post-mortem aging, grain-fed beef tastes different to pasture-fed beef, and the meat of younger animals is more tender. These findings by the ARC challenge the accepted notion that extended aging of carcase after slaughter masks quality differences in beef from cattle of dissimilar ages and feeding regimes, which would allow meat from different animals to be combined and sold as a single product.

Other research found that rather than the age of the animal, production systems and feeding regimes determine the quality of the final product. This research specifically addresses the question of whether the age of an animal at slaughter can still be used to classify meat quality given that beef production has changed drastically since the implementation of the current classification system.

The results will be used by the Beef Classification Working Group, set up by the Red Meat Industry Forum, to introduce any necessary changes into the current beef classification system.

**Producing Nutritious, Low-Cost Meat Products Using Beef Offal**

Trained consumer panels have found the taste of low-cost meat sausages produced by the ARC acceptable. The sausages contain beef trimmings, a soya protein product and beef offal, including intestines, spleen and heart tissue.

Meat sausages enriched by beef offal are cheaper
per kilogram than other sausages, which would benefit lower income populations. Other protein sources, such as whey protein, isolated soya protein and textured vegetable protein, will also be investigated as alternative low-cost additives for processed meat.

Acceptable Levels of Brine Injections in Chicken

The ARC plays an active role in ensuring that legislation and regulations are based on scientific evidence. DAFF is using findings of the ARC research to regulate the amounts of water and brine allowed in frozen chicken portions.

The ARC performed chemical analyses to determine the actual meat and protein content of frozen chicken portions in comparison to fresh chicken portions that had not been injected with brine or water. The aim was to determine the financial and nutrient losses suffered by consumers, since the liquid effectively dilutes the amount of protein available, while artificially increasing the weight of the meat.

The chicken industry has already started to reduce the amount of brine and water injected into poultry, but new legislation will prevent any abuses, use of hazardous products and financial exploitation of consumers.

ARC Biotechnology Platform: Animal Genomics

A number of new areas of genomics research have been developed in the 2012/13 period; these include the genomic analysis of livestock species, sorghum and sunflower.

The livestock genomics group has two main objectives – to study the population diversity of cattle, sheep, goats and chickens, with the aim of creating the tools for the genomic selection of superior breeding animals; and to study disease susceptibility and pathogens in order to select for diseases’ resistance in future breeding programmes. In this programme genomic sequencing has been undertaken on Nguni cattle, with nine genomes sequenced so far, which will provide the data for analysis of the stress and disease resistance found in the Nguni breed, as well as enabling the ARC to join the 1 000 Bull Genomes Consortium, which will enable the analysis of the Nguni genomes within the much larger context of bovine genomics.

Work on goats and chickens is being undertaken in order to characterise the genetics of the indigenous populations in villages throughout South and Eastern Africa. By collecting DNA from animals throughout these regions, the researchers are building a comprehensive genetic map of these two species, which will provide insight into the genetic variation available and the genetic selection observed in these populations.

More Diagnostic and Monitoring Tests Available at ARC

Monitoring the presence and movement of pathogens is a major part of managing animal diseases. As an essential part of this endeavour, a new range of diagnostic tests is now available from the ARC, including tests for avian influenza, African horse sickness, Rift Valley fever and foot-and-mouth disease. The tests used by the ARC are underpinned by stringent quality management systems which are approved by, e.g. the World Organisation for Animal Health (OIE), DAFF and authorities. To this end, the South African National Accreditation System (SANAS) has accredited 12 tests offered in the ARC’s Virology laboratory and four in the Applied Biotechnology laboratory.

Accreditation of tests enables clients who use diagnostic services offered by the ARC to trade internationally in animal and animal products. In order to allow the South African fishing and aquaculture industries to exploit a potentially lucrative niche market, the ARC has recently started a fish monitoring service that will allow access to markets in Europe, the United States and Asia.

New Insight into Rift Valley Fever Outbreaks

In the light of recent outbreaks of Rift Valley fever it is considered to be a re-emerging disease, one that can have devastating consequences for both humans and animals. During the most recent outbreak in SA during 2009 to 2010, there were 232 human cases, 26 of which were fatal. Researchers at the ARC determined that an outbreak in 2008 was caused by viruses of restricted genetic diversity, whereas this subsequent outbreak
resulted from a more diverse virus population. This research into the genetic backgrounds of the viruses that cause RVFV will help to inform future control strategies, such as when and where to deploy the Rift Valley fever vaccines in current use and whether to develop new or modify vaccines against the virus.

Towards a Heartwater Vaccine

As its name suggests, heartwater is a disease that causes fluid to collect around the heart or in the lungs of infected cattle, sheep and other ruminants. While a vaccine is currently available, it tends to perform poorly and is notoriously difficult to produce and transport. Using a spectrum of modern immunological and molecular biological methods, scientists at the ARC are steadily homing in on an improved vaccine against *Ehrlichia ruminantium*, the parasitic bacterium responsible for the disease. For example, they have found that specialised white blood cells, so-called “killer” T lymphocytes, play an important part in making animals immune to heartwater. Accordingly, they are now able to focus their efforts on ensuring that any new vaccine stimulates the production of these specialised cells. In addition, they have made important strides towards genetically manipulating the bacterium so that it elicits immunity, but is considerably less harmful.

For a vaccine to be effective, it must be correctly matched to the pathogen responsible for the disease. In a more traditional approach to a new heartwater vaccine, the ARC researchers have now shown that an artificially weakened version of one particular strain of *Ehrlichia ruminantium* can act as a highly effective vaccine. Field trials and other tests which are underway to evaluate this potential vaccine, have proven to be extremely encouraging.

New and Improved Foot-and-Mouth Disease Vaccine

The ARC researchers have genetically modified the foot-and-mouth disease (FMD) virus to make a vaccine that is better able to elicit a protective immune response against the disease. This is the first time that a ‘reverse genetics’ approach was used to create a new and improved FMD vaccine.

The ARC intends to commence building a state-of-the-art facility to produce the new vaccine. It will be able to provide for South Africa’s requirements, as well as those of other SADC countries. South Africa currently spends R20 million a year purchasing FMD vaccines from Botswana, so the new facility should result in substantial cost savings.

Animal Health

The application of DNA sequencing technologies to animal pathogens has shown that many diseases are much more complex than had been understood from previous work.

In studies on anthrax-like diseases, the ARC has explored the genomic diversity of the species of *Bacillus* that have been isolated from animals that have died from anthrax-like symptoms, but from which it was not possible to isolate the traditional causative agent, *Bacillus anthracis*. We have shown an extensive diversity of related organisms, some of which are only marginally related to *Bacillus anthracis*, but also which carry the pathogenicity plasmids that encode the toxins that cause anthrax. This work has significance for the detection and diagnosis of this disease, as it is likely that future detection systems should focus on the plasmids and not on the bacterial genome sequences.
The Natural Resource Management Programme conducts research to secure national biodiversity and the integrity of ecosystems, as well as to improve the efficient use of agricultural natural resources for agricultural production. The Programme will focus on development strategies to manage risks to natural and agricultural systems. The effective monitoring and management of natural resources will aid their conservation and sustainable use, thereby helping to increase the incomes of farmers and industries dependent on natural resource-based agriculture.

**Soil, Climate and Water**

In one of its campuses located in the heart of Pretoria, the ARC carries out research and development on natural agricultural resources, namely soil, climate and water. It promotes the integrated, sustainable utilisation and management of agricultural natural resources continuum as well as individual agro-ecosystems; innovative technology development; research application and technology transfer; and scientific services.

**Biosystematics, Integrated Pest and Disease, and Weed Management**

In Roodeplaat, north-east of Pretoria, with satellite campuses in KZN and the Western Cape, the ARC also provides extensive and specialist knowledge of the organisms that threaten agricultural crops; to protect arable land, water resources, and natural biodiversity; and food security. Research is focused on promoting economic and environmentally acceptable management strategies for pests, plant diseases and invasive alien plants. The ARC researchers have expertise in monitoring pollution of the environment, which includes analysis of pesticide residue levels in agricultural areas to mitigate agricultural and health risks. It serves as custodian of the following strategic assets on behalf of the State: the South African Rhizobium Culture Collection; and the National Collections of arachnids, fungi, insects, and nematodes.

There have been a number of significant initiatives that the ARC undertook in the Natural Resources Management Programme in the 2012/13 financial year. Described below are some of the important highlights that demonstrate the ARC’s contribution in the sustainable use and management of natural resources.

**A New Bill to Protect Agricultural Land**

The ARC was commissioned by DAFF to provide it with the necessary information to draft a new bill for the preservation and development of agricultural land.

Part of this information entails a report on past and current agricultural land use patterns in South Africa as well as a comparative international review highlighting lessons to be learned.

The proposed legislation is necessary to protect agricultural land for food production and hence food security, sustainable rural development and rural employment, from the increasing pressures by the non-food production sector which includes mining, industry and urbanisation. It is also important to sustainably develop the agricultural sector so that its contribution to the economy, to the gross domestic product and to the quality of life in the country is increased.

**Earthworms Turn Farm Waste into Farm Fertiliser**

Researchers have been investigating the commercial viability of vermiculture, a technique that uses earthworms to convert waste into fertiliser, known as vermicompost. They experimented with different low-cost vermi-bin designs and conducted field trials in cooperation with the Winterveldt United Farmers Union in Gauteng, the Lovu Township and the University of Zululand. The project was funded by DST.

Local extension officers took part in all the field trials and in the Lovu township equipment was kindly donated by a local business, the local municipality and the KZN Department of Agriculture and Environmental Affairs. The result of this donation is that the community is now able to produce vegetables throughout the year.

Vermicompost is a conservation agriculture technology providing an environmentally-friendly substitute for synthetic fertilisers, which are often too expensive for smallholder farmers. The compost significantly improves soil texture, fertility and water-holding capacity.

Since vermiculture is both hygienic and odourless, it can be practised indoors as well as outdoors and is therefore suitable even at a household level. Additional funding has been requested by the ARC to undertake more field trials before the registration and branding of vermiculture products.
South Africa Marks a Century of Biological Control of Invasive Alien Plants

During 2013 we celebrate a century of biological control research and implementation against invasive alien plants (IAPs) in South Africa.

The first of these introduced bio-control agents was a cochineal insect, *Dactylopius ceylonicus*, which was introduced against the drooping prickly pear cactus infestations in 1913 and which is still entirely effective today. Over the past 100 years, South African researchers have tested 270 species or biotypes of insects, mites and other pathogens against IAPs. Of these potential bio-control agents, approximately 100 have been released in the field and some 75 agents have become established in South Africa on 50 species of IAP.

Many other agents were rejected during strict quarantine trials for not being specific enough to the target IAP, or for being too difficult to mass rear. Others are still being evaluated under quarantine before an official decision is made to release them.

Today, South Africa is one of world’s leading countries when it comes to biological control of weeds. Compared to conventional control methods like manual clearing and herbicide treatment, biological control is cost effective and environmentally-friendly. This is a persuasive argument in favour of increased funding for weed biological control research and implementation in the future.

Success for Biological Agents against the Invasive Lantana Weed

The invasive alien plant, *Lantana camara*, is considered one of the world’s worst weeds. In South Africa, the weed has invaded thousands of hectares of land and has become a serious ecological and economic burden.

Since 1997, the ARC, with the help of funding from Working for Water, has been investigating the weed’s natural enemies as agents for biological control. The lantana flower gall mite, *Aceria lantanae*, was among the agents investigated. The mite is host-specific to *Lantana camara* and it can reduce seed production by feeding on the flower buds of the weed, causing it to produce galls instead of flowers and viable seeds.

In 2011, researchers released the mite into affected sites in Limpopo, Mpumalanga, Gauteng and KwaZulu-Natal. At some release sites in Limpopo’s Tzaneen and KwaZulu-Natal’s coastal regions, the mite has significantly reduced flowering by up to 90%, while spreading by over 50 km radius from release sites. The mite also proved quite resilient, surviving in more areas than initially expected, as demonstrated by its survival during winter in sheltered spots around the Pretoria release sites. The mite has the potential to reduce the spread of lantana and reduce the loss of natural pastures and biodiversity, as well as the costs associated with mechanical and chemical control of the lantana weed.

Researchers Discover the Reason Behind Failed Soybean Crops

Instead of applying expensive nitrogen-based fertilisers for crop production, the inoculation of crops, such as soybean, with nitrogen-fixing bacteria is a very effective and natural alternative method of fertilisation. Under normal
circumstances, these bacteria provide the plants with an alternative source of nitrogen in the absence of fertiliser, which may be unavailable or too expensive for small-scale farmers. However, researchers have discovered that some South African soybean crops are being inoculated with unsuitable or ineffective strains of nitrogen-fixing bacteria, resulting in crop failures.

In recent years, soy bean growers have experienced a number of crop failures, leading them to question the quality of South African bacterial inoculants. DAFF and the Oilseed Advisory Committee subsequently asked the ARC to conduct quality control tests in order to find the problem.

Genetic sequencing revealed that the four available inoculant products contained different strains of the bacterium. One of the products contained an entirely different species. The ARC researchers also compared the nitrogen-fixing abilities of the different strains.

The work highlighted the importance of proper handling of the inoculants during storage and application, as well as the impact of soil chemistry, planting time and farming practices on the performance of the inoculants.

Researchers Devise a Successful Strategy to Limit Grapevine Leafroll Disease

In a successful case study on a commercial wine estate, initiated in 2002, researchers were able to virtually eliminate vines infected with Grapevine leafroll disease using a combination of herbicide application, sanitation and disease-free planting material. The disease is a serious disease of grapevines worldwide and causes substantial economic losses in vineyards in South Africa.

At the start of the integrated control trials, 100% of the vineyard was infected with grapevine leafroll associated virus 3 (GLRaV-3). However, by 2012, infection levels were at a mere 0,027%. This effectively means that the researchers' combination control strategy is able to remove the majority of diseased vines and what remains can be effectively controlled using conventional local eradication.

Developing Disease Resistant Proteas to Meet the High International Demand

The quality of protea flowers destined for the lucrative export industry can be affected by a Fusarium fungal wilt disease, with losses of up to 60% in a season recorded by the Fynbos industry. The ARC microbiologists are developing a screening method for proteas resistant to the Fusarium fungus, which will eventually help plant breeders to produce resistant protea varieties. Local and international demand for these flowers is so high that it makes sense for growers to move from wild seeds to more resilient cultivars that prevent crop losses as a result of disease.

Harmful Peanut Nematode Discovered in Hartswater

In 2012, large numbers of the so-called ‘testa’ nematode were found in peanut pods from the Hartswater area in the Northern Cape. The nematode, identified by the ARC taxonomists as Aphelenchoides arachidis, has the potential...
of becoming a major economic threat, since it lowers the confectionary quality of the peanut and predisposes its seeds to fungal infections. Other symptoms of the nematode infection include rotting shells, accelerated germination and shrivelled, brownish seeds. The danger for farmers is that it can survive seed storage for up to 12 months. In fact, some countries have labelled it as quarantine species since other crops like maize, sorghum, pearl millet, sugar cane and rice are also at risk.

Managing Soil-Borne Diseases of Maize

Recent research by the ARC has revealed that soil-borne diseases are caused by a complex of pathogens that can affect maize crops at any growth stage. The findings build on earlier work, which clearly demonstrated that crown and root rot of no-till maize can dramatically depress growth and grain yield, with losses as high as 19%. Further research is now underway to develop a management strategy against such soil-borne diseases in no-till maize crops.

Maize and Sorghum Pest Detected in Israel for the First Time

Taxonomic expertise at the ARC’s national collection of insects has identified a highly invasive stem boring moth sent to the ARC for identification by researchers at Israel’s Ministry of Agriculture and Rural Development. The sorghum stem borer, *Chilo partellus*, is a common pest of sorghum and maize in southern Africa, especially in smallholder farming areas. However, the positive identification represents the first confirmed report of this cereal pest in the Middle East and Plant Protection authorities have since been alerted to the further global spread of the species. This incident confirms the ARC’s status as a centre of excellence on the identification of pests of agricultural importance.

Monitoring Citrus Black Spot Fungus to Prevent a Ban on Foreign Exports

The ARC provides government decision-makers with crucial information about citrus black spot (CBS) in order to safeguard South Africa’s lucrative citrus export markets.

The European Union (EU) has recently intensified regulations for fruits originating from countries where the CBS fungus occurs: it will ban imports if more than five fungal incidences are discovered in export consignments during a season. During the most recent season, some 30 incidences were recorded among South African citrus exports. This means the country could lose access to the EU market if the right measures are not employed immediately to ensure compliance.

The ARC, in collaboration with the citrus industry and Government, can significantly contribute to the monitoring process for CBS. ARC expertise for the correct identification of the fungal agents causing CBS, is paramount. It is hoped that diagnostic protocols will be standardised in line with international guidelines and that independent diagnostic laboratories will also form part of the strategy.
The Mechanisation and Engineering Programme conducts research into agricultural mechanisation technologies to increase the productivity and efficiency of agriculture. The research and development aim of mechanisation and engineering, 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 will improve the quality of work and products, leading to enhanced output and economic competitiveness of the farm.

**Engineering**

At a campus in Silverton, Pretoria, the ARC conducts agricultural engineering. The work is aimed at developing appropriate agricultural engineering technologies for both small- and large-scale agricultural producers. The ARC complies with its goal and purposes, through partnership with provinces and joint ventures with the private sector. The ARC participates in the development and support of farmers country-wide by means of various research projects, service delivery and training of required skills in the four major agricultural engineering fields, namely mechanisation; irrigation and water use; renewable energy; and farm infrastructure and livestock structures.

### Zooming in on Renewable Energy

The ARC used National Science Week 2012, organised by DST, as an opportunity to demonstrate renewable energy technologies like solar cookers and biogas digesters. More than 100 learners and 50 farmers visited the ARC’s campus at Silverton during this time.

In addition, the ARC signed an agreement with DAFF to address climate change in the Thabo Mofutsanyane district in the Free State. Over the next three years, the ARC will design and procure biogas digesters for the local communities. Within these digesters, micro-organisms break down biological waste into gas that can be used for fuel and electricity generation. It will allow the communities to supply their own energy needs and the left-over waste can even be used to fertilise vegetable gardens.

### Poverty and Hunger Alleviation through Better Water Management

Farmers in Venda and Insiza in Zimbabwe have been equipped with the infrastructure and knowledge to harvest rain water on their farms. They received training and a manual translated into TshiVenda.

Many small-scale farmers in the Limpopo basin use boreholes, dams, windmills, small reservoirs and small-scale irrigation systems. Supplementing these systems with harvested rain water is a simple method that farmers can employ to ensure that enough water is available for their food crops. The ARC is piloting the technique in the Limpopo River catchment areas of Botswana, Mozambique, South Africa (Limpopo Province) and Zimbabwe as part of the global

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A young researcher from the ARC was able to attend a three-week training course on biomass cook-stoves at a Chinese agricultural university. During her course, she also presented a talk at the Forum of the Renewable Energy Promotion in Developing Countries information session in Beijing.
Challenge Programme on Water and Food (CPWF). It has also released a number of best practice manuals focused on water systems for rural farms.

The Best Tool for the Job

Researchers have determined that the Erdvark ripper, a soil-loosening tool, is the most suitable ripper for sustainable agriculture because it results in minimal soil disturbance. They have also identified certain systems pulled by animals to be more efficient than tractors in canal systems.

The ARC is collaborating with the agricultural company Noordwes Kooperasie (NWK) to manufacture the Erdvark-type rippers, which are designed for minimal soil disturbance. This practical on-farm research won a prize at a recent conference in Durban, while the research on animal draught systems was accepted for publication as a book chapter by the Tshwane University of Technology.

As part of an initiative aimed at empowering rural communities through mechanisation, the ARC and DAFF delivered 504 tractors and 2 464 other implements to farmers in Limpopo, Gauteng, the North West, the Northern Cape, the Free State, the Western Cape and the Eastern Cape.

New Ideas for Food Processing

The ARC achieved several successes in the area of post-harvest processing, particularly in terms of published training materials, internal capacity building and the development of farming equipment.

A report describing current beekeeping and honey extraction systems used in South Africa was submitted to the National Research Foundation (NRF). Furthermore, a number of manuals outlining the processing of beer, wine, nuts and animal by-products were published. These manuals guide farmers in the production of, for example, pork-rind, dried-meat products, butter and marzipan.

Internal capacity building focused on training the ARC staff members to use the new research information and database management system available from the campus focusing on engineering, which includes several smaller databases on mechanisation, irrigation, and agro-processing.

The ARC has also received the go-ahead to develop a multi-crop thresher and a mobile cooling container. The thresher will process maize, sorghum, wheat, sunflower and soya beans at a capacity of 500 kg/h. Manufacturing of the implement, as well as downstream processing activities, will create employment opportunities. The cooling container is intended for small-scale farmers to temporarily store and transport fruit and vegetables.
BIOTECHNOLOGY
Cutting-edge research today relies on the ability to determine the genetic structure or make-up of organisms, be it for breeding of improved crops or animals or to identify and diagnose pests and diseases of plants and animals. This technology now enables breeding Programmes to deliver results faster than conventional selection and breeding, whilst identification and diagnosis of pests and diseases can also be done more rapidly and accurately. The Biotechnology Platform provides researchers across the ARC with access to advanced technologies to generate and analyse DNA sequence data for use in plant and animal breeding, as well as for diagnostic work.

**Infrastructure Implementation**

During the last two years the ARC Biotechnology Platform has been acquiring and implementing the most advanced technologies for genomics and bioinformatics available, in order to provide leading-edge tools for plant and animal breeding and health studies within the whole of the ARC.

As new technologies have become available in the last five years to generate DNA sequence data at ever increasing rates, and rapidly decreasing costs, so it has become possible to undertake new genomics research projects which can use DNA sequence data for the characterisation of new genomes, for the analysis of genetic relationships and for the quantitative analysis of gene expression or the testing for the presence of organisms.

The overall aim of this Programme is to be able to process thousands of samples a week from the isolation of DNA or RNA, to the generation and analysis of sequence data that can be used in genetics or diagnostics work.

**The new systems implemented include:**

Two liquid handling robots namely Hamilton Star and StarPlus - they can process up to a thousand samples daily for DNA and RNA isolation and the preparation of these samples for DNA sequencing. These highly flexible systems can be programmed to perform a very wide range of protocols, and have been set up to work with plant and animal tissues. They can even be used to extract DNA from soil samples, which will be important in future studies of soil microbiology.

The DNA sequencing capacity is provided by Illumina sequencing systems, the smaller MiSeq systems providing up to 8 billion bases of sequence data per day, while the large HiScanSQ system can generate around 180 billion bases in ten days. The capacity of these sequences has increased three to five-fold in the past year, and is expected to increase by this amount again in 2013. The technology has enabled projects as diverse as the sequencing of the genome of the African leafy vegetable, Amaranthus, to the characterisation of virus genomes from plants and animals.

In addition, the HiScanSQ system is used for the high throughput genotyping of plant and animal species, using SNP chips, and is being used for genetic mapping and population diversity studies of apple, peach, potatoes, cattle, sheep, goats and chickens.

In order to control and integrate the robotics and sequencing technologies, it is necessary to implement a laboratory information management system (LIMS) and this has been undertaken with
software from Genologics, which allows the complete integration of the registration of samples, through their extraction, sequencing and bioinformatics analysis, to the final billing and delivery of data to the clients. This software has been implemented and will go into production during 2013.

The analysis of genomic and genetic data constitutes a major part of the field of bioinformatics, which is the second major area of activity for the Platform. Such analysis has become a key area of skills development for all of the staff and students in the Platform, and this involves training at levels that ensure that the tools used are scalable from laptop to high performance computing facilities. The commissioning of the new cluster and storage array ensures that the ARC has the computing power needed for the analysis of the DNA sequence data being generated in the Platform now, and in the future. At the same time, the use of the CLC Bio Genomic Enterprise Package provides the advanced bioinformatics tools that are needed, and nearly one hundred ARC staff and students were trained on this software in March 2013.

Overall, the ARC Biotechnology Platform has the most complete and advanced genomics and bioinformatics technologies available anywhere in Africa, which are being used for breeding and health research for plants and animals.

Developing People

The Biotechnology Platform was set up in 2010 with the aim to be a major facility for the training of postgraduate students; today there are more than 20 Ph.D. students, as well as M.Sc. students and postdoctoral fellows at the Platform, undertaking projects in all areas of plant and animal genomics research.

During 2012/13, Mr Khashief Soeker completed his Ph.D. on the genetic analysis of fruit quality in apples, while Mr Jahanshah Ashkani completed his Ph.D. on the evolution and molecular interaction studies of the proteins controlling pollination in apples. Mr Paidashe Hove obtained his M.Sc., cum laude, for a study on the genetic mapping of the chilling requirement trait in apples.

Many of the students in the programme have obtained scholarship funding to support their studies, with particular success in the Department of Science and Technology Professional Development Programme.
Introduction

The ARC’s technology transfer performance for the 2012/13 has been led by the strategic plan intention to address more finely the need to grow smallholder agricultural production in South Africa. The technology transfer function at the ARC is crucial to the completion of the innovation cycle, which is the raison d’être for the ARC. The strategic approach of the organisation in this regard, is the integration of the Research and Development (R&D) performing aspects with the market-facing aspects provided for in the Technology Transfer (TT) division. The result is a partnership that achieves visible results for users in the sector and communities.

The TT division is organised in such a manner as to provide value to these internal partnerships, through the formulation and implementation of systems and processes for the technology transfer to happen, and through providing internal services aimed at improved decision-making and an environment that fosters innovation.

The division consists of a group of elements that can be referred to as processes, namely IP commercialisation, business generation and training. The enablers are knowledge management and IP protection, and decision-support is taken care of by the Economics and Biometry unit.

The Strategic Plan of the ARC has, however, taken a programmematic approach, which has been translated into the business with the TT aspects expressed in Programmes five, six, seven, eight and nine. It must be understood that in some of these Programmes, TT is a contributor together with other parts of the organisation, and in others TT has the sole responsibility. Programmes where the responsibility is solely on the TT side are Programme seven: Agricultural Economics and IP Management; and Programme eight: Training and Extension.

A key aspect of the division is the interactions held with key stakeholders and potential customers. Two outcomes are targeted with this approach – the need to constantly engage the stakeholders to deepen the ARC’s understanding of the changing requirements as dictated to by various environmental forces on the one hand, and on the other hand, the need to communicate the R&D output of the ARC and how these could be applied to real problems on the ground. This sets an excellent basis for the fine-tuning of solutions aimed at encouraging sector growth, in general, and improved international competitiveness and increased numbers of smallholder producers, specifically.

Strengthening the ARC as an Agricultural Training and Education Institution

A Quality Management System for Training was developed this year, putting in place standard processes, policies and procedures for delivery of training. This legitimises the ARC as a credible provider of choice in the Agricultural and Education Training Sector. As a result of QMS in place, the ARC was able to exceed its performance in the following areas:

- The ARC attracted more than R30 million income for training of farmers and extension personnel. The funding was sourced from Rural Development and Land Reform, National Treasury and International Donors (Nuffic and CIMMYT). A total of 7,967 smallholder farmers and extension personnel were trained in the current financial year. The training aimed to provide skills and extension support to smallholder farmers towards economic competitiveness.
- Twenty-four courses were prepared for accreditation and submitted to the AgriSETA. This achievement was made possible in partnership with the different researchers and the Training Unit.

Better Utilisation of R&D Outcomes

A Science Communication and Media Relations Programme was implemented as part of ARC’s Information dissemination Strategy (2010). In this financial year, the Programme focused on the Fruit Production Project in the OR Tambo District in Eastern Cape. The ARC working with Is’Baya NGO introduced new and improved fruit varieties to diversify crop production towards the development of small-scale farming in the area. The project, piloted in 2000, has helped improve farming output in this district. The ARC’s intervention, using simple farming technology and trees that are suitable for commercial large-scale production in the region, has already led to the cultivation of avocados, mangoes, bananas, guavas, litchis, oranges and lemons. With the diversification of crops, farmers are gaining access to new markets. They no longer produce only for their own consumption, but are now able to sell their produce to local businesses and vendors.

Implementation of the ARC-LIS Strategic Plan

In line with the ARC-Library and Information Service (ARC-LIS) Strategic Plan, the provision of scientific journals has been modernised through electronic journal subscriptions, thus doing away with the paper-based journal subscription that the organisation has been using. This move was identified as one of the most critical in the ARC-LIS Strategic Plan which was formulated and adopted in the previous year. The allocation of a substantial budget for this service has made it possible. The savings made from going the electronic route for journal provision proved to be cost effective as the budget for Year 1 allowed for the acquisition of more titles than originally planned for.

As was reported in the previous year, this area has been earmarked for focused attention and constant monitoring and evaluation. A customer satisfaction survey was done again in this reporting period, following on one that had been conducted
two years earlier (and had proved invaluable in gathering information on which to base the ARC-LIS Strategic Plan). The outcome of the survey was very positive, with 82% of the respondents indicating satisfaction with the service provided, against a targeted 70%. This can be attributed to the electronic journal provision which has been recently introduced. The immediacy of information availability will add a lot of value to the research Programme and to the business of the ARC.

Performance against 2012/13 Business Plan

Agro-processing, Food Technology and Safety

The TT aspect of this Programme is embedded in the service provision through the analytical and diagnostic services sub-Programme, and reporting will be restricted to this. This business plan deliverable is driven in part by the business generation unit within the TT division. The aim of the unit is to maximise the ability of the ARC to generate income and to support the agricultural sector through provision of services.

The ARC continued to provide vital diagnostic and advisory services to various clients in the private and public sector and thus continuing to assist in the management of agricultural risk of the spread of diseases and pests that could potentially harm the agricultural industry. The services provided include diagnostic and analytical tests to aid in either control of epidemics, or provision of information necessary in managing farming enterprises. Various ARC laboratories have updated their accreditation status and acquired new equipment to enable them to improve the amount and quality of diagnostic and analytical work done. These improvements in capacity have enabled the ARC, for example, to provide crucial testing services for the national foot-and-mouth surveillance programme as was commissioned by the Department of Agriculture, Forestry and Fisheries.

The targeted income from the provision of the services for the financial year was set as R49 million. The ARC exceeded performance in this area, with revenue of R52 million reached. The importance of having these services available to a wider clientele, especially the smallholder producers, cannot be underestimated, and must be expanded to reach the currently unserviced areas. The ARC’s stance in this regard, where accreditation for laboratories has been sought and new equipment procured, are some examples of the work the organisation is doing in support of growth of the sector.

Smallholder Agricultural Development

Through the Smallholder Development Programme, the ARC five-year Strategic Plan has sought to bring to the fore the need to provide focused support aimed at the growth of smallholder production in the country. Not only is this an imperative as defined in various government policies and strategies, such as the national growth path and the National Development Plan, it is an area of great potential especially in the former homelands, where agricultural production has not been systematically supported. The aim is to ensure that the support is provided through targeted R&D that would then be translated into viable and profitable enterprises through the provision of technological solutions. The Programme has been designed to address the support that would be given to the establishment of viable enterprises through incubator development, enterprise planning, the establishment of agricultural development centres and impact assessment to enable the capturing of lessons and refinement of ARC Programmes in this regard.

Incubation and SMME Development

No new incubators were planned for this reporting period. This was a deliberate decision based on the understanding that has been built over a number of years about the time it takes to achieve the establishment of an incubator following a period of intense activity.
A process towards the establishment of two new incubators has been under consideration since the previous financial year. Both these incubators would originate from IP developed at the ARC at the Irene campus, based on dairy and meat science R&D output. In the case of the meat science opportunity, the potential for the development of an SMME offering innovative technologies in processed meat goods was identified, in addition to the incubator opportunity. Both incubators would enable aspiring entrepreneurs to acquire skills in the manufacture of meat and dairy products at a commercial scale, starting from pilot scale batches, which the incubator will provide. The skills acquired would give these entrepreneurs a practical understanding of the operations and requirements of a commercial facility. In discussions with Senior Management at ARC in Irene, these incubators would primarily be training facilities for smallholder enterprise owners, as well as training for larger facilities established by Government for dairy processing, for example, which are currently operating sub-optimally.

In the 2012/2013 financial year, investigation was initiated in the development for an incubator in aquaponics, which was conceptualised based on the ARC’s expertise in aquaculture, and the ARC’s expertise in hydroponics. The concept was formulated on the need to provide alternative vegetable and fish production systems where soil and water availability was low and scarce, respectively. Follow-on work will involve the development of a detailed proposal for the establishment of a demonstration aquaponics production unit as part of the existing hydroponics incubator (size and cost implications, as well as a feasibility study will be included in this proposal). This aquaponics unit will offer a module on aquaponics as part of the hydroponics training courses.

Negotiations were initiated with the Ekurhuleni Metropolitan Municipality (EMM) for the establishment of a Metropolitan Agriculture Incubator to be based on several farms owned by Ekurhuleni. These discussions will continue into the next financial year and hopefully will be concluded with a finding agreement for the establishment. The Department of Rural Development and Land Reform (DRDLR) has come on board in the discussion from an enterprise development perspective.

**Agricultural Development Centres**

Within its research and innovation strategy, the ARC aims to utilise Agricultural Development Centres (ADCs) to transfer technology, prioritised to support smallholder and emerging farmers. The ADCs will provide a facility and focal point for service delivery, prioritising smallholder and emerging farmers aligned to the main agricultural activities in a particular area or district. The ADC approach seeks to address the lack of a geographical footprint by the ARC in areas with potential for smallholder agricultural development, such as the former homelands. The establishment of ADCs remains an important undertaking by the ARC in addressing the needs of the developing agricultural sector in South Africa and also in contributing towards technology transfer initiatives of the organisation. Underutilised ARC land and properties were identified as locations for ADCs. Preparatory work was done during the reporting period which included internal workshops and consultations, and identification of potential sites for establishing ADCs. Although no new ADC was established during the year, mainly due to lack of funds, a solid foundation has been laid for establishing new ones in the upcoming years.

**Development of a Monitoring and Evaluation (M&E) Framework for Benchmarking and Impact Assessment**

In establishing an operational capability in land use and enterprise planning as specified by the business plan, the unit developed a profiling framework. Establishing a baseline is standard scientific practice in R&D and a prerequisite for sound monitoring and evaluation (M&E). An M&E framework that includes a scientific profiling/benchmarking process was developed in consultation with international expertise. This framework is being integrated into the economic analysis processes of the organisation and contributes to the economic tool kit applied throughout the ARC and with clients. It adds value to the organisation’s evaluation processes, will contribute to informed decision-making, and in the longer term will help quantify the effectiveness and efficiency of the ARC’s R&D interventions.

**Benchmarking for the Expanded Horticultural Programme for Department of Rural Development and Land Reform (DRDLR)**

Economic analysis forms an integral part of the horticultural enterprises project sponsored by the DRDLR implemented in 14 district municipalities. The profiling framework is used extensively to determine the benchmark situation for the project at the different sites. This project requires detailed and comprehensive planning, and monitoring from an agro-ecological, socio-economic and enterprise development perspective. All four designated provinces were visited throughout the year as part of reconnaissance survey tours, which included visits to all 14 district municipalities. Visited areas include household gardens, semi-commercial smallholder farming projects, as well as communal projects. Thus far 320 households in two district municipalities, namely Umkhanyakude district municipality in Northern KZN and OR Tambo district municipality in the Eastern Cape, have been profiled. In Umkhanyakude district, a total of 160 households were randomly selected spanning 32 villages, whereas in OR Tambo 160 households were sampled in 30 villages.
Agricultural Economics and IP Management

This Programme combines the aspects of intellectual property (IP) protection and commercialisation (IP management) with the agricultural economics and biometry services.

Intellectual Property Management involves the protection of IP and the commercialisation thereof.

The Protection of Intellectual Property

This section of the report will focus on the protection of IP, taking into account the activities conducted and the strategic effect it has on the organisation.

The IP protection activities are conducted through a special office referred to as the IP Management Office (IPMO), whose functions include the development and implementation of policies for the proper management of Intellectual Property (IP); receive disclosures of potential intellectual property; analyse the disclosures for any existence of IP, attend to all aspects of statutory protection of the IP, and create IP awareness within the organisation. The IPMO keeps track of the IP portfolio of the organisation and ensures that it is maintained.

In this reporting period, the IP portfolio of the ARC grew as follows:

- Plant Breeders’ Rights (PBR) protection was granted on the following 34 new varieties:
  - Four groundnuts (ARC-09-001, ARC-OPal 1, ARC-Oleic2, -KANOsel)
  - Four wheat winter cultivars (Senqu and Selati)
  - Four wheat winter intermediate cultivars (Koonap, Hartbees)
  - Five wheat spring dryland cultivars (Kwartel, Ratel, Umlazi)
  - One irrigation cultivar
- One dry bean variety (RS 7)
- One table grape variety
- One citrus (Redheart)
- Four peaches (Desert Sun, Afrisun, Earliblish, Bella Donna)
- Three nectarines (Primrose, Ruby Rose, Tango, Donna Rosa)
- Three apricots (Solitaire, Rustic, Ambience)
- Three plums (Ruby Sun, Satin Gold, Ruby Crunch)
- The following Avena Sativa (Oats) varieties were approved to be listed on the National Varietal List in terms of the Plant Improvement Act:
  - Simonsberg: VL2012/8585; and
  - Towerberg: 2012/8584.
- PBR applications were filed for the following varieties:
  - Four sweet potato lines (ARC-SP-1, ARC-SP-2, ARC-SP-3, and ARC-SP-4).

Based on the PCT application number PCT/IB2010/053254, entitled Chimeric Foot and Mouth Disease, national phase patent applications were filed in ARIPO, OAPI, Nigeria and Angola. This provides the ARC and its partners with more room and opportunities to commercialise the IP for the good of the African region and generate income to conduct more research to benefit the country and continent.

Three IP workshops aimed at increasing the capacity of the ARC in identifying, securing, monitoring and maintaining its IP were conducted and 56 ARC personnel attended.

Annual maintenance fees for all ARC IP were attended to.

Intellectual Property Commercialisation

Licensing is the major vehicle for IP commercialisation used by the ARC, with performance measured as technologies issued under license. In recognition of the need to accelerate the transfer of new technologies to smallholder producers, this area was flagged for inclusion in the business plan of the ARC to ensure that due attention is paid to this objective. This is based on the fact that increasing access to this group of farmers will improve the probability of success for their farming enterprises through the exploitation of technology.

Licensing to smallholder producers, however, has been planned to start in earnest in the 2012/13 financial year. Activities in this reporting period were focused on identification of technologies in the ARC IP portfolio and matching these with possible licenses. Areas that have been identified include:

- Onion seed production in the Oudtshoorn area with a possibility for export to Australia
- Citrus production by smallholder producers, where it is envisaged that smallholder farmers
would be granted access to ARC citrus varieties in a development partnership with current ARC licensees and the Citrus Growers Association (CGA). The Kat River BEE Citrus group has been identified and a Growers’ Day, held at the Cape College in Fort Beaufort, was attended by 60 people in September 2012.

Performance on technologies issued under license has reached and exceeded the anticipated target. The target was set at 14 technologies issued under license, against a baseline set the previous year of 12. Achievement in this regard was 51 technologies transferred under license. This is largely due to the transfer of new cultivars from the breeding Programmes at the ARC.

Agreements were concluded for the transfer of five wheat and oats varieties. In addition, one agreement was concluded each for maps and databases, and in molecular biology. This year saw the inclusion of a requirement for a clear plan for increasing access to the technology under discussion, with a potential licensee. This has tended to extend the time it takes to conclude agreements. It is believed that in future, as this practice becomes more mainstreamed, this challenge will be overcome. Negotiations that were pursued, but not finalised, were in the areas of ryegrasses (five varieties) and for one inoculant technology.

Agricultural Economics

The ARC provides the sector with valuable consulting and advisory services on aspects such as agricultural engineering, agrochemical evaluations, land plan use advice, crop suitability studies, surveys, impact analysis and biometrical services. A total of 681 consultations were provided for agricultural economics and biometrical support to external clients, ranging from private clients to government departments and tertiary institutions. The biometrical services ensure proper statistical planning, precise analysis of the data, correct interpretation and representation using statistical procedures. These services facilitate informed decision-making by providing research-based strategic advice to clients. Since the ARC is involved in diverse areas of research such as biological pest control, animal production, nutrition and crop production, biometrical services are important in integrating statistical analysis into research programmes, and thus ensuring efficient research.

Despite the number of consultations in this area, the target for revenue set at R19 million, was missed by a wide margin, with achievement at R9.5 million. Despite a number of proposals presented to prospective clients for economics consultancy services, only one was successful. The pricing of these proposals may be a factor in the lack of success. This will be investigated in the next financial year.

Training and Extension

Training Management, Capacity Building and Institutionalisation

A quality management system (QMS) for training was developed, putting into place standard processes and procedures for delivery of training so that the ARC can maintain its accreditation status as a training and education service provider of choice. The QMS requires that all training Programmes be accredited and the trainer be accredited as well. Thirty scientists were trained on facilitation, assessment and moderation of outcomes-based learning for quality assurance.

Accredited ARC Courses

In the reporting period, 25 courses were submitted for accreditation towards Broiler Production (US 119450), Pig Husbandry (US 116153), Agricultural Selection Principles (US 116158), Harvesting Animal Products (US 116198), Small stock Management (US 116198), and Zoonotic Diseases Control, falling under three qualifications – National Certificate: Plant Production, National Certificate: Animal Production and National Certificate: Mixed Farming.

Trained Extension Personnel and Farmers

Training and extension support to 7 967 smallholder farmers and extension personnel was provided, almost doubling the target that had been set at 4 729 trained. This excellent achievement can be attributed to the availability of funds, largely provided by the economic competitiveness support package. Funds made available by local donors have also contributed to the achievement, focused on training and extension support to smallholder farmers towards economic competitiveness.

The International Maize and Wheat Improvement Centre (IMMYT) donor-funded Programme focuses on building capacity for enhanced service delivery by extension institutions. A case in point is the successful training of 145 professionals from Malawi, Tanzania, Mozambique, Kenya, Ethiopia, Botswana, Rwanda, Southern Sudan, Uganda and Zambia on technical skills in Conservation Agriculture as well as establishment and management of Innovation Platforms. The capacity-building initiatives contributed to the uptake of Conservation Agriculture, technologies for improvement of crop production and thus household food.

Resourced Institutions for Extension

A total of four institutions were resourced for extension skills development and delivery. This was through the Agricultural Research for Development Learning (ARD) Programme and the Extension Big Five. The ARD Programme equipped researchers and other R&D actors with skills, knowledge and attitudes needed for enhanced service delivery in the sector. It ran from June to August 2012 and 22 participants from the ARC, Limpopo Department of Agriculture, Eastern Cape Department of Rural Development and Agrarian Reform (DRDDAR), Universities of Fort Hare, Limpopo and Venda, attended.

The Extension Big Five Programme, funded by Nuffic, equipped 25 people to be trainers of 400 extension personnel in Eastern Cape. The participants were
from EC provincial Department of Agriculture, the ARC and the University of Fort Hare.

**Information Dissemination Events**

Two new platforms were used to disseminate ARC information this year. These were Science Communication and the National Science Week. This is in addition to the previously developed platforms used by the ARC, such as farmer’s days, TV/radio, popular articles, pamphlets, the internet and client reports.

The Science Communication Strategy was implemented this year and this included a media visit to the OR Tambo District where the ARC has a Fruit Production Programme. Eighteen journalists from different print and television media were hosted by the ARC CEO and farmers of the OR Tambo District. More than ten articles featured this visit, particularly the success of the ARC and Is’ Baya (NGO) in their contribution towards food security and income generation.

The ARC participated in the National Science Week (conducted under the auspices of the Department of Science and Technology) in August 2013, with the theme “Renewable Energy and environmental sustainability”. The ARC and Fort Cox College of Agriculture hosted learners from ten schools in Gauteng, Limpopo, Eastern Cape and North West. The Fort Cox Programme made news headlines on SABC 1.

**ARC Information Hub**

An ARC Agricultural Information Hub proposal was developed. The Information Hub is meant to operate in the form of a call centre where all agricultural information is consolidated so that when a client (farmers, students, extension, etc.) call or walk in at the ARC, they receive holistic information such as information on production, processing, financial, marketing, bursaries, etc., within the agricultural sector.

**Review and Update Public Sector Extension Policy**

The ARC partnered with DAFF in the development of the National Extension and Advisory Service Policy. A fourth draft is under review by the Department’s Executive Committee.

**Strategic Intent to Manage Extension**

This proposal was not developed due to changes in the Extension Landscape, i.e., Extension Service to include Forestry and Fisheries which are not ARC’s core mandate. Recommendations were sent to the CEO and the ARC Council to review the ARC’s position and strategy regarding co-ordination of Public Sector Extension.
Background

The Human Resource Division ensures that the ARC has a stimulating environment where employees can grow and develop. It is Human Resources’ responsibility to align the performance management systems with a high performance culture, and we remain committed to developing competent research and organisational leaders who focuses their efforts on developing effective teams and greater employee engagement across the organisation. This promotes and enhances a culture of high performance, and employee retention.

For the 2012/2013 financial year, HR was committed to recruiting, developing and retaining high quality human resources to undertake, manage and support research and development at the ARC. Our focus over the last financial year was on streamlining organisational processes, policies and procedures and ensuring that the organisational structure is aligned to the new strategic direction. We also focused on recruiting, developing and retaining qualified employees, through succession planning and performance management. At the same time we developed a competency framework which will create a long-term growth for our research and scientific employees.

Developing and Retaining Employees

The ARC has been experiencing a great deal of difficulty in retaining diverse talent. It is apparent that the ARC is often used as a “training institution” and stepping stone by designated candidates who then move on to better opportunities and more attractive remuneration offers. Another challenge within the organisation is an ageing scientific capacity and workforce. Creating a pipeline of talent for succession, is a strategic imperative for the organisation. While it is acknowledged that the demand for skills in agricultural research fields currently exceeds the supply, the ARC has endeavoured to examine other factors that could be contributing to poor retention and, in turn, find solutions to address these problems.

The ARC vision is excellence in research and development. Our excellence lies in continuously strengthening and building a skilled, motivated and high performing and diverse workforce. In the past financial year we committed ourselves to ensuring that we build and develop talent from within, including recruiting from our pipeline development initiative. We are committed to the development of our employees through continuous training by different training methods, namely undergraduate and postgraduate study bursaries, formal workshops (both internal and external), joint appointments with higher educational institutions, providing study support, on-the-job training, coaching and mentorship, international assignments and conferences.

We reviewed the salaries of all employees that were paid below the minimum of the pay scales as per job grade. We further undertook a job evaluation process for the researchers, research technicians, artisans and facilities managers which resulted in adjusting the salaries of affected employees. It is at these levels that we face market competition for qualified employees.

The turnover rate of ARC employees, this year fell to 2.94% across all ARC occupational groups. Comparing this figure to the 4.7% of the previous year, a decrease of 1.76% in employees turnover is reflected, however, 57% of these exits are from the research and technical employees complement. 38% is due to retirement and early retirement. It is evident that this situation causes an increased loss of depth and knowledge within the ARC.

Undergraduate and Postgraduate Bursary Programme for Full-Time Employees

The ARC provides bursaries to full-time employees to study part-time towards undergraduate and postgraduate degrees. This includes science, engineering and non-technical and/or support functions of the business. This serves as a retention and development measure and it improves productivity. This bursary programme also assists employees with National Diploma and B.Tech qualifications so that they are eligible to undertake further research and science degree studies. The number of full-time employees registered for further studies had decreased, as compared to the previous year from 288 to the current 142.

The table below gives an indication of the number of employee’s per study programme:

<table>
<thead>
<tr>
<th>Study Programme</th>
<th>Male</th>
<th>Female</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>C</td>
<td>I</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>18</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>M.S.c</td>
<td>7</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>B.Sc. Hons.</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>B.Sc.</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D.Tech.</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M.Tech.</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>B.Tech.</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>N.Dipl.</td>
<td>10</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>48</td>
<td>9</td>
<td>0</td>
</tr>
</tbody>
</table>
Employee Qualifications

The table below outlines the current skills levels of the research population within the Agricultural Research Council, indicating the qualifications of research and technology employees.

<table>
<thead>
<tr>
<th>Employee qualifications</th>
<th>31/03/2013</th>
<th>31/3/2012</th>
<th>% of employees excluding students (2322)</th>
<th>% of research employees (835)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research employees with Ph.D. degrees (including Executives and R&amp;D managers)</td>
<td>173</td>
<td>175</td>
<td>7%</td>
<td>21%</td>
</tr>
<tr>
<td>Research employees with Masters degrees (including Executives and R&amp;D managers)</td>
<td>248</td>
<td>243</td>
<td>11%</td>
<td>30%</td>
</tr>
<tr>
<td>Professional Veterinarians and Engineers</td>
<td>24</td>
<td>17</td>
<td>1%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Employment Equity

Currently the ARC employs 2 322 permanent employees who are made up as follows: 73% black and 40% female. When compared to last year’s figures, one sees an improvement. Last financial year’s figures were 67% and 39%, respectively.

Although the ARC is relatively successful in recruiting and appointing employees from the previously disadvantaged groupings, the challenge is to retain these employees.

Total ARC Employment Equity Demographics

Employment Equity Demographics by Race
Professional Development Project (PDP)

The main aim of the professional development project is to offer bursaries and support to postgraduate students in the agricultural sector. All the participants are engaged with studies, which falls within the critical and scarce skills areas, identified by the ARC. The general progress of the candidates is good and in line with the training programme and goals of the ARC.

The table below reflects a summary of the current ARC PDP students per study Programme, funded through THRIP, the NRF and through the parliamentary grant.

Further Training Interventions

We have four (4) external unemployed learners, and fourteen (14) employed learners who received bursaries from the AgriSETA. All the learners have registered at various universities. The following tables give a summary of these learners per gender:

Internships (Externally-Funded)

These interns have been placed across ARC Institutes within prioritised training areas. The interns are funded through various external programmes within the sector. The placement of these interns will assist them to acquire experiential training. The following table gives a breakdown of the interns per gender:

<table>
<thead>
<tr>
<th>Study Programme</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td>B.Sc. Hons.</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>B.Sc.</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td>B.Tech.</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>N.Dipl.</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>45</td>
</tr>
</tbody>
</table>
**Employee Relations**

The salary negotiations were concluded peacefully and a collective agreement signed on 30 July 2012. The salary increases and all substantive issues were implemented during the August pay month, and backdated to 1 April 2012. This was an important achievement, as compared to previous years when agreements were only reached around September and October. The salary increase that was agreed upon for 2012, constituted an average increase of 6.9%.

The ARC remains highly unionised with 1,925 employees out of a total of 2,322 belonging to the unions.

<table>
<thead>
<tr>
<th>Union</th>
<th>Membership</th>
<th>Percentage of Workforce (2,322)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOLIDARITY</td>
<td>716</td>
<td>30.8%</td>
</tr>
<tr>
<td>NEHAWU</td>
<td>1,209</td>
<td>52.1%</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>1,925</strong></td>
<td><strong>82.9%</strong></td>
</tr>
<tr>
<td>Non-unionised employees</td>
<td>397</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARC PF</th>
<th>NNPF</th>
<th>Employees with no pension fund membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,307</td>
<td>773</td>
<td>242</td>
</tr>
</tbody>
</table>

The above membership numbers shows that 242 employees do not belong to any of the two available funds within the ARC. 68 of these employees are appointed on a fixed-term contract basis, and they are not compelled to join one of the ARC retirement funds. The other 174 employees are those employees whose employment status changed from fixed-term to permanent with the implementation of the new organisation structures in 2009.

**ARC Retirements Funds**

The ARC 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:
The table on the left shows that the 42.5% of employees (68) that left the ARC were not in the possession of any formal tertiary qualifications. 30 employees (18.75%) had diploma qualifications, and 23 (14%) possessed other degrees. In terms of core qualifications the ARC lost 10.6% (17) M.Sc. degree holders and 13.75% (22) employees with Ph.D. or D.Sc. degrees in the past financial year.

During the 2012/13 financial year 58 employees retired from the ARC (normal and early retirement). This represents 36% of all categories of terminations in the ARC. Of these 58 employees, eight scientific employees went on retirement or early retirement of which five had Ph.D. and three M.Sc. degrees.

**Awards**

During the 2012-13 financial year a number of ARC employees received national and international recognition for their work.

1. Dr S Laurie and team received an award for the best research project at the GDARD symposium on 6 June 2012. The project is titled “Sweet potato varieties with improved taste and yield for food security and health of resource-poor communities in Gauteng” and involved establishment of on-farm demonstrations with improved ARC sweet potato varieties.

2. Martin Maboko received an award for best poster presented at the 5th GDARD Annual Symposium, held at St George Hotel on 6 June 2012. The project is titled “Plant manipulation including growth spacing, fruit and stem pruning of indeterminate crops in a hydroponic system”. The project was completed in 2010/11 and a final report was submitted.

3. Dr Juanita Liebenberg was awarded Best Oral Presentation Animal Health for the project entitled “Identification of proteins inhibiting E.ruminatium transmission by A. hebraeum”
during the GDARD Agricultural Research Symposium that took place on 6 June 2012 at the St George Hotel.

4. In July 2012, Dr Toi Tsilo of ARC was invited to serve on the Editorial Board and also as the Guest Editor of the Journal of Integrative Agriculture, formally known as Agricultural Sciences in China, which is sponsored by the Chinese Academy of Agricultural Sciences (CAAS). A meeting with editors was held on 7 September 2012 to discuss the role of the journal and how to increase the impact factor and the quality of articles published by the journal. One of the aims of the journal is to publish influential papers that will significantly advance scientific understanding in agricultural fields worldwide.

5. Ms Phyllis Burger was honoured with a Deciduous Fruit Industry Research Award for 2012 during a prestigious Deciduous Fruit Gala Evening at the Cape Sun International Hotel on 14 September 2012. She received the award for her contributions to the South African Table Grape Industry in the field of table grape breeding, evaluation, cultivar registration and commercialisation, specifically the release of four new table grape cultivars recently.

6. Mr APN du Toit of ARC received the award for the best scientific paper award at the 46th Annual Conference of the South African Society for Agricultural Extension (SASAE) in Durban for the paper titled “Implementing community-based projects: the challenge to bring about real change at farm level”.

7. Dr B Manicom received an award for outstanding research and services to the citrus industry.

8. Keynote address by Dr S Schoeman. Title: “An overview of control strategies of economically important stinkbugs (Heteroptera) and Tortricidae moths occurring on litchis in South Africa”. Occasion: 4th International Symposium of Lychee, Longan and Other Sapindaceae Fruits. Date: 6 December 2012, White River, South Africa, hosted by SALGA, ISHS and ARC.


11. An award for outstanding poster by Mr J Husselman. Title: “Promising selections from the ARC’s litchi breeding Programme”. Occasion: 4th International Symposium of Lychee, Longan and Other Sapindaceae Fruits. Date: 6 December 2012, White River, South Africa, hosted by SALGA, ISHS and ARC.


14. Second place for best poster by Mr C Human. Title: “Mango selections from the ARC’s breeding Programme with potential for alternate markets”. Occasion: 30th Annual Congress of the South African Society for Agricultural Technologists. Date: 18 to 21 September 2012, Salt Rock, KwaZulu-Natal, South Africa, hosted by SASAT.

15. Ms Phyllis Burger received the award for best poster at the 34th Congress of the South African Society of Enology and Viticulture (14 to 16 November 2012).

16. Mr Vink Lategan received the award for best oral presentation at the 34th Congress of the South African Society for Enology and Viticulture (14 to 16 November 2012).

17. Mr André Meyer’s poster. Titled: “Straw mulch and compost affect microbial enzyme activity in apple orchard soils” won the best poster award by the Soil Science Society of South Africa (SSSSA) at the Combined Congress (Combined Crops, Soils, Horticulture and Weeds Congress) at the University of KwaZulu-Natal, Westville Campus, on 21 to 25 January 2013.
MARKETING AND STAKEHOLDER MANAGEMENT
Background

The Marketing and Communications Division shapes perceptions about the ARC and elevates the organisation’s reputation and image through the creative use of a suite of communication channels such as media relations, advertising, exhibitions, signature events and other activities. Our brand identity strategy enhances the ARC’s reputation and presence nationally and internationally. We service our internal constituencies through prompt, proactive and proficient communications. Communication includes the dissemination of information in a variety of ways, with the common goal of enhancing the organisation’s raison d’etre.

Key Activities Undertaken

The Marketing and Communications Division, which includes Stakeholder Relations, has, during the period under review, undertaken various interventions to ensure the visibility and enhancement of the ARC brand and image as well as engagement with different ARC stakeholders.

The interventions that the Division undertook to increase the visibility of the ARC Brand included the following exhibitions and publicity:

- Exhibitions - Bien Donne Agri Cape Week (Western Cape); Nampo Harvest Day (Free State); Royal Agricultural Show (KwaZulu-Natal); African Farmers Workshop and Expo (Gauteng); AgriMega Week (Western Cape); The Spring Show (Gauteng); World Food Day celebrations hosted by the United Nations’ FAO and DAFF (Mpumalanga); World Soybean Conference (KwaZulu-Natal); Northern Agricultural Show (Limpopo); 5th BRICS Summit (KwaZulu-Natal).

- Publicity – Business Day articles focusing on Food Security; The Star article and SABC 2 Morning Live interview focusing on Combating Rabies Campaign; INTERGYS advertisement in Farmer’s Weekly; Indigenous Products advertorial in UNESCO/African Heritage World Fund; Climate Change advertorial in ESG and a series of articles were published in CEO Communication magazine.

In efforts to ensure that stakeholders are fully engaged, the division through the ARC CEO and President’s office, campuses and stakeholder management offices, undertook the following interventions:

- Visit by USDA Delegation; Luncheon Discussion for State of Delaware Delegation; ARC partnered with TIA and others to launch Tshwane Animal Health Cluster; ARC hosted stakeholders (National Emergent Red-meat Producers Organisation (NERPO), Milk South Africa and Clover South Africa) at a business briefing with the Minister of DAFF, organised by the New Age and SABC2; ARC CEO and President met with the editor of Farmer’s Weekly; ARC in Stellenbosch hosted delegations from Germany, Belgium and China; ARC at Onderstepoort hosted 15th Annual International Veterinary Biosafety
In addition to various direct stakeholder engagement events during the financial year, we plan to contract a third party to conduct various surveys, including customer satisfaction, stakeholder and employee engagement surveys. We plan to start a Programme that will aid in building our understanding of the key concerns of our stakeholders and ensure that we maintain a high level of transparency and accountability in our reporting. This will enable us to not only become more effective in managing stakeholder expectations, but also maximise the development impact we can deliver.

**Challenges**

A major challenge for this division is under-capacity. One of the audit findings in 2011/12 was that the division was not fully capacitated to deliver on its mandate. Therefore, part of the plan is to negotiate with executive management to bring on board more human resources.

Another challenge is the Public Relations Officers (PROs) based in the campuses whose activities are coordinated at campus level without alignment with central office. The job description of all PROs is inconsistent and in most cases out of kilter with what is expected from a professional PRO. This will be corrected by the Senior Manager: Marketing and Communications together with the Senior Manager: Human Resources and Research Institute Managers.
ARC IN THE NEWS

Bite just beginning of victim’s ordeal

BOTHO MOLOSANKWE
botho.molosankwe@iol.co.za

WHEN A dog attacked Jaqueline Mitchell as she walked along the street, dragging her and biting her, it was not only physical injuries that had the 51-year-old woman worried.

Although the bites were painful, Mitchell and her husband, James, were worried that the dog might not have had a rabies inoculation. And so they took immediate action to ensure that the life-threatening disease could not harm her.

Mitchell had been walking home from the shops on September 13 when a neighbour’s Rottweiler attacked her.

“Without warning I was hit violently from the rear. The dog attacked me, latching on to my left forearm and shaking me violently,” she recalled.

Although she was screaming and in pain, it was only after some time that the owner, who was allegedly watching from a distance, called his dog. Mitchell and her husband believe that the owner was also scared of the dog.

“He never apologised, he just told his domestic worker to give me Dettol and some water,” Mitchell said.

The Mitchells laid a complaint with the police the following day, after hearing that the attack was not the first time the animal had savaged a passer-by. James made contact with another resident who claimed that the same dog had attacked his 13-year-old daughter as she had walked home from school.

However, what was most concerning for the couple was finding out that the dog had not been inoculated against rabies. Neither the owner nor the breeder could verify the dog’s inoculation status, and when the couple called their local veterinary hospital, it confirmed that the dog had not had inoculation. In a panic, they called Morning sickness Hospital to check whether they could go there for an anti-rabies shot.

“They said they don’t stock it because state hospitals have it. They said we should try Charlotte Maxeke, but even there they said they did not have and referred us to Hillbrow Clinic.”

At the Hillbrow Clinic, Mitchell was taken next door to the Medicod Legal Centre – where rape kits and blood is drawn – and was given an antirabies shot. She needed a course of five injections, and had her second one on Friday.

Wonderful Shumba of the Agricultural Research Council said rabies was under control in Joburg. However, he said, the problem was if people brought dogs from provinces that were rabies endemic such as Limpopo, Mpumalanga and KwaZulu-Natal. His department inoculated animals and gave owners a certificate as proof that their dog had been inoculated.

Rabies, he said, was dangerous.

“For a human, rabies is almost invariably fatal if post-exposure prophylaxis is not administered prior to the onset of severe symptoms,” he said.

People who were bitten by a dog they suspected could have rabies, he said, needed to report to their clinics as soon as possible.

Rabies facts

- September 28 is World Rabies Day.
- Dogs are the animals most responsible for infecting humans with rabies.
- In 2006, 31 people died from rabies in SA, 28 of them from Limpopo.
- A state veterinarian has the right to quarantine or put down a dog that is suspected of having rabies.
- If a person has been bitten by an infected dog and the virus is transmitted, some of the signs the person will have will be anxiety, hysteria, fear of water, aggression, drooling, and paralysis of the throat and limbs.

NUTRITION is a critical element of food security and volumes alone cannot be said to provide it, says Dr Andrew Magadlala, livestock research and technology manager at the Agricultural Research Council (ARC) in the Department of Agriculture.

Magadlala does not dismiss a vegetarian diet as inadequate, but he says that human nutrition requires that the correct combination of amino acids is regularly ingested. Meat contains the amino acids essential in human nutrition and it is for that reason that meat production is essential to food security in SA.

The importance of livestock production in rural development should not be underestimated. The Pro-Poor Policy Initiative estimated that about 70% (or 150 million) of poor rural people in sub-Saharan Africa are at least partially dependent on livestock to sustain their livelihoods. Sub-Saharan Africa also has the largest area of permanent pasture of any continent, and the largest number of pastoralists.

A livestock development research report published by the Pro-Poor Policy Initiative has found that livestock production contributes about 35% of agricultural GDP in sub-Saharan Africa. It has found that livestock production can contribute to poverty reduction in different ways. Primarily, it increases food supply, but it also serves as a source of income and a means for capital accumulation, generating employment and supply inputs and services for crop production.

Further, the study finds, non-market exchanges of livestock represent an important factor for social integration. Nutritiionally, meat, dairy and egg products are prime sources of readily absorbable iron, zinc and other minerals, as well as of vitamin B12, all of which are essential for early childhood growth and cognitive development, which has an important effect on longer-term development.

In smallholder mixed farming, livestock and the processing of livestock products is the most important cash crop. Sales of livestock products such as milk, eggs and fibre generate a constant stream of income and the sale of live animals, meat and hides produce substantial sporadic income. Livestock also contribute to the stability of the incomes of farm households as they act as a cash buffer (small stock), a capital reserve (large animals) and as a hedge against inflation. The increase in weight of livestock over time and its reproductive capacity allow farmers gradually and continually to accumulate assets, the Pro-Poor study has found.

Raising livestock is also often found to be more profitable than saving money in a bank as net annual returns from livestock are higher than interest rates, according to the study.

SA’s social structure is similar to that of sub-Saharan Africa, with the greatest number of poor people living in rural areas, market conditions are different.

South Africans consume about 1.6 million tons of white meat a year (about 34.9kg a person) and about 1.2 million tons of red meat a year (about 24.4 kg a person), while 424,000 tons of eggs a year (4.4 kg a person) are consumed. That means South Africans spend about R125m on pork products and about R4bn on eggs and milk every year.

It also means that South African producers are under enormous pressure to meet the demand for protein and to remain competitive, says Magadlala.

“For instance, South African producers cannot supply the country with enough poultry meat, which means we must import poultry to make up the deficit.”

As the country’s population grows and as people urbanise and their diets change, the demand on livestock producers will intensify, says Magadlala. And, as the demand for field crops increases, the land available for livestock production will shrink, he says.

“The answer is to integrate communal livestock production — that is, on the former homeland areas — with traditional livestock production. To do that, the quality of the livestock and pasture management in these areas must be improved to produce competitive quality grass-fed animals,” he says.

“That has to be underpinned by science and innovation, and support services.”

The ARC develops technologies to improve the quality of animals and develops genetic and physiological methods to identify and study superior livestock breeding material to improve the efficiency and production of the national herd.

The council also promotes animal production through improved nutrition through its research programmes and the development of holistic and integrated land-use strategies and sustainable livestock and rangeland management systems.
Farming evolves to fall in line with markets

Producers now plan their crops well ahead of planting against a contracted price, writes NEELS BLOM

IT SHOULD come as no surprise that the approach to maintaining and improving food security in SA is divided, and that the divisions reflect broader economic ideologies.

On the one hand, as it were, are those who would see greater intervention at every point in the agricultural value chain, while dyed-in-the-wool capitalists insist that the market be left to its own devices.

The two may disagree about the mechanisms for tackling food security, but they are in agreement that SA’s agricultural output must increase to either improve its trading position or to increase its level of food self-sufficiency — or both — as a way of ensuring food security.

The parties also agree on what food security means: people must, at all times, have physical and economic access to adequate volumes of nutritious, safe and culturally appropriate food. They agree, too, that while the country as a whole is not under threat of famine, millions of South Africans experience sustained or sporadic food insecurity at household level.

Commercial agriculture — large-scale organised agriculture and its associated industries — have long provided food security through markets as the JSE’s commodities exchange. Yet, according to Statistics SA, about a fifth of South African children live in households that experience hunger.

In world rankings, the comprehensive DuPont Global Food Security Index places SA 40th out of 105 countries, while the United Nations’ Food and Agriculture Organisation (FAO) has found sub-Saharan Africa (including SA) to be the only region in the world where the average daily food supply is below the adult requirement.

“Trade, says the JSE’s commodity derivatives director Chris Sturgess, is the answer. Since the abolition of single-channel marketing mechanisms and monopolistic co-operatives, SA’s open-border, free-market, non-interventionist policies have permitted the country’s sophisticated agricultural commodities markets to evolve. That has improved food security, says Sturgess, first in that it requires the transparency of grain supplies and, second, that it permits producers to manage their price risk.”

“While SA is not under threat of famine, millions experience sustained or sporadic food insecurity at household level supply risk where trading partners close their borders to ensure their own food security, such as it happened during the global food crisis in 2008 when Argentina (a major wheat supplier to SA), India and China stopped exporting, followed later by Russia. That forced SA to buy wheat on the spot market at higher prices, raising millers’ input costs and eventually the price of bread.”

That, he says, is achieved through regulation, which, among others, entails position limits for traders and a limit on daily price fluctuation (R50 per ton per day for maize).

“Interventionists (in the private sector and among agriculture officials) say a trade-dependent open-border approach may work in an ideal world, but SA’s trading partners maintain trade barriers and protect producers, which means SA cannot compete on price. “That would lead to farmers abandoning crops in which they are not competitive, thus exposing the country to shortages,” says Dr Cobus le Roux, GM of the grains division of the Agricultural Research Council in the Department of Agriculture.

Le Roux also refers to a business as a disincentive to produce a surplus. Small-scale producers’ contribution to household food security must not be underestimated, and it warrants support from the state, he says.

Gareth Lloyd-Jones, MD of Ecowize, a health and sanitation company servicing the food and beverage sector, has called for a collaboration between the government and the private sector to establish a “self-sustainable” local food production and agriculture industry through a development programme, similar to the Motor Industry Development Programme and involving small-scale farmers.

“That way we will reduce hunger and poverty and increase agricultural development. This will subsequently contribute towards skills development in the country and improve inclusive economic growth and job creation. The key is a structured, integrated and co-ordinated effort to develop the full ambit of the food supply chain from farm to fork.”

“The idea should be to turn SA’s food supply industry into a net exporter as opposed to a net importer, without compromising the full spectrum of food supply locally.”
Background

Information and Communications Technology (ICT) remains a key enabler for the achievement of organisational strategies and objectives. The key focus for ICT in the financial year 2012-13 has been the implementation of two strategic projects, namely:

- the renewal and upgrade of the core ICT infrastructure across the entire organisation, and
- the acquisition and implementation of an integrated Enterprise Resource Planning (ERP) solution.

Performance Overview

Having obtained approval for the two projects during mid-2012, procurement via tenders was completed in November 2012 for both projects.

The ICT Infrastructure project was initially scheduled for implementation ahead of the commencement of the ERP project due to the direct dependency of the solution on the new infrastructure. Provision was made in the scheduling of the projects for time to complete the prescribed governance processes. However, in hindsight, that provision proved inadequate as we have had to undertake multiple iterations to ensure procedural correctness and completeness, especially in the tendering process.

The following are some noteworthy achievements on the two projects, specifically pertaining to the financial year 2012-13:

- Successful completion of the procurement processes for both the Infrastructure and ERP projects;
- Appointment of an original equipment manufacturer (OEM) vendor for the Infrastructure solution, with a negotiated saving on the original cost of the solution;
- Appointment of an implementation partner for the ERP solution, with a negotiated and committed saving of 5% on the implementation cost;
- Mobilisation of project teams on the two projects, comprising both ARC employees and vendor/implementation partner employees;
- Project initiation and finalisation of contractual matters between the ARC and the two service providers;

A detailed Analysis and Scoping was agreed to after much deliberation on the ERP solution implementation as the initial phase to establish the detailed business requirements and to quantify and confirm the scope of the project. This approach enables a reasonably accurate project plan, confirmation of effort required to design and implement the solution, as well as ensuring a fact- and needs-based procurement of software licenses required. This phase also commenced in the 4th quarter of 2012-13.

Amongst the key success factors identified for successful delivery of the two projects are –

- more focus on the alignment of the two projects as a result of the intrinsic dependencies between them;
- change management and communication to ensure business is continuously engaged and involved;
- training of both ICT staff and employees on the new solutions;
- effective and active project management; and
- project governance to provide leadership and oversight.
The development of ICT performance objectives for the year 2012-13 was based on the identification of threats and weaknesses which specifically highlighted “ageing ICT infrastructure, unable to provide service needs” as well as “poor ICT infrastructure and systems”. These factors further filtered through to the ICT risk register for 2012-13, further substantiating the rationale and justification for a total overhaul of the entire systems landscape.

Further focus was placed on maturing the ICT governance from an initial baseline established during an ICT Governance maturity assessment in the previous financial year (2011-12). The pursuit for maturing the governance of ICT in the ARC is based on the following –

- COBIT (Control Objectives for Information Technology) as a de facto Framework for IT Governance and Control;
- ITIL® (Information Technology Infrastructure Library) – a guideline standard for IT service management;
- ITSM (Information Technology Service Management) – ITSM employs ITIL documented best practices and addresses the need to align the delivery of IT services closely with the needs of the business; and
- King III Report on ICT Governance.

A maturity self-assessment conducted in the last quarter of the financial year, yielded an overall improvement of 3.2 from the baseline figure of 2.7 (out of 5) in 2011-12.

The rationale for governance maturity stems from the recognition of the critical dependence of many business processes on IT, the need to comply with increasing regulatory compliance demands and the benefits of managing risk effectively.

Recognising that governance is not a once-off event, ICT Governance assessments will continue to be a key focus area for ICT. This is to ensure continuous improvement of the overall maturity going forward as more and more emphasis is placed on managing the risks associated with information technology, requirements for regulatory compliance, and the need to expose and increase the value attained from IT investments.

During the year ICT successfully completed the acquisition (through tender) and rollout of desktop computer equipment on a new operating lease agreement to ARC employees across all campuses, including Central Office and the more than 29 smaller sites across the country. This project was completed within the scheduled timeframes and was executed simultaneously with the facilitated sale of the old computers to interested ARC employees.

In respect of the current (as-is) environment, the ICT department has maintained reasonable stability of the overall ICT platform and a high level of service delivery performance against a background of obsolete technologies with severe performance and storage capacity limitations.

Reasonable improvements have also been made on the resolution of audit issues in the IT environment, especially with regard to operating controls and security, given that most of these issues and risks are as a direct consequence of the current state of the ICT environment. A marked improvement should emerge with the progressive implementation of the infrastructure and ERP projects.

These and other business imperatives of improving operational and organisational efficiency and effectiveness underpinned the performance focus for ICT during the year.
FACILITIES MANAGEMENT
Background

Like other business units across the ARC, Facilities Management has had to consistently deliver an acceptable level of performance against a background of severe financial resource limitations for a long time. What brings the Facilities Management situation into even sharper focus, is the level of deterioration and breakdown of various facilities, assets and infrastructure which are critical enablers for core business.

Performance Overview

The ARC Strategic Plan (2012-13 to 2016-17) identified the effective and optimised utilisation of assets as one of the key strategic focus areas for Facilities Management, underpinned by the development of a corporate asset management plan.

The corporate asset management plan identifies and analyses critical components necessary for optimised management and use of ARC assets, namely –

- Development and implementation of a consolidated, prioritised maintenance plan for all assets, infrastructure and facilities requiring different maintenance interventions according to R&D priorities;
- Alternative use of assets that are either underutilised or not used at all;
- Improving revenue generating capabilities through increased leases/rentals of surplus land and buildings, balancing against R&D and Technology Transfer priorities;
- Reclamation of land and buildings that are currently illegally occupied and/or abandoned;
- Disposal of assets either deemed surplus to requirements or not usable for agricultural research and development purposes.

A further key focus area also affected by the availability of funding, is the need for asset protection in the form of implementation of various security measures across all ARC sites. Facilities Management have had to reprioritise planned actions in accordance with available funding, and these initiatives will, among others, continue to be prioritised into the new financial year.

Despite the resource challenges, the Facilities Management department has managed to deliver some praiseworthy performances, namely:

- Successful procurement of services for the reclamation of the Umtihiza Experimental Research Farm, including security fencing and revamp of identified buildings. This has led to the re-engagement of some of the former employees of the ARC at Umtihiza (a total of 16) as casual workers for the clean-up of the built area of the farm;
- Streamlining the process of rental/lease agreements processing to ensure consistency and standardisation of applied terms and conditions, ensuring market-relatedness of rates charged, facilitating corrective interventions on contracts that are problematic, among other issues; these issues are also referred to in the Asset Management plan to ensure optimum revenue from leased properties;
- Aggregation and consolidation of all leased assets into one repository to enable proper tracking and management of associated contracts;
- Aggregation and consolidation of all unused/underutilised properties to serve as a basis for driving more lease opportunities and thereby improve lease revenue, and evaluating options of retention and/or disposal;
- Consolidating all campuses maintenance plans (in respect of budgetary requirements) to ensure the development of a maintenance plan prioritised ARC-wide as opposed to the current practice of silo-based prioritisation; this will also serve as a basis for determining maintainability and disposability of various movable assets;
- Processed servitudes on ARC land and negotiating compensation which resulted in a total compensation of about R1,2 million; while servitudes ordinarily diminish the usability of land, of the three processed and approved to-date, only one represents a minor loss of land (287 m2) which had no prospect of agricultural use; the other servitude limits certain types of usage while the one at Loskop Farm (electricity pylons) does not diminish the primary use (grazing);
- The successful amalgamation of Facilities Management for Central Office, Silverton campus and Nelspruit campus with the appointment of the Facilities Manager overseeing all three sites;
- Successfully conducted security clearances and screening in line with the ARC levels of security clearance for vetting as well as the security vetting procedure. A security vetting awareness programme was developed and presented to the staff in three of the ARC’s service delivery points; and
- The process of reviewing the current security service provision has commenced.

Challenges/Risks

The cumulative effect of inadequate security measures could have long-term effects on yields and render some of the research projects either worthless or give skew results. Given that research output is the main function at the ARC, these negative effects will therefore impact directly on the researcher’s performance.
The following are the division’s main challenges:

- A reduction in the ARC R&D capabilities, i.e. output and quality, as a result of ageing infrastructure across the ARC, which has been exacerbated by increasing maintenance costs and inadequate maintenance funding;

- A compromised R&D output that are coupled with increased R&D input costs, as a result of inadequate security measures across the ARC;

- “Sub-optimal utilisation of ARC properties/facilities/assets in respect of:
  - occupied and/or unoccupied properties
  - underutilisation of properties, e.g. total land area used vs. available capacity
  - non-utilisation of properties, e.g. unused farms/land

  - general surplus capacity of other assets for inter-campus use, e.g. farming equipment”.
CHAPTERS IN BOOKS


THESES AND DISSERTATIONS


6. **Frylinck, L.** (2012). Determination of levels of vitamin D and its metabolites after feeding of high levels of vitamin D3 to beef animals to alleviate the effects of beta-agonist supplementation in feedlot cattle. A Thesis submitted in partial fulfilment of University of Johannesburg for the degree of Mater of Science.


22. **Van der Merwe, J.D.** (2012). Exposure to polyphenol-enriched rooibos (Aspalathus linearis) and honeybush (*Cyclopia spp.*) extracts: Implications of metabolism for the oxidative status in rat liver. A Thesis submitted in partial fulfilment of University of Stellenbosch for the degree of Doctor of Philosophy.

23. **Venter, A.** (2013). Phenolic composition and in vitro antioxidant activity of South...


JOURNAL ARTICLES


87. Kruger, F.J. & Lemmer, D. (2012). Respiration and softening rates of ‘Maluma’ and ‘Ryan’ avocados and the effect that cold chain breaks have on the ripening and quality of these cultivars. SA Avocado Growers’ Association Yearbook, 35:12.


AUDIT AND RISK COMMITTEE REPORT
Purpose of the Audit and Risk Committee

The function of the Audit and Risk Committee of the 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 Committee Charter was reviewed and updated recently to accommodate new and extended responsibilities.

The membership of the Committee comprises four independent external members and one member of Council.

Attendance at meetings

<table>
<thead>
<tr>
<th>Name of Member</th>
<th>23 May 2012</th>
<th>24 July 2012 (SP)</th>
<th>24 Aug 2012</th>
<th>1 Nov 2012</th>
<th>14 Feb 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr R Wesseloo</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mr V K Naicker</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Mr H McBain</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Mr L Mangquku</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dr ST Cornelius</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

*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 regularly (scheduled and unscheduled) to address the issues at hand. 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.

Audit and Risk Committee responsibility

The Committee reports that it has complied with its responsibilities arising from the prevailing Treasury Regulations and the PFMA. The Committee also reports that it has adopted appropriate formal terms of reference as its Charter, has regulated its affairs in compliance with this Charter and has discharged all its responsibilities as contained therein.

Further hereto, the Committee notes the principles as contained in the King III Report on Corporate Governance in as far as these relate to the functions of the Committee.

Evaluation of internal controls

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. During the previous financial year, Deloitte was appointed as the preferred outsourced service provider for the internal audit capacity. Through this engagement, the Committee is able to report on the effectiveness of the internal control systems and to assess whether the Internal Audit Function is fulfilling its roles effectively and efficiently. Deloitte’s contract expires at the end of July 2013 and the ARC is in the process of appointing a new internal audit service provider.

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 programme, coordination 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.

Evaluation of the Annual Report

The Committee has:

• Evaluated and discussed with Management the draft Annual Financial Statements included in the Annual Report and, based on the information provided to the Committee, considered that the said statements comply in all material respects with the requirements of the Treasury Regulations, the PFMA requirements as well as South African Statements of Generally Accepted Accounting Practice (GAAP) and certain Statements of Generally Recognised Accounting Practices (GRAP);

• Reviewed the accounting policies and practices; and

• Reviewed the ARC’s Report on Performance Information.

The Committee acknowledges that the ARC’s ongoing concern status is totally dependent on the continued support of Government through its various Departments. With this support, the Committee is of the opinion that the adoption of the going concern premise in drafting 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 underfunding of the organisation. Such continuous underfunding places a considerable strain on the financial resources of the ARC, which, in turn, places a huge risk on the ARC by causing it to not fulfill its delivery on certain mandates.

The monitoring of the organisation’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 has accepted the responsibility to ensure adequate reporting on performance information and the policies and procedures are of a standard acceptable to Council. The Committee’s mandate and charter has been altered to acknowledge this responsibility. The Committee has taken note of the Performance Information Report which compares the actual performance of the organisation against the approved Business Plan for the financial year, the strategic objectives, key performance indicators and targets set.

Conclusion

The Committee has, once again, taken note of the concerns of the Auditor-General 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.

I would like to thank all members of the Committee for their contribution and the professional way in which meetings were conducted. The Committee wishes to express to the ARC Council, CEO and staff of the ARC, our sincere appreciation for the commitment shown during the year.

Robert Wesseloo
Chairperson of the ARC Audit and Risk Committee
31 May 2013
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 Council**

The members of the Council, serving in the year under review, were:
- Mr J W A Godden – Chairperson
- Prof S Vil-Nkomo – Deputy Chairperson
- Mr J H McBain
- Ms W Jansen van Rijssen
- Dr J Chitja
- Prof T Mayekiso
- Prof T Mofokeng
- Prof M Kahn
- Mr A Young
- Prof M Karaan (resigned May 2012)
- Prof F Swanepoel
- Ms D Msomi
- Mr M Dyasi
- Ms B Aphane
- Dr S R Moephuli (President and CEO)

**Responsibilities of the Council**

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 organisation.

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.

**Council 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 and Fisheries.

Members of the Audit and 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 and 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.

**Council Members’ Interest in Contracts**

None of the Council 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 Framework**

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 Council meetings scheduled:

<table>
<thead>
<tr>
<th>Council member</th>
<th>No. of meetings attended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr J W A Godden – Chairperson</td>
<td>3</td>
</tr>
<tr>
<td>Prof S Vil-Nkomo – Deputy Chairperson</td>
<td>4</td>
</tr>
<tr>
<td>Mr J H McBain</td>
<td>5</td>
</tr>
<tr>
<td>Ms W Jansen van Rijssen</td>
<td>5</td>
</tr>
<tr>
<td>Dr J Chitja</td>
<td>5</td>
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<tr>
<td>Prof T Mayekiso</td>
<td>2</td>
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<tr>
<td>Prof T Mofokeng</td>
<td>6</td>
</tr>
<tr>
<td>Prof M Kahn</td>
<td>5</td>
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</table>
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 and 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 organisation. 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 2012, together with their respective terms of reference in the form of Committee Charters:

Executive Committee

No meetings for the year under review.

Human Resources and Remunerations Committee

Three meetings held.

Finance and Investment Committee

Three meetings held.

Audit and Risk Committee

The Audit and Risk Committee comprises four independent members and two members of Council. A specialist independent member chairs the Audit Committee.

The independent members are:
Mr R Wesseloo (Chairperson)
Mr V Naiker (Deputy Chairperson)
Dr S Cornelius
Mr L Mangquku

Research, Development and Evaluation Committee

Three meetings held.

Finance and Investment Committee

Three meetings held.
The Council members on the Audit and Risk Committee, as at 31 March 2013, were:

Mr. H McBain

During the year under review the following Audit and Risk Committee members attended the five scheduled meetings:

<table>
<thead>
<tr>
<th>Council member</th>
<th>No. of meetings attended</th>
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</thead>
<tbody>
<tr>
<td>Mr R Wesseloo (Chairperson)</td>
<td>5</td>
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<tr>
<td>Mr V Naiker (Deputy Chairperson)</td>
<td>2</td>
</tr>
<tr>
<td>Dr S Cornelius</td>
<td>4</td>
</tr>
<tr>
<td>Mr L Mangquku</td>
<td>5</td>
</tr>
<tr>
<td>Mr H McBain</td>
<td>4</td>
</tr>
</tbody>
</table>

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 organisation, 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 unionised.

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

Accounting Authority’s Statement of Responsibility and Approval of Annual Financial Statements 127
Statement of Financial Performance 130
Statement of Financial Position 131
Statement of Changes in Net Assets 132
Cash-flow Statement 133
Accounting Policies 134
Notes to the Annual Financial Statements 147
**General Information**

| **Country of incorporation and domicile** | South Africa |
| **Legal form of entity** | Public entity established in terms of Agricultural Research Act, 1990 (Act No. 86 of 1990) |
| **Nature of business and principle 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** | Craig Matthews |
APPRIATENESS 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 2014 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 2013 presented on pages 130 to 175 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 28 May 2013 and are signed on its behalf:

Mr JWA Godden (Chairperson)
Chairperson: ARC Council

Dr SR Moephuli
CEO and President
REPORT ON THE FINANCIAL STATEMENTS

Introduction

1. I have audited the financial statements of the Agricultural Research Council set out on pages 130 to 175, which comprise the statement of financial position as at 31 March 2013, the statement of financial performance, statement of changes in net assets and the cash-flow statement for the year then ended, and 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 Management Act of South Africa, 1999 (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 the Public Audit Act of South Africa, 2004 (Act No. 25 of 2004) (PAA), the general notice issued in terms thereof and 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 2013, and its financial performance and cash-flows for the year then ended in accordance with South African Standards of Generally Recognised Accounting Practices (SA Standards of GRAP) and the requirements of the Public Finance Management Act of South Africa, 1999 (Act No.1 of 1999) (PFMA).

REPORT ON OTHER LEGAL AND REGULATORY REQUIREMENTS

7. In accordance with the PAA and the general notice issued in terms thereof, I report the following findings relevant to performance against predetermined objectives, compliance with laws and regulations and internal control, but not for the purpose of expressing an opinion.

Predetermined objectives

8. I performed procedures to obtain evidence about the usefulness and reliability of the information in the annual performance report as set out on pages 130 to 175 of the annual report.

9. The reported performance against predetermined objectives was evaluated against the overall criteria of usefulness and reliability. The usefulness of information in the annual performance report relates to whether it is presented in accordance with the National Treasury’s annual reporting principles and whether the reported performance is consistent with the planned objectives. The usefulness of information further relates to whether indicators and targets are measurable (i.e. well defined, verifiable, specific, measurable and time bound) and relevant as required by the National Treasury’s Framework for managing Programme performance information (FMPPI).

The reliability of the information in respect of the selected objectives is assessed to
determine whether it adequately reflects the facts (i.e. whether it is valid, accurate and complete).

10. There were no material findings on the annual performance report concerning the usefulness and reliability of the information.

Additional matter
11. Although no material findings were identified concerning the usefulness and reliability of the performance information in the annual performance report, I draw attention to the matter below. This matter does not have an impact on the audit findings on predetermined objectives reported above.

Achievement of planned targets
12. Of the total number of 103 targets planned for the year, 42 were not achieved during the year under review. This represents 41% of the total planned targets that were not achieved during the year under review as disclosed in page 178 to 185 of the annual performance report. This was mainly due to budget constraints and a shortage of technical expertise to finalise researches.

Compliance with laws and regulations
13. I performed procedures to obtain evidence that the entity has complied with applicable laws and regulations regarding financial matters, financial management and other related matters. My finding on material non-compliance with specific matters in key applicable laws and regulations as set out in the general notice issued in terms of the PAA is as follows:

Annual financial statements, performance and annual report
14. The financial statements submitted for auditing were not prepared in all material respects in accordance with the requirements of section 55(1) (a) and (b) of the PFMA and GRAP statements. Material misstatements of revenue, expenditure, current assets, non-current assets, current liabilities and disclosure items identified by the auditors were subsequently corrected by management, which resulted in the financial statements receiving an unqualified audit opinion.

Internal control
15. I considered internal control relevant to my audit of the financial statements, performance report and compliance with laws and regulations. The matters reported below, under the fundamentals of internal control, are limited to the significant deficiencies that resulted in the finding on the compliance with laws and regulations included in this report.

Leadership
16. The accounting authority’s internal controls relating to the financial reporting processes between the central office and the institutes did not ensure that certain exceptions were prevented and/or detected and as a result material misstatements were identified in the financial statements submitted for audit.

Financial and performance management
17. In certain instances, annual financial information compiled and prepared by management were not supported and evidenced by accurate and complete information, mainly due to inadequate year-end processes and procedures implemented between the central office and the institutes, and as a result material adjustments were made to the annual financial statements submitted for audit.

OTHER REPORTS

Investigations
18. During the current financial year, one investigation was conducted by an independent consulting firm at the request of the entity. The investigation related to allegations that certain recruitment agencies received preference above others at the Agricultural Research Council (ARC). The investigation resulted in an employee being suspended. The employee subsequently resigned.

Agreed-upon procedures engagement
19. As requested by the public entity, an engagement was conducted during the year under review on the expenditure of National Research Foundation (NRF) grants, scholarships and Grant Deposits awarded to institutions. The report covered the period 1 January 2012 to 31 December 2012, the audit has been finalised and no material findings were noted.

Pretoria 
31 July 2013
### Note(s) 2013 2012

#### Revenue

**Revenue from exchange transactions**

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale of goods in agricultural activities</td>
<td>60 976 531</td>
<td>47 369 245</td>
</tr>
<tr>
<td>Rendering of services</td>
<td>256 880 907</td>
<td>228 329 079</td>
</tr>
<tr>
<td>Royalty income</td>
<td>6 301 335</td>
<td>9 754 560</td>
</tr>
<tr>
<td>Rental of facilities and equipment</td>
<td>9 220 422</td>
<td>9 011 735</td>
</tr>
<tr>
<td>Interest received</td>
<td>23 064 236</td>
<td>17 648 684</td>
</tr>
<tr>
<td>Dividends received</td>
<td>82 487</td>
<td>10 452</td>
</tr>
<tr>
<td><strong>Total revenue from exchange transactions</strong></td>
<td>356 525 918</td>
<td>312 123 755</td>
</tr>
</tbody>
</table>

**Revenue from non-exchange transactions**

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parliamentary grant</td>
<td>747 383 866</td>
<td>666 015 399</td>
</tr>
<tr>
<td><strong>Total revenue</strong></td>
<td>1 103 909 784</td>
<td>978 139 154</td>
</tr>
</tbody>
</table>

#### Expenditure

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td>(611 755 805)</td>
<td>(518 343 824)</td>
</tr>
<tr>
<td>Depreciation</td>
<td>(23 794 272)</td>
<td>(21 819 658)</td>
</tr>
<tr>
<td>Impairment deficit</td>
<td>(29 073 514)</td>
<td>(1 500 000)</td>
</tr>
<tr>
<td>Finance costs</td>
<td>(20 891)</td>
<td>(5 599)</td>
</tr>
<tr>
<td>Bad debts</td>
<td>(3 348 412)</td>
<td>(870 492)</td>
</tr>
<tr>
<td>Administrative expenses</td>
<td>(347 338 728)</td>
<td>(311 555 684)</td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td>(1 015 331 622)</td>
<td>(854 095 257)</td>
</tr>
</tbody>
</table>

**Total revenue**

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>1 103 909 784</td>
<td>978 139 154</td>
</tr>
<tr>
<td>Total expenditure</td>
<td>(1 015 331 622)</td>
<td>(854 095 257)</td>
</tr>
</tbody>
</table>

**Surplus for the year**

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surplus for the year</td>
<td>88 578 162</td>
<td>124 043 897</td>
</tr>
</tbody>
</table>
## Statement of Financial Position

**as at 31 March 2013**

<table>
<thead>
<tr>
<th></th>
<th>Note(s)</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current Assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventories</td>
<td>5</td>
<td>10 438 051</td>
<td>11 840 471</td>
</tr>
<tr>
<td>Trade and other receivables from exchange transactions</td>
<td>6</td>
<td>77 018 155</td>
<td>71 986 566</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>7</td>
<td>496 724 111</td>
<td>457 359 021</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>584 180 317</strong></td>
<td><strong>541 186 058</strong></td>
</tr>
<tr>
<td><strong>Non-Current Assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment land and buildings</td>
<td>8</td>
<td>783 606 153</td>
<td>728 771 849</td>
</tr>
<tr>
<td>Heritage assets</td>
<td>9</td>
<td>221 000</td>
<td>221 000</td>
</tr>
<tr>
<td>Investments</td>
<td>10</td>
<td>3 848 936</td>
<td>2 431 520</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>787 676 089</strong></td>
<td><strong>731 424 369</strong></td>
</tr>
<tr>
<td><strong>Non-current assets held for sale</strong></td>
<td>8</td>
<td>484 213</td>
<td>216 979</td>
</tr>
<tr>
<td><strong>Total Assets</strong></td>
<td></td>
<td><strong>1 372 340 619</strong></td>
<td><strong>1 272 827 406</strong></td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Current Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade and other payables from exchange transactions</td>
<td>11</td>
<td>226 668 153</td>
<td>358 125 158</td>
</tr>
<tr>
<td>VAT payable</td>
<td>12</td>
<td>13 983 556</td>
<td>11 221 584</td>
</tr>
<tr>
<td>Provisions</td>
<td>13</td>
<td>86 490 287</td>
<td>46 603 915</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>327 141 996</strong></td>
<td><strong>415 950 657</strong></td>
</tr>
<tr>
<td><strong>Non-Current Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees benefit obligation</td>
<td>14</td>
<td>20 682 000</td>
<td>27 302 000</td>
</tr>
<tr>
<td>Deferred Income: Parliamentary Grant</td>
<td>15</td>
<td>192 596 947</td>
<td>87 333 943</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>213 278 947</strong></td>
<td><strong>114 635 943</strong></td>
</tr>
<tr>
<td><strong>Non-Current Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Liabilities</td>
<td></td>
<td>213 278 947</td>
<td>114 635 943</td>
</tr>
<tr>
<td>Liabilities of disposal groups</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Liabilities</strong></td>
<td></td>
<td><strong>540 420 943</strong></td>
<td><strong>530 586 600</strong></td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td><strong>1 372 340 619</strong></td>
<td><strong>1 272 827 406</strong></td>
</tr>
<tr>
<td>Liabilities</td>
<td></td>
<td>(540 420 943)</td>
<td>(530 586 600)</td>
</tr>
<tr>
<td><strong>Net Assets</strong></td>
<td></td>
<td><strong>831 919 676</strong></td>
<td><strong>742 240 806</strong></td>
</tr>
<tr>
<td><strong>Net Assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Fund</td>
<td>16</td>
<td>109 593 403</td>
<td>108 905 191</td>
</tr>
<tr>
<td>Insurance reserve</td>
<td></td>
<td>2 368 421</td>
<td>2 368 421</td>
</tr>
<tr>
<td>Accumulated surplus</td>
<td>17</td>
<td>719 957 852</td>
<td>630 967 194</td>
</tr>
<tr>
<td><strong>Total Net Assets</strong></td>
<td></td>
<td><strong>831 919 676</strong></td>
<td><strong>742 240 806</strong></td>
</tr>
</tbody>
</table>
## Statement of Changes in Net Assets

for the year ending 31 March 2013

<table>
<thead>
<tr>
<th></th>
<th>Capital fund</th>
<th>Insurance reserve</th>
<th>Accumulated surplus</th>
<th>Total net assets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance at 01 April 2011</strong></td>
<td>108 905 191</td>
<td>2 368 421</td>
<td>506 923 297</td>
<td>618 196 909</td>
</tr>
<tr>
<td>Surplus for the year</td>
<td>-</td>
<td>-</td>
<td>124 043 897</td>
<td>124 043 897</td>
</tr>
<tr>
<td>Total changes</td>
<td>-</td>
<td>-</td>
<td>124 043 897</td>
<td>124 043 897</td>
</tr>
<tr>
<td><strong>Balance at 01 April 2012</strong></td>
<td>108 905 191</td>
<td>2 368 421</td>
<td>630 967 194</td>
<td>742 240 806</td>
</tr>
<tr>
<td>Land and buildings added to register</td>
<td>688 212</td>
<td>-</td>
<td>412 496</td>
<td>1 100 708</td>
</tr>
<tr>
<td>Net income (losses) recognised directly in net assets</td>
<td>688 212</td>
<td>-</td>
<td>412 496</td>
<td>1 100 708</td>
</tr>
<tr>
<td>Surplus for the year</td>
<td>-</td>
<td>-</td>
<td>88 578 162</td>
<td>88 578 162</td>
</tr>
<tr>
<td>Total recognised income and expenses for the year</td>
<td>688 212</td>
<td>-</td>
<td>88 990 658</td>
<td>89 678 870</td>
</tr>
<tr>
<td>Total changes</td>
<td>688 212</td>
<td>-</td>
<td>88 990 658</td>
<td>89 678 870</td>
</tr>
<tr>
<td><strong>Balance at 31 March 2013</strong></td>
<td>109 593 403</td>
<td>2 368 421</td>
<td>719 957 852</td>
<td>831 919 676</td>
</tr>
</tbody>
</table>
## Cash-flow Statement

**for the year ending 31 March 2013**

<table>
<thead>
<tr>
<th>Cash-flows from operating activities</th>
<th>Note(s)</th>
<th>2013</th>
<th>Restated 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receipts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sale of goods and services</td>
<td>23</td>
<td>173 735 183</td>
<td>461 551 369</td>
</tr>
<tr>
<td>Grants</td>
<td></td>
<td>876 908 772</td>
<td>709 875 399</td>
</tr>
<tr>
<td>Interest income</td>
<td></td>
<td>23 064 236</td>
<td>17 648 684</td>
</tr>
<tr>
<td>Dividends received</td>
<td></td>
<td>82 487</td>
<td>10 452</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>1 073 790 678</strong></td>
<td><strong>1 189 085 904</strong></td>
</tr>
<tr>
<td>Payments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee costs</td>
<td></td>
<td>(611 755 805)</td>
<td>(518 343 824)</td>
</tr>
<tr>
<td>Suppliers</td>
<td></td>
<td>(312 199 172)</td>
<td>(286 294 268)</td>
</tr>
<tr>
<td>Finance costs</td>
<td></td>
<td>(20 891)</td>
<td>(5 599)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>(923 975 868)</strong></td>
<td><strong>(804 643 691)</strong></td>
</tr>
<tr>
<td>Total receipts</td>
<td></td>
<td><strong>1 073 790 678</strong></td>
<td><strong>1 189 085 904</strong></td>
</tr>
<tr>
<td>Total payments</td>
<td></td>
<td><strong>(923 975 868)</strong></td>
<td><strong>(804 643 691)</strong></td>
</tr>
<tr>
<td>Net cash-flows from operating activities</td>
<td>22</td>
<td><strong>149 814 810</strong></td>
<td><strong>384 442 213</strong></td>
</tr>
</tbody>
</table>

| Cash-flows from investing activities|         |               |              |
| Purchase of equipment land and buildings | 8      | (110 990 060) | (90 531 434) |
| Proceeds from sale of equipment      |         | 540 340       | -            |
| Net cash-flows from investing activities |         | **(110 449 720)** | **(90 531 434)** |
| Net increase/(decrease) in cash and cash equivalents |         | **39 365 090** | **293 910 779** |
| Cash and cash equivalents at the beginning of the year |         | 457 359 021   | 163 448 242   |
| Cash and cash equivalents at the end of the year | 7       | **496 724 111** | **457 359 021** |
1. Basis of preparation

The annual financial statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practice (GRAP) including any interpretations, guidelines and directives issued by the Accounting Standards Board, Public Finance Management Act No.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 unless specified otherwise. They are presented in South African Rand.

1.1 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.

1.2 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. Property, plant and equipment 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:

<table>
<thead>
<tr>
<th>Item</th>
<th>Average useful life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>Not depreciated</td>
</tr>
<tr>
<td>Buildings</td>
<td>40-50 years</td>
</tr>
<tr>
<td>Machinery and farming equipment</td>
<td>15-20 years</td>
</tr>
<tr>
<td>Office furniture and equipment</td>
<td>5-10 years</td>
</tr>
<tr>
<td>Motor vehicles and aircrafts</td>
<td>4-7 years</td>
</tr>
<tr>
<td>Computer equipment</td>
<td>3-5 years</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>10-50 years</td>
</tr>
<tr>
<td>Laboratory equipment</td>
<td>15-20 years</td>
</tr>
</tbody>
</table>

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 property plant and equipment is derecognised on disposal or when no future economic benefits are expected from its use or disposal.

1.3 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 was made in accordance with its transitional provision and per directorate 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 9. The transitional provision expires on 2015/06/30. The ARC has provisionally measured the heritage asset at a value of R 221 000.

**1.4 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.

1.5 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.

1.6 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.

1.7 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.

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

1.9 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.

1.10 Revenue from exchange transactions

Revenue represents the grants from the Government as well as external earnings which comprise revenue from contracts, services rendered and excess farm produce sold.

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.

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.

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.

1.11 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.

To the extent that, at the beginning of the financial period, any cumulative unrecognised actuarial gain or loss exceeds ten percent of the greater of the present value of the projected benefit obligation and the fair value of the plan assets (the corridor), that portion is recognised in surplus or deficit over the expected average remaining service lives of participating employees. Actuarial gains or losses within the corridor are not recognised.

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.

Any asset resulting from 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.

1.12 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.

1.13 Research and development expenditure

Research costs are recognised as an expense when incurred. Development costs incurred will be capitalised when they satisfy the definition of an intangible asset as contemplated in GRAP 102 (Intangible Assets).

1.14 Financial instruments

Classification
The entity classifies financial assets and financial liabilities into the following categories:
- Financial assets at fair value through surplus or deficit - held for trading
- Held-to-maturity investment
- Loans and receivables
- Available-for-sale financial assets
- Financial liabilities at fair value through surplus or deficit - held for trading
- Financial liabilities measured 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.

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 assets designated as at FVTPL.

Financial assets at FVTSD
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 Entity 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 Entity’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, and IAS 39 (AC 133) Financial Instruments: Recognition and Measurement permits the entire combined contract (asset or liability) to be designated as at FVTPL.

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 24.

Available-for-sale financial assets

Unlisted shares and listed redeemable notes held by the Entity that are traded in an active market are classified as being AFS and are stated at fair value. Fair value is determined in the manner described in note 24. Gains and losses arising from changes in fair value are recognised directly in equity in the investments revaluation reserve with the exception of impairment losses, interest calculated using the effective interest method and foreign exchange gains and losses on monetary assets, which are recognised directly in surplus or deficit. Where the investment is disposed of or is determined to be impaired, the cumulative gain or loss previously recognised in the investments revaluation reserve is included in profit or loss for the period.

Dividends on AFS equity instruments are recognised in surplus or deficit when the Entity’s right to receive the dividends is established. The fair value of AFS monetary assets denominated in a foreign currency is determined in that foreign currency and translated at the spot rate at the statement of financial position date. The change in fair value attributable to translation differences that result from a change in amortised cost of the asset is recognised in surplus or deficit, and other changes are recognised in equity.

Loans and receivables

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as loans and receivables. Loans and receivables are subsequently measured at amortised cost using the effective interest method, less any impairment. Interest income is recognised by applying the effective interest rate, except for short-term receivables when the recognition of interest would be immaterial.

Impairment of financial assets

Financial assets, other than those at FVTPL and finance lease 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 asset, 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 credit period of 60 days, as well as observable changes in national or local economic conditions that correlate with default on receivables.
For financial assets 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 asset is reduced by the impairment loss directly for all financial assets 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 Entity 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 Entity neither transfers nor retains substantially all the risks and rewards of ownership and continues to control the transferred asset, the Entity recognises its retained interest in the asset and an associated liability for amounts it may have to pay. If the Entity retains substantially all the risks and rewards of ownership of a transferred financial asset, the Entity continues to recognise the financial asset and also recognises a collateralised borrowing for the proceeds received.

Financial liabilities
Financial liabilities are classified as either financial liabilities ‘at FVTSD’ or ‘other financial liabilities’.

Financial liabilities at FVTSD
Financial liabilities are classified as at FVTSD where the financial liability is either held for trading or it is designated as at FVTPL. A financial liability is classified as held for trading if:
- it has been incurred principally for the purpose of repurchasing in the near future; or
- it is a part of an identified portfolio of financial instruments that the Entity manages together and has a recent actual pattern of short-term profit-taking; or
- it is a derivative that is not designated but effective as a hedging instrument.

A financial liability other than a financial liability held for trading may be designated as at FVTSD upon initial recognition if:
- such designation eliminates or significantly reduces a measurement or recognition inconsistency that would otherwise arise; or
- the financial liability 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 Entity’s documented risk management or investment strategy, and information about the grouping is provided internally on that basis; or
- it forms part of a contract containing one or more embedded derivatives, and Financial Instruments: Recognition and Measurement permits the entire combined contract (asset or liability) to be designated as at FVTSD.

Financial liabilities 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 interest paid on the financial liability. Fair value is determined in the manner described in note 24.

1.15 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.

1.16 Borrowing costs
Borrowing costs directly attributable to the acquisition, construction or production of qualifying assets, which are assets that necessarily take a substantial period of time to get ready for their intended use or sale, are added to the cost of those assets, until such time as the assets are substantially ready for their intended use or sale.

To the extent that fixed rate borrowings are used to finance a qualifying asset and are hedged in
an effective fair value hedge of interest rate risk, the capitalised borrowing costs reflect the hedged interest rate.

Investment income earned on the temporary investment of specific borrowings pending their expenditure on qualifying assets is deducted from the borrowing costs eligible for capitalisation.

All other borrowing costs are recognised in the statement of financial performance in the period in which they are incurred.

1.17 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.

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.

Plant and equipment

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 estimaters between the periods where a sworn valuer is not used for valuation.

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.

1.19 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.

1.20 Related Parties

The Entity operates in an economic environment currently dominated by entities directly or indirectly owned by the South African Government. As a result of the constitutional independence of all three spheres of the South African Government, only parties within the national sphere of the South African Government will be considered to be related parties. The disclosure of transactions and balances shall be limited to the transaction/balances which were not entered into at arms length prices not entered into under normal trading terms.
2. New standards and interpretations

2.1 Standards and interpretations effective and adopted in the current year

In the current year, the entity has adopted the following standards and interpretations that are effective for the current financial year and that are relevant to its operations:

GRAP 103: Heritage Assets

Grap 103 defines heritage assets as assets which have a cultural, environmental, historical, natural, scientific, technological or artistic significance and are held indefinitely for the benefit of present and future generations.

Certain heritage assets are described as inalienable items thus assets which are retained indefinitely and cannot be disposed of without consent as required by law or otherwise.

A heritage asset should be recognised as an asset only if:

- it is probable that future economic benefits or service potential associated with the asset will to the entity; and
- the cost of fair value of the asset can be measured reliably.

The standard required judgment in applying the initial recognition criteria to the specific circumstances surrounding the entity and the assets.

Grap 103 states that a heritage asset should be measured at its cost unless it is acquired through a non-exchange transaction which should then be measured at its fair value as at the date of acquisition.

In terms of the standard, an entity has a choice between the cost and revaluation model as accounting policy for subsequent recognition and should apply the chosen policy to an entire class of heritage assets.

The cost model requires a class of heritage assets to be carried at its cost less any accumulated impairment losses.

GRAP 103 states that a heritage asset should not be depreciated but an entity should assess at each reporting date whether there is an indication that it may be impaired.

In terms of the standard, compensation from third parties for heritage assets that have been impaired, lost or given up, should be included in surplus or deficit when the compensation becomes receivable.

For a transfer from heritage assets carried at a revalued amount to property, plant and equipment, investment property, inventories or intangible assets, the asset's deemed cost for subsequent accounting should be its revalued amount at the date of transfer. The entity should treat any difference at that date between the carrying amount of the heritage asset and its fair value in the same way as a revaluation in accordance with this Standard. If an item of property, plant and equipment or an intangible asset carried at a revalued amount, or investment property carried at fair value is reclassified as a heritage asset carried at a revalued amount, the entity applies the applicable Standard of GRAP to that asset up to the date of change. The entity treats any difference at that date between the carrying amount of the asset and its fair value in accordance with the applicable Standard of GRAP relating to that asset.

For a transfer from investment property carried at fair value, or inventories to heritage assets at a revalued amount, any difference between the fair value of the asset at that date and its previous carrying amount should be recognised in surplus or deficit.

If a heritage asset's carrying amount is increased as a result of a revaluation, the increase should be credited directly to a revaluation surplus. However, the increase should be 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 should be recognised in surplus or deficit. However, the decrease should be debited directly to a revaluation surplus to the extent of any credit balance existing in the revaluation surplus in respect of that heritage asset.
The carrying amount of a heritage asset should be derecognised:
- 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 should be 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.

The effective date of the standard is for years beginning on or after 01 April 2012.

The entity has adopted the standard for the first time in the 2013 annual financial statements.

**GRAP 104: Financial Instruments**

The standard prescribes recognition, measurement, presentation and disclosure requirements for financial instruments. Financial instruments are defined as those contracts that result in a financial asset in one entity and a financial liability or residual interest in another entity. A key distinguishing factor between financial assets and financial liabilities and other assets and liabilities, is that they are settled in cash or by exchanging financial instruments rather than through the provision of goods or services.

One of the key considerations in initially recognising financial instruments is the distinction, by the issuers of those instruments, between financial assets, financial liabilities and residual interests. Financial assets and financial liabilities are distinguished from residual interests because they involve a contractual right or obligation to receive or pay cash or another financial instrument. Residual interests entitle an entity to a portion of another entity’s net assets in the event of liquidation and, to dividends or similar distributions paid at management’s discretion.

In determining whether a financial instrument is a financial asset, financial liability or a residual interest, an entity considers the substance of the contract and not just the legal form.

Where a single instrument contains both a liability and a residual interest component, the issuer allocates the instrument into its component parts. The issuer recognises the liability component at its fair value and recognises the residual interest as the difference between the carrying amount of the instrument and the fair value of the liability component. No gain or loss is recognised by separating the instrument into its component parts.

Financial assets and financial liabilities are initially recognised at fair value. Where an entity subsequently measures financial assets and financial liabilities at amortised cost or cost, transactions costs are included in the cost of the asset or liability.

The transaction price usually equals the fair value at initial recognition, except in certain circumstances, for example, where interest free credit is granted or where credit is granted at a below market rate of interest.

Concessionary loans are loans either received by or granted to another entity on concessionary terms, e.g. at low interest rates and flexible repayment terms. On initial recognition, the fair value of a concessionary loan is the present value of the agreed contractual cash-flows, discounted using a market related rate of interest for a similar transaction. The difference between the proceeds either received or paid and the present value of the contractual cash-flows is accounted for as non-exchange revenue by the recipient of a concessionary loan in accordance with Standard of GRAP on Revenue from Non-exchange Revenue Transactions (Taxes and Transfers), and using the Framework for the Preparation and Presentation of Financial Statements (usually as an expense) by the grantor of the loan.

Financial assets and financial liabilities are subsequently measured either at fair value or, amortised cost or cost. An entity measures a financial instrument at fair value if it is:
- a derivative;
- a combined instrument designated at fair value, i.e. an instrument that includes a derivative and a non-derivative host contract;
- held-for-trading;
- a non-derivative instrument with fixed or determinable payments that is designated at initial recognition to be measured at fair value;
- an investment in a residual interest for which fair value can be measured reliably; and
- other instruments that do not meet the definition of financial instruments at amortised cost or cost.

Derivatives are measured at fair value. Combined instruments that include a derivative and non-derivative host contract are accounted for as follows:
- Where an embedded derivative is included in a host contract which is a financial instrument within the scope of this Standard, an entity can designate the entire contract to be measured at fair value or, it can account for the host contract and embedded derivative separately.
using GRAP 104. An entity is however required to measure the entire instrument at fair value if the fair value of the derivative cannot be measured reliably.

- Where the host contract is not a financial instrument within the scope of this Standard, the host contract and embedded derivative are accounted for separately using GRAP 104 and the relevant Standard of GRAP.

Financial assets and financial liabilities that are non-derivative instruments with fixed or determinable payments, for example deposits with banks, receivables and payables, are measured at amortised cost. At initial recognition, an entity can however designate such an instrument to be measured at fair value.

An entity can only measure investments in residual interests at cost where the fair value of the interest cannot be determined reliably.

Once an entity has classified a financial asset or a financial liability either at fair value or amortised cost or cost, it is only allowed to reclassify such instruments in limited instances.

An entity derecognises a financial asset, or the specifically identified cash-flows of an asset, when:
- the cash-flows from the asset expire, are settled or waived;
- significant risks and rewards are transferred to another party; or
- despite having retained significant risks and rewards, an entity has transferred control of the asset to another entity.

An entity derecognises a financial liability when the obligation is extinguished. Exchanges of debt instruments between a borrower and a lender are treated as the extinguishment of an existing liability and the recognition of a new financial liability. Where an entity modifies the term of an existing financial liability, it is also treated as the extinguishment of an existing liability and the recognition of a new liability.

An entity cannot offset financial assets and financial liabilities in the statement of financial position unless a legal right of set-off exists, and the parties intend to settle on a net basis.

GRAP 104 requires extensive disclosures on the significance of financial instruments for an entity’s statement of financial position and statement of financial performance, as well as the nature and extent of the risks that an entity is exposed to as a result of its annual financial statements. Some disclosures, for example the disclosure of fair values for instruments measured at amortised cost or cost and the preparation of a sensitivity analysis, are encouraged rather than required.

GRAP 104 does not prescribe principles for hedge accounting. An entity is permitted to apply hedge accounting, as long as the principles in IAS 39 are applied.

The entity has adopted the standard for the first time in the 2013 annual financial statements.
2.2 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 2013 or later periods:

<table>
<thead>
<tr>
<th>Standard/interpretation:</th>
<th>Effective date:</th>
<th>Expected impact:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAp 18: Segment Reporting</td>
<td>01 April 2013</td>
<td>Segment disclosure in the notes</td>
</tr>
<tr>
<td>GRAp 25: Employee benefits</td>
<td>01 April 2013</td>
<td>Corridor limit will not apply on employee benefit valuations. The employee costs may increase or decrease when valuation is performed.</td>
</tr>
<tr>
<td>GRAp 105: Transfers of functions between entities under common control</td>
<td>01 April 2014</td>
<td>None</td>
</tr>
<tr>
<td>GRAp 106: Transfers of functions between entities not under common control</td>
<td>01 April 2014</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 107: Mergers</td>
<td>01 April 2014</td>
<td>None</td>
</tr>
<tr>
<td>GRAp 20: Related parties</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>IGRAp 11: Consolidation - Special purpose entities</td>
<td>01 April 2014</td>
<td>None</td>
</tr>
<tr>
<td>IGRAp 12: Jointly controlled entities - Non-monetary contributions by ventures</td>
<td>01 April 2014</td>
<td>None</td>
</tr>
<tr>
<td>GRAp 6 (as revised 2010): Consolidated and Separate Financial Statements</td>
<td>01 April 2014</td>
<td>None</td>
</tr>
<tr>
<td>GRAp 7 (as revised 2010): Investments in Associates</td>
<td>01 April 2014</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 8 (as revised 2010): Interests in Joint Ventures</td>
<td>01 April 2014</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 1 (as revised 2012): Presentation of Financial Statements</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 3 (as revised 2012): Accounting Policies, Change in Accounting Estimates and Errors</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 7 (as revised 2012): Investments in Associates</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 9 (as revised 2012): Revenue from Exchange Transactions</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 12 (as revised 2012): Inventories</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 13 (as revised 2012): Leases</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 16 (as revised 2012): Investment Property</td>
<td>01 April 2013</td>
<td>None</td>
</tr>
<tr>
<td>GRAp 17 (as revised 2012): Property, Plant and Equipment</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 27 (as revised 2012): Agriculture (Replaces GRAp 101 )</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>GRAp 31 (as revised 2012): Intangible Assets (Replaces GRAp 102)</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
<tr>
<td>IGRAP16: Intangible assets website costs</td>
<td>01 April 2013</td>
<td>Immaterial</td>
</tr>
</tbody>
</table>

The aggregate impact of the initial application of the statements and interpretations on the entity’s annual financial statements is expected to be immaterial.
3. Revenue

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale of goods in Agricultural activities</td>
<td>60 976 531</td>
<td>47 369 245</td>
</tr>
<tr>
<td>Rendering of services</td>
<td>256 880 907</td>
<td>228 329 079</td>
</tr>
<tr>
<td>Royalty income</td>
<td>6 301 335</td>
<td>9 754 560</td>
</tr>
<tr>
<td>Rental of facilities and equipment</td>
<td>9 220 422</td>
<td>9 011 735</td>
</tr>
<tr>
<td>Interest received</td>
<td>23 064 236</td>
<td>17 648 684</td>
</tr>
<tr>
<td>Dividends received</td>
<td>82 487</td>
<td>10 452</td>
</tr>
<tr>
<td>Parliamentary grant - non exchange transactions</td>
<td>747 383 866</td>
<td>666 015 399</td>
</tr>
<tr>
<td></td>
<td>1 103 909 784</td>
<td>978 139 154</td>
</tr>
</tbody>
</table>

The amount included in revenue arising from exchanges of goods or services are as follows:

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale of goods in agricultural activities</td>
<td>60 976 531</td>
<td>47 369 245</td>
</tr>
<tr>
<td>Rendering of services</td>
<td>256 880 907</td>
<td>228 329 079</td>
</tr>
<tr>
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<td>6 301 335</td>
<td>9 754 560</td>
</tr>
<tr>
<td>Rental of facilities and equipment</td>
<td>9 220 422</td>
<td>9 011 735</td>
</tr>
<tr>
<td>Interest received</td>
<td>23 064 236</td>
<td>17 648 684</td>
</tr>
<tr>
<td>Dividends received</td>
<td>82 487</td>
<td>10 452</td>
</tr>
<tr>
<td></td>
<td>356 525 918</td>
<td>312 123 755</td>
</tr>
</tbody>
</table>

The amount included in revenue arising from non-exchange transactions is as follows:

**Transfer revenue**

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parliamentary grant</td>
<td>747 383 866</td>
<td>666 015 399</td>
</tr>
</tbody>
</table>

(a) Parliamentary grant

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant received during the financial year</td>
<td>876 908 772</td>
<td>709 875 399</td>
</tr>
<tr>
<td>Allocated portion of deferred capital/ revenue grant (Note 15)</td>
<td>(105 263 004)</td>
<td>(43 860 000)</td>
</tr>
<tr>
<td>Allocated to income received in advance</td>
<td>(24 261 902)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>747 383 866</td>
<td>666 015 399</td>
</tr>
</tbody>
</table>

(b) External earnings

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross revenue</td>
<td>479 687 796</td>
<td>593 832 561</td>
</tr>
<tr>
<td>Less: Received in advance (note 11)</td>
<td>(146 308 601)</td>
<td>(299 367 942)</td>
</tr>
<tr>
<td></td>
<td>333 379 195</td>
<td>294 464 619</td>
</tr>
</tbody>
</table>

The external earnings arise from exchange transactions on research projects performed on behalf of Government departments, industry partners and private customers.
4. Operating surplus

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

Remuneration, other than to employees, for:

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Council fees (Note 21)</td>
<td>527,462</td>
<td>625,469</td>
</tr>
<tr>
<td>Auditors</td>
<td>4,258,943</td>
<td>3,862,874</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,786,405</td>
<td>4,488,343</td>
</tr>
</tbody>
</table>

Operating lease charges

Premises

Motor vehicles

Equipment

**Total** operating lease charges: 14,540,405 (2013), 16,328,570 (2012)


Movement in the provision for bad debts: (1,780,746) (2013), (1,140,060) (2012)

Profit or loss on foreign exchange: 10,512 (2013), 42,359 (2012)

Impairment on property, plant and equipment: 29,073,514 (2013), 1,500,000 (2012)


5. Inventories

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in progress</td>
<td>160,820</td>
<td>22,263,411</td>
</tr>
<tr>
<td>Finished goods</td>
<td>10,277,231</td>
<td>608,044</td>
</tr>
<tr>
<td>Inventories write up/(write-downs)</td>
<td>-</td>
<td>9,793</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10,438,051</td>
<td>11,840,471</td>
</tr>
</tbody>
</table>
6. Trade and other receivables from exchange transactions

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade debtors</td>
<td>57 450 686</td>
<td>37 053 532</td>
</tr>
<tr>
<td>Other debtors</td>
<td>23 710 977</td>
<td>37 523 460</td>
</tr>
<tr>
<td>Provision for bad debts</td>
<td>(5 656 193)</td>
<td>(3 875 447)</td>
</tr>
<tr>
<td>Staff debtors</td>
<td>1 038 641</td>
<td>851 331</td>
</tr>
<tr>
<td>Deposits</td>
<td>474 044</td>
<td>433 690</td>
</tr>
<tr>
<td></td>
<td>77 018 155</td>
<td>71 986 566</td>
</tr>
</tbody>
</table>

Trade receivables are interest bearing and are generally on 30 days’ terms. Trade receivables are stated at amortised cost.

Of the receivables balance at the end of the year, R 16.8 million is due from the largest customer and R 8.8 million is due from second largest customer. There are no other customers who represent more than 5% of the total balance of trade receivables.

Trade and other receivables past due but not impaired

The ageing of amounts past due but not impaired relate to debtors balances outstanding for more than 30 days.

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>20 476 663</td>
<td>18 092 450</td>
</tr>
<tr>
<td>30 to 59 days</td>
<td>19 339 756</td>
<td>4 023 099</td>
</tr>
<tr>
<td>60 to 89 days</td>
<td>599 480</td>
<td>701 674</td>
</tr>
<tr>
<td>90 to 119 days</td>
<td>246 773</td>
<td>573 156</td>
</tr>
<tr>
<td>120 to 149 days</td>
<td>4 925 455</td>
<td>2 790 837</td>
</tr>
<tr>
<td>150+ days</td>
<td>6 206 366</td>
<td>6 996 869</td>
</tr>
<tr>
<td>Balance at the end of the year</td>
<td>51 794 493</td>
<td>33 178 085</td>
</tr>
</tbody>
</table>

Reconciliation of provision of impairment of trade and other receivables

As at 31 March 2013, receivables at nominal value of R 5 656 193 (2012: R 3 875 447) 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:

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening balance</td>
<td>3 875 447</td>
<td>5 015 507</td>
</tr>
<tr>
<td>Raised during the year</td>
<td>2 876 430</td>
<td>-</td>
</tr>
<tr>
<td>Utilised during the year</td>
<td>(1 095 684)</td>
<td>(1 140 060)</td>
</tr>
<tr>
<td>Balance at the end of the year</td>
<td>5 656 193</td>
<td>3 875 447</td>
</tr>
</tbody>
</table>

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.
7. Cash and cash equivalents

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash on hand</td>
<td>92 821 130</td>
<td>55 156 069</td>
</tr>
<tr>
<td>Short-term bank deposits</td>
<td>403 902 981</td>
<td>402 202 952</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>496 724 111</td>
<td>457 359 021</td>
</tr>
</tbody>
</table>

Cash and cash equivalents consist of cash on hand and balances with banks and investments in money market instruments. Included in the 2012 balance is an amount of R 210 144 886 held as an agent on behalf of a third party. Cash and cash equivalents included in the cash-flow statement is made as follows:

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash on hand</td>
<td>92 821 130</td>
<td>55 156 069</td>
</tr>
<tr>
<td>Short-term bank deposits</td>
<td>403 902 981</td>
<td>402 202 952</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>496 724 111</td>
<td>457 359 021</td>
</tr>
</tbody>
</table>

8. Equipment land and buildings

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost / Valuation</td>
<td>Accumulated depreciation and accumulated impairment</td>
</tr>
<tr>
<td>Land</td>
<td>117 648 063</td>
<td>(5 012 085)</td>
</tr>
<tr>
<td>Buildings</td>
<td>473 485 420</td>
<td>(117 323 476)</td>
</tr>
<tr>
<td>Leasehold property</td>
<td>250 450</td>
<td>(247 946)</td>
</tr>
<tr>
<td>Machinery and Farming Equipment</td>
<td>73 218 041</td>
<td>(27 753 866)</td>
</tr>
<tr>
<td>Motor vehicles and aircraft</td>
<td>54 457 753</td>
<td>(30 260 235)</td>
</tr>
<tr>
<td>Office equipment</td>
<td>32 743 447</td>
<td>(23 683 356)</td>
</tr>
<tr>
<td>Computer equipment</td>
<td>58 108 278</td>
<td>(34 700 425)</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>14 435 052</td>
<td>(1 278 468)</td>
</tr>
<tr>
<td>Laboratory equipment</td>
<td>234 212 486</td>
<td>(74 512 486)</td>
</tr>
<tr>
<td>Assets under construction</td>
<td>39 819 506</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1 098 378 496</strong></td>
<td>(314 772 343)</td>
</tr>
</tbody>
</table>
Reconciliation of equipment land and buildings - 2013

<table>
<thead>
<tr>
<th></th>
<th>Opening balance</th>
<th>Additions</th>
<th>Write off</th>
<th>Re-classification to held for sale</th>
<th>Added to register</th>
<th>Re-classification</th>
<th>Depreciation</th>
<th>Impairment deficit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>116 959 851</td>
<td>-</td>
<td>-</td>
<td>688 212</td>
<td>-</td>
<td>-</td>
<td>(5 012 085)</td>
<td>112 635 978</td>
<td></td>
</tr>
<tr>
<td>Buildings</td>
<td>373 637 824</td>
<td>7 176 417</td>
<td>(553 563)</td>
<td>412 496</td>
<td>-</td>
<td>(548 809)</td>
<td>(23 962 421)</td>
<td>356 161 944</td>
<td></td>
</tr>
<tr>
<td>Leasehold property</td>
<td>2 504</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 504</td>
</tr>
<tr>
<td>Machinery and Farming Equipment</td>
<td>44 194 689</td>
<td>4 601 964</td>
<td>(2 727 676)</td>
<td>-</td>
<td>2 821 559</td>
<td>(3 371 896)</td>
<td>-</td>
<td>45 464 175</td>
<td></td>
</tr>
<tr>
<td>Motor vehicles and aircraft</td>
<td>12 514 586</td>
<td>15 918 524</td>
<td>(198 495)</td>
<td>(280 128)</td>
<td>-</td>
<td>(3 756 969)</td>
<td>-</td>
<td>24 197 518</td>
<td></td>
</tr>
<tr>
<td>Office equipment</td>
<td>9 238 942</td>
<td>1 826 383</td>
<td>(9 142)</td>
<td>(53 507)</td>
<td>-</td>
<td>172 927</td>
<td>(2 115 512)</td>
<td>-</td>
<td>9 060 091</td>
</tr>
<tr>
<td>Computer equipment</td>
<td>10 958 122</td>
<td>15 855 156</td>
<td>(56 489)</td>
<td>(8 018)</td>
<td>-</td>
<td>(3 241 910)</td>
<td>(99 008)</td>
<td>23 407 853</td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td>7 296 473</td>
<td>4 304 978</td>
<td>(12 049)</td>
<td>-</td>
<td>2 168 739</td>
<td>(601 557)</td>
<td>-</td>
<td>13 156 584</td>
<td></td>
</tr>
<tr>
<td>Laboratory equipment</td>
<td>135 075 997</td>
<td>35 216 768</td>
<td>(347 051)</td>
<td>(88 095)</td>
<td>-</td>
<td>(10 157 619)</td>
<td>-</td>
<td>159 700 000</td>
<td></td>
</tr>
<tr>
<td>Assets under construction</td>
<td>18 892 861</td>
<td>26 089 870</td>
<td>-</td>
<td>(5 163 225)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>39 819 506</td>
<td></td>
</tr>
</tbody>
</table>

728 771 849 110 990 060 (3 904 465) (484 213) 1 100 708 - (23 794 272) (29 073 514) 783 606 153

Reconciliation of equipment land and buildings - 2012

<table>
<thead>
<tr>
<th></th>
<th>Opening balance</th>
<th>Additions</th>
<th>Write off</th>
<th>Re-classification</th>
<th>Depreciation</th>
<th>Impairment</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>117 562 321</td>
<td>-</td>
<td>-</td>
<td>(602 470)</td>
<td>-</td>
<td>-</td>
<td>116 959 851</td>
</tr>
<tr>
<td>Buildings</td>
<td>365 781 222</td>
<td>8 271 744</td>
<td>-</td>
<td>2 064 195</td>
<td>(979 337)</td>
<td>(1 500 000)</td>
<td>373 637 824</td>
</tr>
<tr>
<td>Leasehold property</td>
<td>-</td>
<td>95 484</td>
<td>-</td>
<td>-</td>
<td>(92 980)</td>
<td>-</td>
<td>2 504</td>
</tr>
<tr>
<td>Machinery and Farming Equipment</td>
<td>35 438 782</td>
<td>12 071 177</td>
<td>(219 957)</td>
<td>(67 989)</td>
<td>(3 027 324)</td>
<td>-</td>
<td>44 194 689</td>
</tr>
<tr>
<td>Motor vehicles and aircraft</td>
<td>7 116 465</td>
<td>8 357 293</td>
<td>(169 235)</td>
<td>(24 071)</td>
<td>(2 765 866)</td>
<td>-</td>
<td>12 514 586</td>
</tr>
<tr>
<td>Office equipment</td>
<td>9 475 446</td>
<td>5 193 912</td>
<td>(402 966)</td>
<td>(2 755 182)</td>
<td>(2 272 268)</td>
<td>-</td>
<td>9 238 942</td>
</tr>
<tr>
<td>Computer equipment</td>
<td>9 124 422</td>
<td>6 000 734</td>
<td>(940 772)</td>
<td>(6 737)</td>
<td>(3 219 525)</td>
<td>-</td>
<td>10 958 122</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>3 761 468</td>
<td>2 917 835</td>
<td>(129 392)</td>
<td>1 271 944</td>
<td>(525 382)</td>
<td>-</td>
<td>7 296 473</td>
</tr>
<tr>
<td>Laboratory equipment</td>
<td>112 056 049</td>
<td>34 234 101</td>
<td>(2 180 508)</td>
<td>(96 669)</td>
<td>(8 936 976)</td>
<td>-</td>
<td>135 075 997</td>
</tr>
<tr>
<td>Assets under construction</td>
<td>5 503 707</td>
<td>13 389 154</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>18 892 861</td>
</tr>
</tbody>
</table>

665 819 882 90 531 434 (4 042 830) (216 979) (21 819 658) (1 500 000) 728 771 849

The ARC has reclassified its assets under construction as a separate asset class in this note. The assets under construction were in the previous year included in machinery and farming equipment for ease of reconciliation. The balance has increased significantly which warranted a split to the different asset categories. The non current assets held for sale are fixed assets that have been retired from active use and are expected to be disposed of with the next financial year.
8. Equipment land and buildings (continued)

Other information

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property, plant and equipment fully depreciated and still in use (Gross carrying amount)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab equipment</td>
<td>11,467</td>
<td>1,951</td>
</tr>
<tr>
<td>Vehicles</td>
<td>562</td>
<td>481</td>
</tr>
<tr>
<td>Computer equipment</td>
<td>3,932</td>
<td>971</td>
</tr>
<tr>
<td>Office Furniture and Equipment</td>
<td>36,539</td>
<td>1,950</td>
</tr>
<tr>
<td>Machinery and Farming equipment</td>
<td>4,388</td>
<td>591</td>
</tr>
<tr>
<td>Equipment Infrastructure</td>
<td>10</td>
<td>7,174</td>
</tr>
<tr>
<td>Components to buildings</td>
<td>900</td>
<td>2,539</td>
</tr>
<tr>
<td></td>
<td>57,798</td>
<td>15,657</td>
</tr>
</tbody>
</table>

| Property, plant and equipment retired from active use and held for disposal (Carrying amount) |          |          |
| Lab Equipment                   | 88,094   | 96,669   |
| Vehicles                        | 280,128  | 24,071   |
| Computer equipment              | 8,018    | 6,737    |
| Office Furniture and Equipment  | 53,507   | 21,490   |
| Machinery and Farming Equipment | 54,466   | 67,989   |
| Infrastructure                  | -        | 23       |
|                                | 484,213  | 216,979  |

In the prior year fully depreciated assets still in use were disclosed at cost, in 2013 they are disclosed at carrying amount.
## Reconciliation of Work-in-Progress 2013

<table>
<thead>
<tr>
<th>Assets under construction</th>
<th>Buildings</th>
<th>Lab equipment</th>
<th>Computer Equipment</th>
<th>Infrastructure</th>
<th>Other PPE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening</td>
<td>5 821 559</td>
<td>5 503 707</td>
<td>5 384 210</td>
<td>2 168 739</td>
<td>14 646</td>
<td>18 892 861</td>
</tr>
<tr>
<td>Additions</td>
<td>2 384 839</td>
<td>11 137 561</td>
<td>8 870 375</td>
<td>3 437 467</td>
<td>259 627</td>
<td>26 089 869</td>
</tr>
<tr>
<td>Subtotal</td>
<td>8 206 398</td>
<td>16 641 268</td>
<td>14 254 585</td>
<td>5 606 206</td>
<td>274 273</td>
<td>44 982 730</td>
</tr>
<tr>
<td>Transfers to complete items</td>
<td>(2 821 559)</td>
<td>-</td>
<td>-</td>
<td>(2 168 738)</td>
<td>(172 927)</td>
<td>(5 163 224)</td>
</tr>
<tr>
<td></td>
<td>5 384 839</td>
<td>16 641 268</td>
<td>14 254 585</td>
<td>3 437 468</td>
<td>101 346</td>
<td>39 819 506</td>
</tr>
</tbody>
</table>

## Reconciliation of Work-in-Progress 2012

<table>
<thead>
<tr>
<th>Assets under construction</th>
<th>Buildings</th>
<th>Lab equipment</th>
<th>Computer Equipment</th>
<th>Infrastructure</th>
<th>Other PPE</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening Balance</td>
<td>-</td>
<td>5 503 707</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 503 707</td>
</tr>
<tr>
<td>Additions</td>
<td>7 283 284</td>
<td>-</td>
<td>5 384 210</td>
<td>3 440 706</td>
<td>2 748 338</td>
<td>18 856 538</td>
</tr>
<tr>
<td>Subtotal</td>
<td>7 283 284</td>
<td>5 503 707</td>
<td>5 384 210</td>
<td>3 440 706</td>
<td>2 748 338</td>
<td>24 360 245</td>
</tr>
<tr>
<td>Transfers to complete items</td>
<td>(1 461 725)</td>
<td>-</td>
<td>-</td>
<td>(1 271 967)</td>
<td>(2 733 692)</td>
<td>(5 467 384)</td>
</tr>
<tr>
<td></td>
<td>5 821 559</td>
<td>5 503 707</td>
<td>5 384 210</td>
<td>2 168 739</td>
<td>14 646</td>
<td>18 892 861</td>
</tr>
</tbody>
</table>

## 9. Heritage assets

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost / Valuation</td>
<td>Accumulated impairment losses</td>
</tr>
<tr>
<td>Historical buildings</td>
<td>221 000</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Opening balance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical buildings</td>
<td>221 000</td>
<td>221 000</td>
</tr>
</tbody>
</table>

**Reconciliation of heritage assets 2013**

Historical buildings 221 000 221 000

**Reconciliation of heritage assets 2012**

Historical buildings 221 000 221 000

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.
## 10. Investments

Listed are held at fair value through surplus or deficit and unlisted at cost due to a reliable fair value not being determined.

<table>
<thead>
<tr>
<th>Company</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capevin (KWV unbundling)</td>
<td>3 139 015</td>
<td>2 141 221</td>
</tr>
<tr>
<td>KWV Holdings LTD (KWV unbundling)</td>
<td>464 473</td>
<td>17 973</td>
</tr>
<tr>
<td>51 041 shares market price R 9.10 (2012: 2 054 shares at R 8.75)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>De Dooms Winery</td>
<td>5 434</td>
<td>5 434</td>
</tr>
<tr>
<td>9 880 shares at R 0.55 (2012: 9 880 shares at R 0.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutzville 2009 Co-operative Limited</td>
<td>1 070</td>
<td>1 070</td>
</tr>
<tr>
<td>107 000 shares at R0.01each (2012: 107 000 shares at R0.01 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burpak Limited</td>
<td>1 948</td>
<td>1 948</td>
</tr>
<tr>
<td>1 948 shares at R1.00 each (2012: 1 948 shares at R1.00 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lango Co-operative Limited</td>
<td>-</td>
<td>2 997</td>
</tr>
<tr>
<td>Lutzville Vineyard Co-operative</td>
<td>44 867</td>
<td>44 867</td>
</tr>
<tr>
<td>44 867 shares at R 1.00 each (2012: 44 867 shares at R1.00 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutzville Vineyard Co-operative</td>
<td>10 700</td>
<td>10 700</td>
</tr>
<tr>
<td>1 070 000 shares at R0.01each (2012: 1 070 000 shares at R0.01 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lutzville Vineyard Co - Operative</td>
<td>-</td>
<td>23 881</td>
</tr>
<tr>
<td>Hex Valley Coolrooms</td>
<td>8 046</td>
<td>8 046</td>
</tr>
<tr>
<td>16 092 shares at R 0.50 each (2012: 16 092 shares at R0.50 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McGregor Co-operative Limited</td>
<td>152 320</td>
<td>152 320</td>
</tr>
<tr>
<td>152 320 shares at R1.00 each (2012: 152 320 shares at R 1.00 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lanko Co-operative Limited</td>
<td>21 063</td>
<td>21 063</td>
</tr>
<tr>
<td>21 063 shares at R 1.00 each (2012: 21 063 shares at R 1.00 each)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3 848 936</strong></td>
<td><strong>2 431 520</strong></td>
</tr>
</tbody>
</table>
Notes to the Annual Financial Statements (continued)
for the year ending 31 March 2013

11. Trade and other payables from exchange transactions

<table>
<thead>
<tr>
<th>Payables ageing</th>
<th>Amount due</th>
<th>Amount due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade payables</td>
<td>43 800 478</td>
<td>26 184 393</td>
</tr>
<tr>
<td>Payments received in advanced - contract in process</td>
<td>146 308 601</td>
<td>299 367 942</td>
</tr>
<tr>
<td>Other payables</td>
<td>36 559 074</td>
<td>32 572 823</td>
</tr>
<tr>
<td></td>
<td>226 668 153</td>
<td>358 125 158</td>
</tr>
</tbody>
</table>

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

Ageing of trade payables started in 2013 financial year. There are no ageing values for 2012 financial year.

<table>
<thead>
<tr>
<th>Payables ageing</th>
<th>Amount due</th>
<th>Amount due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>36 633 164</td>
<td>-</td>
</tr>
<tr>
<td>Up to 60 days</td>
<td>4 091 981</td>
<td>-</td>
</tr>
<tr>
<td>61-90 days</td>
<td>2 035 185</td>
<td>-</td>
</tr>
<tr>
<td>91-120 days</td>
<td>125 168</td>
<td>-</td>
</tr>
<tr>
<td>121-150 days</td>
<td>20 991</td>
<td>-</td>
</tr>
<tr>
<td>150 days +</td>
<td>893 989</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>43 800 478</td>
<td>-</td>
</tr>
</tbody>
</table>

12. VAT payable

<table>
<thead>
<tr>
<th>VAT payable</th>
<th>Amount due</th>
<th>Amount due</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAT payable</td>
<td>13 983 556</td>
<td>11 221 584</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reconciliation of provisions - 2013</th>
<th>Opening Balance</th>
<th>Additions</th>
<th>Utilised during the year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave accrual</td>
<td>46 603 915</td>
<td>12 247 950</td>
<td>(7 861 578)</td>
<td>50 990 287</td>
</tr>
<tr>
<td>Bonus provision</td>
<td>-</td>
<td>35 500 000</td>
<td>-</td>
<td>35 500 000</td>
</tr>
<tr>
<td></td>
<td>46 603 915</td>
<td>47 747 950</td>
<td>(7 861 578)</td>
<td>86 490 287</td>
</tr>
</tbody>
</table>

Reconciliation of provisions - 2012

<table>
<thead>
<tr>
<th>Reconciliation of provisions - 2012</th>
<th>Opening Balance</th>
<th>Additions</th>
<th>Utilised during the year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave accrual</td>
<td>53 950 195</td>
<td>5 549 221</td>
<td>(12 895 501)</td>
<td>46 603 915</td>
</tr>
<tr>
<td>Bonus provision</td>
<td>15 000 000</td>
<td>-</td>
<td>(15 000 000)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>68 950 195</td>
<td>5 549 221</td>
<td>(27 895 501)</td>
<td>46 603 915</td>
</tr>
</tbody>
</table>

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.

14. 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% (2012: 1.00%) of the employees whilst 99.0% (2012: 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 2012. No material transactions or other material changes in circumstances have occurred since the valuation date necessitating additional bridging valuations.
Notes to the Annual Financial Statements (continued)

for the year ending 31 March 2013

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

<table>
<thead>
<tr>
<th>Working members</th>
<th>Employer contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
</tr>
<tr>
<td>ARC Pension Fund (Options A to C)</td>
<td>15</td>
</tr>
</tbody>
</table>

Employer contribution for the next financial year are estimated at R 300 000. Estimates were made by the actuary based on the actuarial valuation as at 31 March 2013.

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

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-retirement discount rate</td>
<td>8,4</td>
<td>9</td>
</tr>
<tr>
<td>Post-retirement discount rate</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Expected real after-tax return on fund’s assets</td>
<td>8,4</td>
<td>9</td>
</tr>
<tr>
<td>Future general and merit salary increases</td>
<td>7,3</td>
<td>7</td>
</tr>
<tr>
<td>Expected rate of return on assets</td>
<td>8,4</td>
<td>10</td>
</tr>
</tbody>
</table>

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.

The following table summarises the components of the benefit:

<table>
<thead>
<tr>
<th>Net benefit gain</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current service cost</td>
<td>(772 000)</td>
<td>(614 000)</td>
</tr>
<tr>
<td>Interest on the benefit obligation</td>
<td>(2 650 000)</td>
<td>(2 178 000)</td>
</tr>
<tr>
<td>Expected return on plan assets</td>
<td>3 968 000</td>
<td>4 076 000</td>
</tr>
<tr>
<td>Amortisation</td>
<td>3 730 000</td>
<td>(2 646 000)</td>
</tr>
<tr>
<td><strong>Net benefit (loss)/gain</strong></td>
<td><strong>4 276 000</strong></td>
<td><strong>(1 362 000)</strong></td>
</tr>
</tbody>
</table>

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 a insignificant change in the plan assets.
### Reconciliation of plan assets

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair value at beginning of the year</td>
<td>43 748 000</td>
<td>40 475 000</td>
</tr>
<tr>
<td>Expected Return on Assets</td>
<td>3 968 000</td>
<td>4 076 000</td>
</tr>
<tr>
<td>Member contributions</td>
<td>198 000</td>
<td>216 000</td>
</tr>
<tr>
<td>Risk Premiums</td>
<td>(213 000)</td>
<td>(106 000)</td>
</tr>
<tr>
<td>Benefits paid</td>
<td>(867 000)</td>
<td>(1 160 000)</td>
</tr>
<tr>
<td>Actuarial gain/(loss)</td>
<td>2 120 000</td>
<td>(323 000)</td>
</tr>
<tr>
<td>Employer contributions</td>
<td>483 000</td>
<td>570 000</td>
</tr>
<tr>
<td></td>
<td><strong>49 437 000</strong></td>
<td><strong>43 748 000</strong></td>
</tr>
</tbody>
</table>

### Changes in the defined benefit obligation

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit obligation at beginning of the year</td>
<td>28 575 000</td>
<td>22 840 000</td>
</tr>
<tr>
<td>Service cost</td>
<td>772 000</td>
<td>614 000</td>
</tr>
<tr>
<td>Members contributions</td>
<td>198 000</td>
<td>216 000</td>
</tr>
<tr>
<td>Interest cost</td>
<td>2 650 000</td>
<td>2 178 000</td>
</tr>
<tr>
<td>Actuarial gain</td>
<td>2 741 000</td>
<td>3 993 000</td>
</tr>
<tr>
<td>Benefits paid</td>
<td>(867 000)</td>
<td>(1 160 000)</td>
</tr>
<tr>
<td>Risk premiums</td>
<td>(213 000)</td>
<td>(106 000)</td>
</tr>
<tr>
<td><strong>Benefit obligation at end of the year</strong></td>
<td><strong>33 856 000</strong></td>
<td><strong>28 575 000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefit obligation</td>
<td>(22 840 000)</td>
<td>(20 368 000)</td>
<td>(24 080 000)</td>
<td>(26 625 000)</td>
</tr>
<tr>
<td>Fair value - benefit asset</td>
<td>40 475 000</td>
<td>33 825 000</td>
<td>39 774 000</td>
<td>53 332 000</td>
</tr>
<tr>
<td>Unrecognised surplus</td>
<td>17 635 000</td>
<td>13 457 000</td>
<td>15 694 000</td>
<td>26 707 000</td>
</tr>
</tbody>
</table>

### Defined contribution Funds

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

<table>
<thead>
<tr>
<th></th>
<th>Working members</th>
<th>Employer contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
<td>2012</td>
</tr>
<tr>
<td>ARC Pension Fund (Option D)</td>
<td>1 306</td>
<td>1 221</td>
</tr>
<tr>
<td>ARC Provident Fund</td>
<td>788</td>
<td>679</td>
</tr>
</tbody>
</table>

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 33 089 004 to option D pension fund and R 9 588 764 for the provident fund.
**Notes to the Annual Financial Statements (continued)**

for the year ending 31 March 2013

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**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 2013. 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 results in 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 2013. 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:

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present value of obligations</td>
<td>20 682 000</td>
<td>27 302 000</td>
</tr>
<tr>
<td>Fair value of plan assets</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Post-retirement benefit obligation</td>
<td>20 682 000</td>
<td>27 302 000</td>
</tr>
<tr>
<td>Net discount rate applied</td>
<td>8,00%</td>
<td>8,75%</td>
</tr>
<tr>
<td>Membership of the fund at 31 March</td>
<td>511</td>
<td>552</td>
</tr>
</tbody>
</table>

**Amounts recognised in respect of the scheme are as follows:**

<table>
<thead>
<tr>
<th>Description</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer of liability</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Current service cost</td>
<td>1 986 000</td>
<td>927 000</td>
</tr>
<tr>
<td>Interest cost</td>
<td>881 000</td>
<td>2 103 000</td>
</tr>
<tr>
<td><strong>Annual expense</strong></td>
<td><strong>2 867 000</strong></td>
<td><strong>3 030 000</strong></td>
</tr>
</tbody>
</table>
### Changes in the benefit obligation

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening balance</td>
<td>27 302 000</td>
<td>29 005 000</td>
</tr>
<tr>
<td>Service cost</td>
<td>1 986 000</td>
<td>927 000</td>
</tr>
<tr>
<td>Interest cost</td>
<td>881 000</td>
<td>2 103 000</td>
</tr>
<tr>
<td>Expected benefit settlements</td>
<td>(9 199 000)</td>
<td>(9 933 000)</td>
</tr>
<tr>
<td>Expected liability as at 31 March 2013/12</td>
<td>20 970 000</td>
<td>22 102 000</td>
</tr>
<tr>
<td>Actuarial gain</td>
<td>(288 000)</td>
<td>-</td>
</tr>
<tr>
<td>Adjustment to benefit settlement over provision</td>
<td>-</td>
<td>6 075 000</td>
</tr>
<tr>
<td>Miscellaneous items</td>
<td>-</td>
<td>(875 000)</td>
</tr>
<tr>
<td>Closing balance</td>
<td>20 682 000</td>
<td>27 302 000</td>
</tr>
</tbody>
</table>

### Deferred Income: Parliamentary Grant

Government grants received that will be recognised in future accounting periods. These are conditional grants, which revenue will be recognised in future period.

#### Movement during the year

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance at the beginning of the year</td>
<td>87 333 943</td>
<td>43 473 943</td>
</tr>
<tr>
<td>Received</td>
<td>105 263 004</td>
<td>43 860 000</td>
</tr>
<tr>
<td></td>
<td><strong>192 596 947</strong></td>
<td><strong>87 333 943</strong></td>
</tr>
<tr>
<td>Non-current portion</td>
<td>192 596 947</td>
<td>87 333 943</td>
</tr>
</tbody>
</table>

This grant relates to construction of the Exotic Disease and Wild Suid facilities.

### Capital Fund

#### Contributed

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance</td>
<td>109 593 403</td>
<td>108 905 191</td>
</tr>
</tbody>
</table>

The capital fund represent the cost of land when the ARC was transferred out of the Department of Agriculture, Forestry and Fisheries.
17. Accumulated surplus

In terms of the Agricultural Research Act, 1990 (Act No. 86 of 1990) as amended, this reserve may be utilised, only with the prior approval of the Minister for Agriculture, Forestry and Fisheries in concurrence with the Minister of Finance. This reserve is not substantiated by cash reserves, which makes it inaccessible to the ARC.

18. 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:

<table>
<thead>
<tr>
<th></th>
<th>Up to 1 year</th>
<th>2-5 yrs</th>
<th>More than 5 yrs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 Commitment</td>
<td>7 101 455</td>
<td>10 009 125</td>
<td>-</td>
<td>17 110 580</td>
</tr>
<tr>
<td>2012 Commitment</td>
<td>2 687 026</td>
<td>1 648 932</td>
<td>-</td>
<td>4 335 958</td>
</tr>
</tbody>
</table>

19. Contingencies

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guarantees on municipal and electricity accounts</td>
<td>1 075 360</td>
<td>968 360</td>
</tr>
<tr>
<td>Pending labour dispute</td>
<td>1 515 200</td>
<td>236 373</td>
</tr>
<tr>
<td>Surplus generated from commercial activities</td>
<td>88 578 162</td>
<td>124 043 897</td>
</tr>
<tr>
<td>Litigation</td>
<td>2 784 000</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>93 952 722</td>
<td>125 248 630</td>
</tr>
</tbody>
</table>

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.
20. Commitments

20.1 Capital Commitments

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>3,296,577</td>
<td>3,035,461</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>744,509</td>
<td>2,437,924</td>
</tr>
<tr>
<td>Machinery and farming equipment</td>
<td>1,392,676</td>
<td>822,078</td>
</tr>
<tr>
<td>Lab Equipment</td>
<td>11,899,365</td>
<td>30,608,534</td>
</tr>
<tr>
<td>Office furniture and Equipment</td>
<td>515,967</td>
<td>171,427</td>
</tr>
<tr>
<td>Computer Equipment</td>
<td>10,290,631</td>
<td>2,633,803</td>
</tr>
<tr>
<td>Vehicles</td>
<td>4,019,023</td>
<td>12,185,792</td>
</tr>
<tr>
<td>Farming mechanisation - (ARC operating as an agent)</td>
<td>-</td>
<td>178,883,065</td>
</tr>
<tr>
<td></td>
<td><strong>32,158,748</strong></td>
<td><strong>230,778,084</strong></td>
</tr>
</tbody>
</table>

Capital expenses commitments relate to various capital items for which orders have been placed.

Included in the 2012 commitments is an amount of R 178,883,065 which relates to orders placed on behalf of third party which ARC is acting as an agent of.
## 21. Council, Executive Managers and Audit Committe remuneration

### Executive

<table>
<thead>
<tr>
<th>Name</th>
<th>2013 Salaries</th>
<th>Subsistence and travel</th>
<th>Pension</th>
<th>Bonus</th>
<th>Leave payout</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr SR Moephuli</td>
<td>1 862 304</td>
<td>-</td>
<td>232 503</td>
<td>-</td>
<td>-</td>
<td>2 094 807</td>
</tr>
<tr>
<td>Mr GM Maluleke</td>
<td>1 598 364</td>
<td>-</td>
<td>167 986</td>
<td>-</td>
<td>-</td>
<td>1 766 350</td>
</tr>
<tr>
<td>Ms A Canca</td>
<td>1 040 212</td>
<td>8 788</td>
<td>70 337</td>
<td>-</td>
<td>-</td>
<td>1 119 337</td>
</tr>
<tr>
<td>Dr M Jeenah</td>
<td>1 732 497</td>
<td>8 103</td>
<td>117 228</td>
<td>-</td>
<td>-</td>
<td>1 857 828</td>
</tr>
<tr>
<td>Mr F Monkwe</td>
<td>1 269 423</td>
<td>-</td>
<td>133 363</td>
<td>-</td>
<td>-</td>
<td>1 402 786</td>
</tr>
<tr>
<td>Ms M Umlaw</td>
<td>1 214 273</td>
<td>1 611</td>
<td>104 791</td>
<td>-</td>
<td>-</td>
<td>1 320 675</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8 717 073</strong></td>
<td><strong>18 502</strong></td>
<td><strong>826 208</strong></td>
<td></td>
<td></td>
<td><strong>9 561 783</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>2012 Salaries</th>
<th>Subsistence and travel</th>
<th>Pension</th>
<th>Bonus</th>
<th>Leave payout</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr SR Moephuli</td>
<td>1 867 293</td>
<td>-</td>
<td>363 780</td>
<td>64 120</td>
<td>-</td>
<td>2 295 193</td>
</tr>
<tr>
<td>Mr MT Netsienda</td>
<td>356 594</td>
<td>-</td>
<td>77 975</td>
<td>-</td>
<td>219 920</td>
<td>654 489</td>
</tr>
<tr>
<td>Mr GM Maluleke</td>
<td>1 445 721</td>
<td>-</td>
<td>235 426</td>
<td>54 048</td>
<td>-</td>
<td>1 735 195</td>
</tr>
<tr>
<td>Ms A Canca</td>
<td>897 513</td>
<td>3 907</td>
<td>197 150</td>
<td>29 952</td>
<td>-</td>
<td>1 128 522</td>
</tr>
<tr>
<td>Ms M Umlaw</td>
<td>373 037</td>
<td>1 816</td>
<td>48 173</td>
<td>-</td>
<td>-</td>
<td>423 026</td>
</tr>
<tr>
<td>Dr M Jeenah</td>
<td>1 618 758</td>
<td>11 344</td>
<td>110 074</td>
<td>84 864</td>
<td>-</td>
<td>1 825 040</td>
</tr>
<tr>
<td>Mr F Monkwe</td>
<td>362 578</td>
<td>-</td>
<td>55 915</td>
<td>-</td>
<td>-</td>
<td>418 493</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6 921 494</strong></td>
<td><strong>17 067</strong></td>
<td><strong>1 088 493</strong></td>
<td><strong>232 984</strong></td>
<td><strong>219 920</strong></td>
<td><strong>8 479 958</strong></td>
</tr>
</tbody>
</table>
## 21. Council, Executive Managers and Audit Committee remuneration (continued)

### Non-executive

<table>
<thead>
<tr>
<th>2013</th>
<th>Committees fees</th>
<th>Subsistence travel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr JWA Godden (Chairperson)</td>
<td>51 049</td>
<td>335</td>
<td>51 384</td>
</tr>
<tr>
<td>Mr JH Mcbain</td>
<td>53 443</td>
<td>4 613</td>
<td>58 056</td>
</tr>
<tr>
<td>Mr M Dyasi</td>
<td>58 418</td>
<td>838</td>
<td>59 256</td>
</tr>
<tr>
<td>Ms OD Aphane</td>
<td>64 257</td>
<td>1 253</td>
<td>65 510</td>
</tr>
<tr>
<td>Mr AD Young</td>
<td>17 526</td>
<td>6 738</td>
<td>24 264</td>
</tr>
<tr>
<td>Ms D Msomi</td>
<td>40 883</td>
<td>3 730</td>
<td>44 613</td>
</tr>
<tr>
<td>Ms FW Jansen van Rijssen</td>
<td>29 209</td>
<td>1 217</td>
<td>30 426</td>
</tr>
<tr>
<td>Dr JM Chitja</td>
<td>29 209</td>
<td>1 560</td>
<td>30 769</td>
</tr>
<tr>
<td>Prof TV Mayekiso</td>
<td>14 605</td>
<td>1 785</td>
<td>16 390</td>
</tr>
<tr>
<td>Prof MJ Kahn</td>
<td>29 209</td>
<td>3 240</td>
<td>32 449</td>
</tr>
<tr>
<td>Prof T A Mofokeng</td>
<td>29 206</td>
<td>2 274</td>
<td>31 480</td>
</tr>
<tr>
<td>Prof FJC Swanepoel</td>
<td>35 051</td>
<td>885</td>
<td>35 936</td>
</tr>
<tr>
<td>Prof S Vii Nkomo</td>
<td>46 929</td>
<td>-</td>
<td>46 929</td>
</tr>
<tr>
<td></td>
<td>498 994</td>
<td>28 468</td>
<td>527 462</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2012</th>
<th>Committees fees</th>
<th>Subsistence travel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr JWA Godden (Chairperson)</td>
<td>154 497</td>
<td>1 177</td>
<td>155 674</td>
</tr>
<tr>
<td>Mr JH Mcbain</td>
<td>55 498</td>
<td>2 671</td>
<td>58 169</td>
</tr>
<tr>
<td>Mr M Dyasi</td>
<td>41 310</td>
<td>1 551</td>
<td>42 861</td>
</tr>
<tr>
<td>Ms OD Aphane</td>
<td>44 064</td>
<td>-</td>
<td>44 064</td>
</tr>
<tr>
<td>Mr AD Young</td>
<td>16 524</td>
<td>1 509</td>
<td>18 033</td>
</tr>
<tr>
<td>Ms D Msomi</td>
<td>24 786</td>
<td>584</td>
<td>25 370</td>
</tr>
<tr>
<td>Ms FW Jansen van Rijssen</td>
<td>41 310</td>
<td>1 233</td>
<td>42 543</td>
</tr>
<tr>
<td>Dr JM Chitja</td>
<td>22 032</td>
<td>408</td>
<td>22 440</td>
</tr>
<tr>
<td>Prof TV Mayekiso</td>
<td>24 786</td>
<td>1 285</td>
<td>26 071</td>
</tr>
<tr>
<td>Prof MJ Kahn</td>
<td>33 048</td>
<td>3 612</td>
<td>36 660</td>
</tr>
<tr>
<td>Prof T A Mofokeng</td>
<td>33 048</td>
<td>1 406</td>
<td>34 454</td>
</tr>
<tr>
<td>Prof FJC Swanepoel</td>
<td>27 540</td>
<td>701</td>
<td>28 241</td>
</tr>
<tr>
<td>Mr M Sirenya</td>
<td>49 572</td>
<td>4 677</td>
<td>54 249</td>
</tr>
<tr>
<td>Prof S Vii Nkomo</td>
<td>19 278</td>
<td>561</td>
<td>19 839</td>
</tr>
<tr>
<td>Prof ASM Karaan</td>
<td>16 524</td>
<td>277</td>
<td>16 801</td>
</tr>
<tr>
<td></td>
<td>603 817</td>
<td>21 652</td>
<td>625 469</td>
</tr>
</tbody>
</table>
Notes to the Annual Financial Statements (continued)

for the year ending 31 March 2013

Audit committee

<table>
<thead>
<tr>
<th>2013</th>
<th>Committees fees</th>
<th>Subsistence travel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LM Mangquku</td>
<td>46 638</td>
<td>1 755</td>
<td>48 393</td>
</tr>
<tr>
<td>R Wesseloo</td>
<td>42 420</td>
<td>1 897</td>
<td>44 317</td>
</tr>
<tr>
<td>VN Naicker</td>
<td>15 150</td>
<td>288</td>
<td>15 438</td>
</tr>
<tr>
<td>S Cornelius</td>
<td>27 144</td>
<td>1 290</td>
<td>28 434</td>
</tr>
<tr>
<td></td>
<td>131 352</td>
<td>5 230</td>
<td>136 582</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2012</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr LM Mangquku</td>
<td>46 219</td>
<td>2 170</td>
<td>48 389</td>
</tr>
<tr>
<td>Mr R Wesseloo</td>
<td>34 500</td>
<td>613</td>
<td>35 113</td>
</tr>
<tr>
<td>Mr VK Naicker</td>
<td>38 750</td>
<td>1 242</td>
<td>39 992</td>
</tr>
<tr>
<td>Dr S Cornelius</td>
<td>40 000</td>
<td>876</td>
<td>40 876</td>
</tr>
<tr>
<td></td>
<td>159 469</td>
<td>4 901</td>
<td>164 370</td>
</tr>
</tbody>
</table>

22. Cash generated from operations

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surplus</td>
<td>88 578 162</td>
<td>124 043 897</td>
</tr>
<tr>
<td>Adjustments for:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation and amortisation</td>
<td>23 794 272</td>
<td>21 819 658</td>
</tr>
<tr>
<td>Profit on sale of non-current assets</td>
<td>(323 360)</td>
<td>-</td>
</tr>
<tr>
<td>Impairment deficit</td>
<td>29 073 514</td>
<td>1 500 000</td>
</tr>
<tr>
<td>Movements in retirement benefit assets and liabilities</td>
<td>(6 620 000)</td>
<td>(1 703 000)</td>
</tr>
<tr>
<td>Movements in provisions</td>
<td>39 886 372</td>
<td>(22 346 280)</td>
</tr>
<tr>
<td>Change in investments fair value</td>
<td>(1 417 417)</td>
<td>(274 015)</td>
</tr>
<tr>
<td>Assets written off</td>
<td>3 904 465</td>
<td>4 042 830</td>
</tr>
<tr>
<td>Changes in working capital:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventories</td>
<td>1 402 420</td>
<td>(355 463)</td>
</tr>
<tr>
<td>Trade and other receivables from exchange transactions</td>
<td>(3 250 843)</td>
<td>(5 931 059)</td>
</tr>
<tr>
<td>Receivables from non-exchange transactions</td>
<td>(1 780 746)</td>
<td>(1 140 060)</td>
</tr>
<tr>
<td>Trade and other payables from exchange transactions</td>
<td>(131 457 005)</td>
<td>218 845 274</td>
</tr>
<tr>
<td>VAT</td>
<td>2 761 972</td>
<td>2 080 431</td>
</tr>
<tr>
<td>Deferred Income: Parliamentary Grant</td>
<td>105 263 004</td>
<td>43 860 000</td>
</tr>
<tr>
<td></td>
<td>149 814 810</td>
<td>384 442 213</td>
</tr>
</tbody>
</table>
### 23. Sale of goods and services

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale of goods and services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross external earnings (note 3)</td>
<td>479 687 796</td>
<td>549 972 561</td>
</tr>
<tr>
<td>Received in advance - prior year</td>
<td>(299 367 942)</td>
<td>(82 069 649)</td>
</tr>
<tr>
<td>Trade and other debtors- current year</td>
<td>(81 161 663)</td>
<td>(74 576 992)</td>
</tr>
<tr>
<td>Trade and other debtors - prior year</td>
<td>74 576 992</td>
<td>68 225 449</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>173 735 183</td>
</tr>
<tr>
<td></td>
<td>461 551 369</td>
<td></td>
</tr>
</tbody>
</table>

### 24. Risk management

**Category of financial instruments and maturity profile**

#### 2013

<table>
<thead>
<tr>
<th></th>
<th>Notes</th>
<th>0-1 Years</th>
<th>&gt;1 year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>At fair value through profit or loss:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments</td>
<td>10</td>
<td>3 848 936</td>
<td></td>
<td>3 848 936</td>
</tr>
<tr>
<td><strong>Loans and receivables:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td></td>
<td>496 724 111</td>
<td>-</td>
<td>496 724 111</td>
</tr>
<tr>
<td>Trade and other receivables</td>
<td></td>
<td>57 450 686</td>
<td>-</td>
<td>57 450 686</td>
</tr>
<tr>
<td><em>profit or loss:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables</td>
<td>(80 359 552)</td>
<td>-</td>
<td>(80 359 552)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>473 815 245</td>
<td>3 848 936</td>
<td>477 664 181</td>
<td></td>
</tr>
<tr>
<td><strong>Percentage profile</strong></td>
<td>99,19%</td>
<td>0,81%</td>
<td>100,00%</td>
<td></td>
</tr>
</tbody>
</table>

#### 2012

<table>
<thead>
<tr>
<th></th>
<th>Notes</th>
<th>0-1 Years</th>
<th>&gt;1 year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>At fair value through profit or loss:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investments</td>
<td>10</td>
<td>2 431 520</td>
<td></td>
<td>2 431 520</td>
</tr>
<tr>
<td><strong>Loans and receivables:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td></td>
<td>457 359 021</td>
<td>-</td>
<td>457 359 021</td>
</tr>
<tr>
<td>Trade and other receivables</td>
<td></td>
<td>37 053 532</td>
<td>-</td>
<td>37 053 532</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>At amortised cost:</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables</td>
<td>(58 757 216)</td>
<td>-</td>
<td>(58 757 216)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>435 655 337</td>
<td>2 431 520</td>
<td>438 086 857</td>
<td></td>
</tr>
<tr>
<td><strong>Percentage profile</strong></td>
<td>99,44%</td>
<td>0,55%</td>
<td>100,00%</td>
<td></td>
</tr>
</tbody>
</table>
Notes to the Annual Financial Statements (continued)

for the year ending 31 March 2013

**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:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase by 50 base points</td>
<td>2 483 620</td>
<td>2 286 795</td>
</tr>
<tr>
<td>Decrease by 50 base points</td>
<td>(2 483 620)</td>
<td>(2 286 795)</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th></th>
<th>Effective Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2013</strong></td>
<td></td>
</tr>
<tr>
<td>Current cash balances</td>
<td>4,20%</td>
</tr>
<tr>
<td>Short-term cash deposits</td>
<td>5,40%</td>
</tr>
<tr>
<td></td>
<td>92 821 130</td>
</tr>
<tr>
<td></td>
<td>403 902 981</td>
</tr>
<tr>
<td></td>
<td>496 724 111</td>
</tr>
<tr>
<td><strong>2012</strong></td>
<td></td>
</tr>
<tr>
<td>Current cash balances</td>
<td>4,70%</td>
</tr>
<tr>
<td>Short-term cash deposits</td>
<td>5,80%</td>
</tr>
<tr>
<td></td>
<td>55 156 069</td>
</tr>
<tr>
<td></td>
<td>402 202 952</td>
</tr>
<tr>
<td></td>
<td>457 359 021</td>
</tr>
</tbody>
</table>

**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 a 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 two of the entity’s largest debtors exceed 5% of the total trade receivables balance as disclosed in note 6. 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 2013, 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 (unadjusted) 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:

<table>
<thead>
<tr>
<th>Assets measured at fair value</th>
<th>31-Mar-13</th>
<th>Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial assets at fairvalue</td>
<td>3 603 488</td>
<td>3 603 488</td>
</tr>
</tbody>
</table>

**25. Related parties**

**Relationships**
- Controlling entity
- Executive managers are regarded as related parties
- Public entity - (Under common control with ARC)
- National Department - (under common control with controlling entity)
- National Department - (under common control with controlling entity)
- National Department - (under common control with controlling entity)
- National Department - (under common control with controlling entity)
- National Department - (under common control with controlling entity)
- National Department - (under common control with controlling entity)

**Name of the related party**
- Department of Agriculture, Forestry and Fisheries
- Onderstepoort Biological Products
- Department of Science and Technology
- Department of Rural Development and Land Reform
- Department of Water Affairs
- Department of Public Works
- Department of Basic Education
- Department of Transport
- Department of Arts and Culture

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:
## Related party balances

<table>
<thead>
<tr>
<th>Department / Grant Type</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Water Affairs</td>
<td>(1 211 868)</td>
<td>-</td>
</tr>
<tr>
<td>Department of Rural Development and Land Reform - Other Grants</td>
<td>(39 354 972)</td>
<td>(2 731 449)</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries - Other Grants</td>
<td>(6 168 513)</td>
<td>-</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries - Other Grants</td>
<td>8 790 753</td>
<td>12 827 278</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries - Services</td>
<td>(4 570 430)</td>
<td>-</td>
</tr>
<tr>
<td>OBP</td>
<td>786 261</td>
<td>-</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries FMD</td>
<td>(129 524 909)</td>
<td>-</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries Economics Competitiveness support</td>
<td>(24 260 906)</td>
<td>-</td>
</tr>
<tr>
<td>Department of Water Affairs</td>
<td>83 813</td>
<td>41 101</td>
</tr>
<tr>
<td>Department of Science and Technology</td>
<td>(6 651 817)</td>
<td>(15 180 861)</td>
</tr>
<tr>
<td>Department of Public works</td>
<td>-</td>
<td>20 047</td>
</tr>
<tr>
<td>Department of Education</td>
<td>-</td>
<td>8 478</td>
</tr>
<tr>
<td>Department of Arts and Culture</td>
<td>-</td>
<td>6 500</td>
</tr>
<tr>
<td>Department of Rural Development and Land Reform</td>
<td>16 848 427</td>
<td>270 000</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries - Held as agent (Cash balance)</td>
<td>-</td>
<td>210 144 886</td>
</tr>
<tr>
<td>Department of Agriculture forestry and Fisheries - Held as agent (Received in Advance)</td>
<td>-</td>
<td>(210 144 886)</td>
</tr>
</tbody>
</table>

## Related party transactions

<table>
<thead>
<tr>
<th>Department / Grant Type</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department of Rural Development and Land Reform</td>
<td>(21 580 909)</td>
<td>(16 131 508)</td>
</tr>
<tr>
<td>OBP</td>
<td>(7 809 358)</td>
<td>-</td>
</tr>
<tr>
<td>Department of Science and Technology - Parliamentary Grant</td>
<td>(49 692 983)</td>
<td>(47 189 123)</td>
</tr>
<tr>
<td>Department of Science and Technology - Other Revenue Grants</td>
<td>(12 228 060)</td>
<td>(15 660 988)</td>
</tr>
<tr>
<td>Department of Agriculture Forestry and Fisheries - Parliamentary Grant</td>
<td>(827 215 789)</td>
<td>(662 722 000)</td>
</tr>
<tr>
<td>Department of Agriculture - Other Revenue Grant</td>
<td>(13 711 969)</td>
<td>(22 959 820)</td>
</tr>
<tr>
<td>Department of Water affairs</td>
<td>(12 558 979)</td>
<td>(21 810 405)</td>
</tr>
<tr>
<td>Department of Education</td>
<td>-</td>
<td>(13 532)</td>
</tr>
<tr>
<td>Department of Public works</td>
<td>(15 672)</td>
<td>(42 468)</td>
</tr>
<tr>
<td>Department of Agriculture forestry and Fisheries - Services</td>
<td>83 750</td>
<td>462 988</td>
</tr>
</tbody>
</table>

The balances are payable and collectable within 30 days.

Executive Managers' remuneration is disclosed in note 21.
### 26. Irregular expenditure

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening balance</td>
<td>2 136 145</td>
<td>2 259 304</td>
</tr>
<tr>
<td>Add: Irregular Expenditure - current year</td>
<td>1 123 155</td>
<td>1 101 534</td>
</tr>
<tr>
<td>Less: Amounts condoned</td>
<td>(2 112 244)</td>
<td>(1 039 279)</td>
</tr>
<tr>
<td>Less: Condoned - Disciplinary action taken/in progress</td>
<td>-</td>
<td>(185 414)</td>
</tr>
<tr>
<td></td>
<td>1 147 056</td>
<td>2 136 145</td>
</tr>
</tbody>
</table>

**Analysis of expenditure awaiting condonation per age classification**

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current year</td>
<td>1 123 155</td>
<td>916 120</td>
</tr>
<tr>
<td>Prior years</td>
<td>23 901</td>
<td>1 220 025</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1 147 056</td>
<td>2 136 145</td>
</tr>
</tbody>
</table>

**Goods and services**

The irregular expenditure relates to goods and services expenditure incurred in 2013 and 2012 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 Of 1999).

**2013**

Management will investigate the 2013 irregular procurement of goods and service and take necessary actions i.e. apply for condonement, take disciplinary action and or recover from the employees.

**2012**

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.
27. Fruitless and wasteful expenditure

Fruitless and wasteful expenditure

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruitless and wasteful expenditure</td>
<td>8 635</td>
<td>-</td>
</tr>
</tbody>
</table>

The fruitless and wasteful expenses were incurred in 2012 by paying for faulty machinery and interest charged on late payment.

28. Events after reporting date

The Council members are not aware of any significant matters or circumstances arising since the end of the financial year.

29. Prior period errors

During 2012 financial year, a conditional grant was incorrectly classified as Sale of goods and services, instead of Grants on the face of the cashflow statement.

There were printing errors on the disclosures the trade and other receivables and trade and other payables from exchange transactions.

The correction of the errors resulted in adjustments as follows:

<table>
<thead>
<tr>
<th>Statement of financial position</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease in net assets</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
## Prior period errors impact

<table>
<thead>
<tr>
<th>Prior period errors</th>
<th>Sale of goods and services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previously reported</td>
<td>503 644 931</td>
</tr>
<tr>
<td>Prior period error</td>
<td>(43 860 000)</td>
</tr>
<tr>
<td>Income received in advance error</td>
<td>1 079 810</td>
</tr>
<tr>
<td>Trade and other debtors</td>
<td>686 628</td>
</tr>
<tr>
<td></td>
<td>461 551 369</td>
</tr>
</tbody>
</table>

## Printing error on the annual report

<table>
<thead>
<tr>
<th>Prior period errors</th>
<th>Income received in advance</th>
<th>Trade other receivables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income received in advance</td>
<td>298 681 314</td>
<td>75 656 802</td>
</tr>
<tr>
<td>Prior period error</td>
<td>686 628</td>
<td>(1 079 810)</td>
</tr>
<tr>
<td></td>
<td>299 367 942</td>
<td>74 576 992</td>
</tr>
</tbody>
</table>

## Trade and other receivables

<table>
<thead>
<tr>
<th>Prior period errors</th>
<th>Trade and other receivables</th>
<th>Payables</th>
<th>Cash Balance</th>
<th>Short term cash deposits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previously reported</td>
<td>38 022 121</td>
<td>47 040 274</td>
<td>54 658 078</td>
<td>402 700 943</td>
</tr>
<tr>
<td>Prior period error</td>
<td>(968 589)</td>
<td>11 716 942</td>
<td>497 991</td>
<td>(497 991)</td>
</tr>
<tr>
<td></td>
<td>37 053 532</td>
<td>58 757 216</td>
<td>55 156 069</td>
<td>402 202 952</td>
</tr>
</tbody>
</table>
Notes to the Annual Financial Statements (continued)

for the year ending 31 March 2013

Cash-flow Statement

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash-flow from operating activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grants - previously reported</td>
<td>-</td>
<td>666 015 399</td>
</tr>
<tr>
<td>Sale of goods and services</td>
<td>-</td>
<td>43 860 000</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>709 875 399</td>
</tr>
</tbody>
</table>

30. Impairment of assets

Impairments

<table>
<thead>
<tr>
<th>Equipment land and buildings</th>
<th>2013</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29 073 514</td>
<td>1 500 000</td>
</tr>
</tbody>
</table>

An impairment review was completed during the 2013 financial year. The review revealed cumulative impairments to land and buildings which are either not in use or maintained inadequately.

31. Taxation

The ARC is exempt from Income Tax in terms of section 10(1) (a) of the Income Tax Act No.58 of 1962.
32. New standard adopted

The annual financial statements have been prepared in accordance with Standards of Generally Recognised Accounting Practice on a basis consistent with the prior year except for the adoption of the following new or revised standards.

GRAP 104 was adopted in the current year. The impact of adopting this standard is insignificant to the entity as it has already applied the principles in the prior periods.

GRAP 103

During the year ARC adopted the heritage assets accounting standard. This resulted in property being reclassified from buildings to heritage assets as disclosed in note 8 and 9.

The aggregate effect of the changes in the adoption of the new accounting standard on the annual financial statements for the year ended 31 March 2012 is as follows:

<table>
<thead>
<tr>
<th>Statement of financial position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
</tr>
<tr>
<td>Previously stated (Note 8)</td>
</tr>
<tr>
<td>Adjustment</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Heritage assets</td>
</tr>
<tr>
<td>Previously stated (Note 9)</td>
</tr>
<tr>
<td>Adjustment</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

33. Change in estimate

33.1. Equipment land and buildings

The useful life of certain assets was revised to longer useful lives than the initial estimate.

The impact is a decrease in depreciation for the current year, estimated at R2 190 000.

The impact for the future years is a decrease in depreciation estimated at R4 469 000.
PERFORMANCE REPORT
Introduction

This report provides information on the ARC’s performance in accordance with the predetermined outlined strategic objectives against associated targets in the tables on the following pages. The six strategic objectives were developed to enable the ARC to effectively focus on the prioritised options and delivering on its mandate.

- Sustainable use and management of natural resources
- Enhanced nutrition and food security
- Improved ability of the sector to manage and mitigate agricultural risks
- Improved efficiency and competitiveness of the sector
- Transformed agrarian landscape
- Improved operational and organisational efficiency and effectiveness

<table>
<thead>
<tr>
<th>Sub-programme</th>
<th>Performance output</th>
<th>Key performance indicator</th>
<th>Annual target</th>
<th>YTD achievement</th>
<th>Reasons for variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme 1: CROP PRODUCTION, IMPROVEMENT AND PROTECTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Broadening the food base</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>15</td>
<td>14</td>
<td>Research did not progress as anticipated</td>
</tr>
<tr>
<td></td>
<td>IP registered</td>
<td>Total number of registrations</td>
<td>2</td>
<td>9</td>
<td>Target exceeded. Additional registrations were processed by DAFF in the reporting year, from submissions of prior year.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>37</td>
<td>89</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2 Production systems</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>7</td>
<td>7</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Total number of registrations</td>
<td>1</td>
<td>1</td>
<td>On target</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>141</td>
<td>217</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>1.3 Breeding, physiology and genetics</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>23</td>
<td>15</td>
<td>Manuscripts submitted on time, the publication date of articles is determined by editors of journals, not ARC.</td>
</tr>
<tr>
<td></td>
<td>IP registered</td>
<td>Total number of registrations</td>
<td>12</td>
<td>15</td>
<td>Target exceeded. Additional registrations were processed by DAFF in the reporting year, from submissions of prior year.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>118</td>
<td>158</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>1.4 Plant health</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>28</td>
<td>26</td>
<td>Research did not progress as anticipated</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>79</td>
<td>140</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
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<td>---------------------------------------------------------------</td>
<td>---------------</td>
<td>----------------</td>
<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Programme 2: ANIMAL HEALTH, PRODUCTION AND IMPROVEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Animal health</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>31</td>
<td>28</td>
<td>More fundamental research was conducted to develop novel vaccines and therefore publications were delayed</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>27</td>
<td>27</td>
<td>On target</td>
</tr>
<tr>
<td>2.2 Rangeland and pasture science and animal nutrition</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>16</td>
<td>20</td>
<td>Target exceeded. Research results obtained faster than anticipated.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>18</td>
<td>15</td>
<td>Target not met due to delays in contracting with Mpumalanga Provincial Government regarding three communities in the province</td>
</tr>
<tr>
<td>2.3 Breeding and improvement</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>19</td>
<td>19</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>1 185</td>
<td>1 210</td>
<td>Target exceeded due to better use of information dissemination platforms.</td>
</tr>
<tr>
<td>2.4 Production systems</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>1</td>
<td>1</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>2</td>
<td>2</td>
<td>On target</td>
</tr>
<tr>
<td><strong>Programme 3: NATURAL RESOURCES MANAGEMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Renewable energy</td>
<td>IP registered</td>
<td>Number of registrations</td>
<td>1</td>
<td>0</td>
<td>Resignation of engineers delayed progress on the projects.</td>
</tr>
<tr>
<td></td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>1</td>
<td>0</td>
<td>Resignation of engineers delayed progress on the projects.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>15</td>
<td>18</td>
<td>Target exceeded due to hosting of National Science week at three sites</td>
</tr>
<tr>
<td>3.2 Conservation agriculture</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>7</td>
<td>8</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>73</td>
<td>96</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>3.3 Reduction and management of risks and disaster</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>25</td>
<td>32</td>
<td>Publication accepted faster than anticipated.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>128</td>
<td>148</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>3.4 Water management and irrigation</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>11</td>
<td>5</td>
<td>Difficulties in recruitment of suitable scientists; a senior research has since been engaged.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>40</td>
<td>83</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>3.5 Monitoring and characterisation of natural resources and ecological systems</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>11</td>
<td>16</td>
<td>Publication accepted faster than anticipated.</td>
</tr>
<tr>
<td></td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>37</td>
<td>46</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
</tr>
<tr>
<td>---------------</td>
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<td>---------------</td>
<td>-----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td><strong>3.6</strong> Maintenance and use of national assets</td>
<td>Scientific publication</td>
<td>Number of publications</td>
<td>32</td>
<td>38</td>
<td>Target exceeded due to more effective use of national assets.</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>149</td>
<td>153</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>Programme 4: MECHANISATION AND ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4.1</strong> Precision agriculture</td>
<td>Scientific publication</td>
<td>Number of publications</td>
<td>1</td>
<td>0</td>
<td>Research slower than anticipated due to resignation of engineers.</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>7</td>
<td>11</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>4.2</strong> Equipment design and development</td>
<td>Scientific publication</td>
<td>Number of publications</td>
<td>3</td>
<td>1</td>
<td>Research slower than anticipated due to resignation of engineers.</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>8</td>
<td>1</td>
<td>Target not met due to lack of staff in Engineering.</td>
</tr>
<tr>
<td><strong>4.3</strong> Testing of farm machinery and irrigation equipment</td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>19</td>
<td>23</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>4.4</strong> Agricultural Structures and environmental engineering</td>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td>5</td>
<td>8</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>Programme 5: AGRO-PROCESSING, FOOD TECHNOLOGY AND SAFETY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5.1</strong> Food and non-food processing</td>
<td>Scientific publication</td>
<td>Number of publications</td>
<td>3</td>
<td>7</td>
<td>Publication accepted faster than anticipated.</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>15</td>
<td>31</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>5.2</strong> Food science and technology</td>
<td>Scientific publication</td>
<td>Number of publications</td>
<td>7</td>
<td>21</td>
<td>Target exceeded due increased use of post graduate students.</td>
</tr>
<tr>
<td>IP registered</td>
<td>Number of registrations</td>
<td>1</td>
<td>2</td>
<td>On target</td>
<td></td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>20</td>
<td>36</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>5.3</strong> Animal Product development</td>
<td>Scientific publication</td>
<td>Information dissemination</td>
<td>2</td>
<td>3</td>
<td>On target</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>8</td>
<td>6</td>
<td>Target not met.</td>
</tr>
<tr>
<td><strong>5.4</strong> Post-harvest processing</td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>7</td>
<td>7</td>
<td>On target</td>
</tr>
<tr>
<td>Information dissemination</td>
<td>Information dissemination</td>
<td></td>
<td>41</td>
<td>71</td>
<td>Target exceeded due to improved use of the dissemination platforms. An additional platform (National Science Week) was also utilised this financial year.</td>
</tr>
<tr>
<td><strong>5.5</strong> Analytical and diagnostic services</td>
<td>Services to measure the quality of processed foods</td>
<td>Services</td>
<td>R49m</td>
<td>R52m</td>
<td>Target exceeded due to increase in diagnostics test performed.</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
</tr>
<tr>
<td>---------------</td>
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<td>----------------------</td>
</tr>
<tr>
<td><strong>Programme 6: SMALLHOLDER AGRICULTURAL DEVELOPMENT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1 Incubation and SMME development</td>
<td>Established and functional agri-enterprise incubators based on ARC technology</td>
<td>Numbers of agri-business incubators</td>
<td>0</td>
<td>0</td>
<td>None were planned for this year</td>
</tr>
<tr>
<td></td>
<td>Scientific publication</td>
<td>Total number of publications</td>
<td>25</td>
<td>34</td>
<td>Target exceeded because of more emphasis on research of smallholder farmers.</td>
</tr>
<tr>
<td></td>
<td>IP registered</td>
<td>Number of registrations</td>
<td>2</td>
<td>3</td>
<td>On target</td>
</tr>
<tr>
<td>6.3 Agricultural Development Centres (ADCs)</td>
<td>Established and functional ADCs</td>
<td>Number of ADCs</td>
<td>1</td>
<td>0</td>
<td>Four sites have been identified. However, this was not funded in this financial year.</td>
</tr>
<tr>
<td>6.4 Smallholder enterprise support</td>
<td>Operational land-use and enterprise planning capability</td>
<td>Number of profiling reports completed for smallholder communities</td>
<td>1</td>
<td>1</td>
<td>On target</td>
</tr>
<tr>
<td>6.5 Impact assessment</td>
<td>Impact assessment of SHF support (impact assessment framework integrated)</td>
<td>Number of IA reports produced</td>
<td>1</td>
<td>1</td>
<td>On target</td>
</tr>
<tr>
<td><strong>Programme 7: AGRICULTURAL ECONOMICS AND COMMERCIALISATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1 IP management</td>
<td>Report on activities undertaken on registered, and unregistered ARC IP</td>
<td>IP report on management activities</td>
<td>4</td>
<td>4</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Consolidated report of ARC technologies made available to smallholder farmers from a portfolio technologies suitable for smallholders farmers</td>
<td>Number of technologies licensed to smallholders farmers</td>
<td>0</td>
<td>0</td>
<td>None are planned for this financial year</td>
</tr>
<tr>
<td></td>
<td>Report on technologies issued under licence</td>
<td>Number of technologies issued under licence</td>
<td>14</td>
<td>51</td>
<td>Technical issues around cultivars were resolved in the current financial year resulting in more technologies available for licensing</td>
</tr>
<tr>
<td></td>
<td>Inventory of agri-business SMMEs created from ARC technologies</td>
<td>Number of SMMEs</td>
<td>4</td>
<td>0</td>
<td>In progress</td>
</tr>
<tr>
<td>7.2 Agricultural economics</td>
<td>External consultancy reports on enterprises, development project viability</td>
<td>Number of consultations</td>
<td>5</td>
<td>1</td>
<td>Four proposals developed and submitted, but none were successful</td>
</tr>
<tr>
<td>7.3 Consultancy and biometric services</td>
<td>Support services to the sector, facilitating decision-making and quality control</td>
<td>Revenue generated from consultancy and biometric services (R mil)</td>
<td>R19m</td>
<td>R10m</td>
<td>Despite proposals submitted to potential clients, the ARC received fewer requests for services due to the poor economic climate</td>
</tr>
<tr>
<td><strong>Programme 8: TRAINING AND EXTENSION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1 training management, capacity building and institutionalisation</td>
<td>Trained ARC scientists in facilitation, assessor and moderation skills</td>
<td>Number of trained scientists</td>
<td>30</td>
<td>30</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td>Accredited ARC courses</td>
<td>Number of accredited courses (additional each year)</td>
<td>5</td>
<td>24</td>
<td>Target exceeded due to 18 extra courses submitted</td>
</tr>
<tr>
<td></td>
<td>Trained extension personnel and farmers</td>
<td>Number of trained extension practitioners and farmers</td>
<td>4 729</td>
<td>7 975</td>
<td>This target has been exceeded because of additional training through the Kaonafatso Ya Dikgomo scheme</td>
</tr>
<tr>
<td></td>
<td>Resourced institutions for extensions</td>
<td>Number of institutions resourced for extension</td>
<td>3</td>
<td>4</td>
<td>Target exceeded due to ARD training engagement with Universities of Limpopo, Fort Hare and Venda and Madzivhandila Agricultural College</td>
</tr>
<tr>
<td>8.2 Information dissemination</td>
<td>ARC information hub for effective information dissemination established</td>
<td>ARC agricultural information hub proposal finalised and endorsed</td>
<td>Jun 12</td>
<td>-</td>
<td>Delayed proposal finalisation to ensure alignment with ARC’s ICT systems, specifically software and hardware</td>
</tr>
<tr>
<td></td>
<td>Knowledge construction finalised</td>
<td></td>
<td>Mar 13</td>
<td>-</td>
<td>Knowledge construction also impacted by ARC’s ERP system</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>---------------</td>
<td>-----------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>8.3 Extension services co-ordination and standard setting</td>
<td>Reviewed and updated Public Sector Extension Policy implemented</td>
<td>Public Sector Extension Policy reviewed and updated</td>
<td>Mar 13</td>
<td></td>
<td>ARC partnered with DAFF to formulate the policy; draft policy is under consideration at DAFF</td>
</tr>
<tr>
<td>8.4 Strategic intent to manage extension services</td>
<td>Proposal on the management and co-ordination of extension services developed</td>
<td>Proposal developed</td>
<td>Mar 13</td>
<td>-</td>
<td>Proposal not developed due to changes in the extension policy landscape. ARC served as part of DAFF’s reference group on extension policy review and formulation</td>
</tr>
</tbody>
</table>

**Programme 9: ADMINISTRATION AND CORPORATE AFFAIRS**

<table>
<thead>
<tr>
<th>9.1 Finance</th>
<th>Unqualified</th>
<th>9.1.1 Number of material</th>
<th>0</th>
<th>0</th>
<th>Unqualified report with material adjustments to the notes, PPE and expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth in contract income</td>
<td></td>
<td>9.1.2 Contract income achieved</td>
<td>R316m</td>
<td>R334m</td>
<td>Target exceeded; more contracts delivered than budgeted</td>
</tr>
<tr>
<td>Effective cost control</td>
<td></td>
<td>9.1.3 Annual operating expenditure</td>
<td>R1 107m</td>
<td>R984m</td>
<td>Target achieved</td>
</tr>
<tr>
<td>Growth in BEE procurement</td>
<td></td>
<td>9.1.4 BEE procurement spend</td>
<td>R94m</td>
<td>R191m</td>
<td>Target exceeded; basis for BEE score calculation changed</td>
</tr>
<tr>
<td>9.2 Risk and audit</td>
<td>Effective, efficient and transparent system of risk management and internal controls</td>
<td>9.2.1 Maintain risk exposures within the risk appetite level</td>
<td>R 5m</td>
<td>R5m</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.2.2 Value insurance claims below insurance aggregate</td>
<td>R 2,5m</td>
<td>R 1m</td>
<td>Less claims processed during the year</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.2.3 Number of internal control assessments</td>
<td>5</td>
<td>6</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.2.4 % reduction in the number of audit findings which are critical and significant</td>
<td>10%</td>
<td>40%</td>
<td>Target exceeded; more attention given to the resolution of findings</td>
</tr>
<tr>
<td>Effective, efficient and transparent system of risk management and internal controls</td>
<td></td>
<td>9.2.1 Maintain risk exposures within the risk appetite level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
</tr>
<tr>
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<td>----------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9.3 Human resources</td>
<td>Talent management and capacity building</td>
<td>9.3.1 Number of employees trained in scarce skills</td>
<td>40</td>
<td>86</td>
<td>The target was exceeded for informal training in scarce skills due to an increase in demand for training in IP awareness and ARD (Agricultural Research for Development)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.3.2 % of research employees registered for Master’s degree</td>
<td>15%</td>
<td>8,7%</td>
<td>The challenges of understaffing resulted in low registration rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.3.3 % research employees registered for Ph.D. degree (as a % of total staff)</td>
<td>18%</td>
<td>13,4%</td>
<td>The challenges of understaffing resulted in low registration rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.3.4 ARC average % of staff turnover (as % of total staff)</td>
<td>5%</td>
<td>2,94%</td>
<td>The target is exceeded due to management intervention with regard to retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.3.5 % of ARC staff turnover per grouping:</td>
<td></td>
<td></td>
<td>The market demand for senior management skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Senior Managers (as a % of total staff)</td>
<td>4%</td>
<td>9,4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Programme Managers (as a % of total staff)</td>
<td>5%</td>
<td>8,2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Researchers (as a % of total staff)</td>
<td>5%</td>
<td>4,23%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Research Technicians (as a % of total staff)</td>
<td>9%</td>
<td>5,21%</td>
<td></td>
</tr>
<tr>
<td>Transformation and change management</td>
<td></td>
<td>9.3.6 % increase in employment equity ratios in the following groupings</td>
<td></td>
<td></td>
<td>The recruitment and retention of female employees remain a challenge for the ARC in all occupational groupings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Core business</td>
<td>45%</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Female managers</td>
<td>20%</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Female employees in all ARC occupational groupings</td>
<td>42%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Employee relations</td>
<td></td>
<td>9.3.7 % of disputes successfully resolved</td>
<td>60%</td>
<td>80%</td>
<td>Target exceeded due to reduction in number of disputes, following training in Industrial Relations throughout the ARC</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
<td>Key performance indicator</td>
<td>Annual target</td>
<td>YTD achievement</td>
<td>Reasons for variance</td>
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</tr>
<tr>
<td>9.4 Information and communication technology</td>
<td>9.4.1 Renewed/upgraded and stable ICT infrastructure platform</td>
<td>Server and storage infrastructure upgraded</td>
<td>Sept 12</td>
<td>-</td>
<td>Project fell out of original planned implementation schedule as a result of governance compliance and procurement process reviews</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implementation of e-mail archiving</td>
<td>Jun 12</td>
<td>-</td>
<td>Initiative dependent on, and is part of infrastructure solution implementation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Microsoft platform migration (from Novell)</td>
<td>Mar 13</td>
<td>-</td>
<td>Initiative dependent on, and is part of infrastructure solution implementation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VoIP (IP telephony) implementation</td>
<td>Mar 13</td>
<td>-</td>
<td>Funding reprioritisation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infrastructure data migration</td>
<td>-</td>
<td>-</td>
<td>Only applicable and planned for 2013/14 due to direct dependency on infrastructure project</td>
</tr>
<tr>
<td>9.4.2 Implemented commercial ERP solution</td>
<td>Number of ERP modules implemented and operational</td>
<td>3 (HR, Fin, PM)</td>
<td>-</td>
<td>Project fell out of original planned implementation schedule as a result of governance compliance and procurement process reviews</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RIMS instances implemented (number of institutes)</td>
<td>5</td>
<td>-</td>
<td>Research databases consolidation forms part of the solution and therefore subject to the same project plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LIMS instances implemented (number of institutes)</td>
<td>5</td>
<td>6</td>
<td>Five sites use ARC lab fully and one site uses ARC lab partially</td>
</tr>
<tr>
<td>9.4.3 Document management solution (imaging and back-scanning of historic documents)</td>
<td>Planning, configuration and implementation</td>
<td>Mar 13</td>
<td>-</td>
<td>Document management solution has a direct dependency on infrastructure and the ERP solution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Document imaging and back-scanning</td>
<td>-</td>
<td>-</td>
<td>Not applicable for 2012/13 FY. Only relates to 2013/14, dependent on completion of Infrastructure Project</td>
</tr>
<tr>
<td>9.4.4 ICT governance implementation</td>
<td>Governance model/ framework approved</td>
<td>Sept 12</td>
<td>-</td>
<td>Late development of framework due to ERP/infrastructure project time and resource demands; draft framework due for approval later in 2013/14</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CoBIT compliance implemented</td>
<td>Mar 13</td>
<td>March 13</td>
<td>On target</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduction in adverse risk findings</td>
<td>4</td>
<td>4</td>
<td>ICT risks as per Strategic Risk Register for 2012/13</td>
</tr>
<tr>
<td>9.5 Legal services</td>
<td>9.5.1 Compliance to the legislative requirements and contractual obligations</td>
<td>% compliance to the legislative requirements and contractual obligations</td>
<td>100%</td>
<td></td>
<td>Audit was performed on two institutes and nil non-compliance was identified</td>
</tr>
<tr>
<td></td>
<td>9.5.2 Litigation managed properly to ensure reduction thereof</td>
<td>Reduction in the number of cases</td>
<td>3</td>
<td>4</td>
<td>One new matter was instituted against the ARC</td>
</tr>
<tr>
<td>Sub-programme</td>
<td>Performance output</td>
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<td>YTD achievement</td>
<td>Reasons for variance</td>
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<td>--------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>9.6 Facilities</td>
<td>9.6.1 Effective Asset Management Plan</td>
<td>Asset Management Plan developed and approved</td>
<td>Nov 12</td>
<td>-</td>
<td>Challenges experienced in finding a service provider to assist in the development/finalisation of the plan; approval deferred to later in 2013/14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Asset Management Plan implemented (start of implementation)</td>
<td>Mar 13</td>
<td>-</td>
<td>Plan completed awaiting approval</td>
</tr>
<tr>
<td></td>
<td>9.6.2 Integrated physical security and safety measures</td>
<td>Number of institutes and sites with complete physical security measures (access control, perimeter fencing, surveillance and alarm systems) installed</td>
<td></td>
<td>5</td>
<td>Funding/CAPEX limitations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Established compliance to OHS Act (policy review, setting up execution structures, development of inspection plan and schedule)</td>
<td>Mar 13</td>
<td>-</td>
<td>OHS structures in place at all institutes; OHS policy due for approval early 2013/14; other legal appointments to be made after approval of OHS policy</td>
</tr>
<tr>
<td>9.7 Stakeholder relations</td>
<td>9.8.1 Improved relations and positive relationships with stakeholders through the appropriate management of stakeholder expectations</td>
<td>Stakeholder Management Plan developed and approved</td>
<td>1</td>
<td>0</td>
<td>Plan developed; awaiting approval</td>
</tr>
<tr>
<td>9.8 Information and knowledge management</td>
<td>Functional records management system in place</td>
<td>Percentage of client satisfaction</td>
<td>70%</td>
<td>83%</td>
<td>New e-resources procured have made a positive impact on the users of the library</td>
</tr>
<tr>
<td></td>
<td>Efficient provision of information services</td>
<td>Approved knowledge management strategy</td>
<td>Dec 13</td>
<td>-</td>
<td>Knowledge management strategy formulation not initiated due to delay in finding a service provider</td>
</tr>
</tbody>
</table>