



ARC • LNR

Excellence in Research and Development



Strategic Plan

2007/8 – 2011/12



The Agriculture Research Council
Striving for excellence in agricultural R&D

STRATEGIC PLAN

2007 – 2012

Table of Contents

Acknowledgements	3
1 Introduction	4
1.1 Public Sector Strategic Planning.....	4
2 The Strategic Context	6
2.1 The History of the ARC and its Legislative Mandate.....	6
2.2 A Government-wide Agenda.....	7
2.3 The African Agenda.....	8
3 The Strategy of the ARC.....	9
3.1 Strategy Development Framework	9
3.2 Strategy Development Process	10
3.2.1 Strategic Reviews.....	10
3.2.1.1 <i>The SETI Review</i>	10
3.2.1.2 <i>Internal Review</i>	10
3.2.2 Strategic Considerations	12
3.2.2.1 <i>Increased Focus on Basic Research</i>	12
3.2.2.2 <i>Human Capital Development</i>	13
3.2.2.3 <i>Technology Development</i>	13
3.2.2.4 <i>Focus on User Groups</i>	13
3.2.2.5 <i>Commitment to Agrarian Reform</i>	14
3.3 Vision and Mission	14
3.4 Strategic Thrusts.....	15
3.5 Strategic Objectives.....	15
3.6 Values – the ARC’s T A R G E T.....	17
4 Strategic Alignment.....	18
4.1 Alignment of the ARC Strategy to its Legislative Mandate	18
4.2 Alignment of the ARC Strategy to DoA Strategy	18
4.3 Alignment of the ARC Strategy to the National R&D Strategy	19
5 Key Result Areas.....	20
5.1.1 Objective 1: Generate, develop and apply new knowledge and technology...	21
5.1.2 Objective 2: Sustainable use of natural resources	26
5.1.3 Objective 3: Enhance Nutrition and Food Safety	32
5.1.4 Objective 4: Enhance the ability of the agricultural sector to manage and mitigate agricultural risks.....	36
5.1.5 Objective 5: Commercialisation of ARC research results.....	39
5.1.6 National Assets and National Services	48
5.1.6.1 <i>Animal Production Institute</i>	48
5.1.6.2 <i>Onderstepoort Veterinary Institute</i>	48
5.1.6.3 <i>Natural Resources and Engineering</i>	49
6 How do we make the strategy work?.....	50
6.1 Critical Success Factors	50
6.1.1 Priority actions to facilitate strategy implementation.....	51
6.2 Strategic Management	51
6.2.1 Capabilities	51
6.2.2 Role of the CEO	51
6.2.3 Executive Management Below the CEO.....	52
6.3 Operational Management.....	52
6.3.1 Capabilities	52
6.3.2 Operational planning	52
6.3.2.1 <i>Targets, Indicators, Review Milestones</i>	53
6.4 Reporting against the Strategy	53
6.4.1 Cross-cutting indicators of success	53

6.4.2 The ARC Balanced Scorecard	53
6.5 Organisational Structure.....	54
6.5.1 Governance.....	55
7 Budget	56
Bibliography	58

Acknowledgements

The President and CEO of the ARC hereby recognizes and appreciates the participation of all senior and executive managers, including the support functions of the organization for their participation and active contributions towards the development and formulation of this strategic plan. It indeed serves as testimony that this work will become the ownership of all in leadership positions of the ARC for effective, efficient and transparent execution of the plan.

Bridging the Gap facilitated the process of developing this strategic plan.

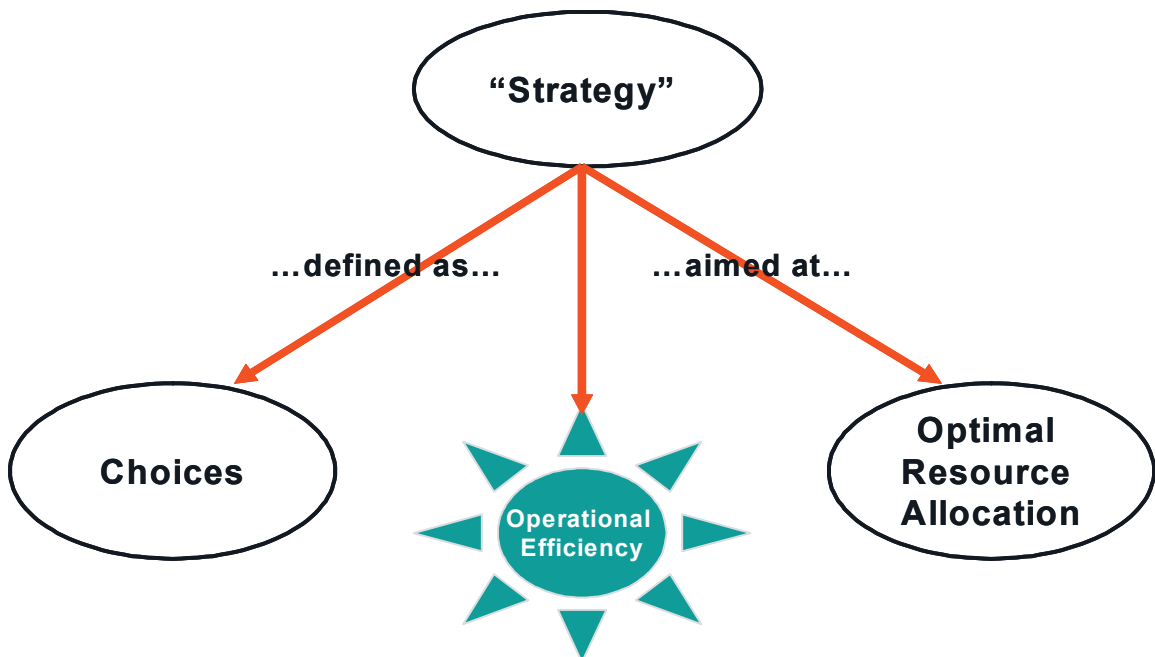
My special thanks to **Mr. M. W. Buthelezi** for his expert advice in creating the schematic of Figure 2 around the process of strategic planning without any compensation.

1 Introduction

1.1 Public Sector Strategic Planning

Strategic planning in the public sector has evolved from being a mundane and routine exercise aimed at ensuring compliance to one that is primarily driven by challenges that Government faces with regards to service delivery as well as providing a basis for the transformation of public sector institutions to deal with a wide range of issues that have an impact on service.

Unlike the private sector, strategic planning in the public sector is defined as



"making the right choices aimed at ensuring that there is resource allocation and utilisation that result in operational efficiency". In particular, strategic planning is informed by a number of trends:

- Citizen as customer – focus on delivery
- Resource limitations have created a need for strategy led institutions (vision, mission, corporate strategy and plans of action)
- Shift away from input controls, rules and procedures to output measurement and targets as an accountability framework
- Competitive provision of goods and services
- Contracting out for publicly funded services
- Performance based remuneration schemes
- Focus on efficiency and effectiveness
- Value for money principle
- Decentralisation

- A shift from a highly reactive public service to one that is proactive and delivery oriented.

These challenges are pertinent to the ARC and form the basis for understanding the process engaged in to develop this strategic plan.

2 The Strategic Context

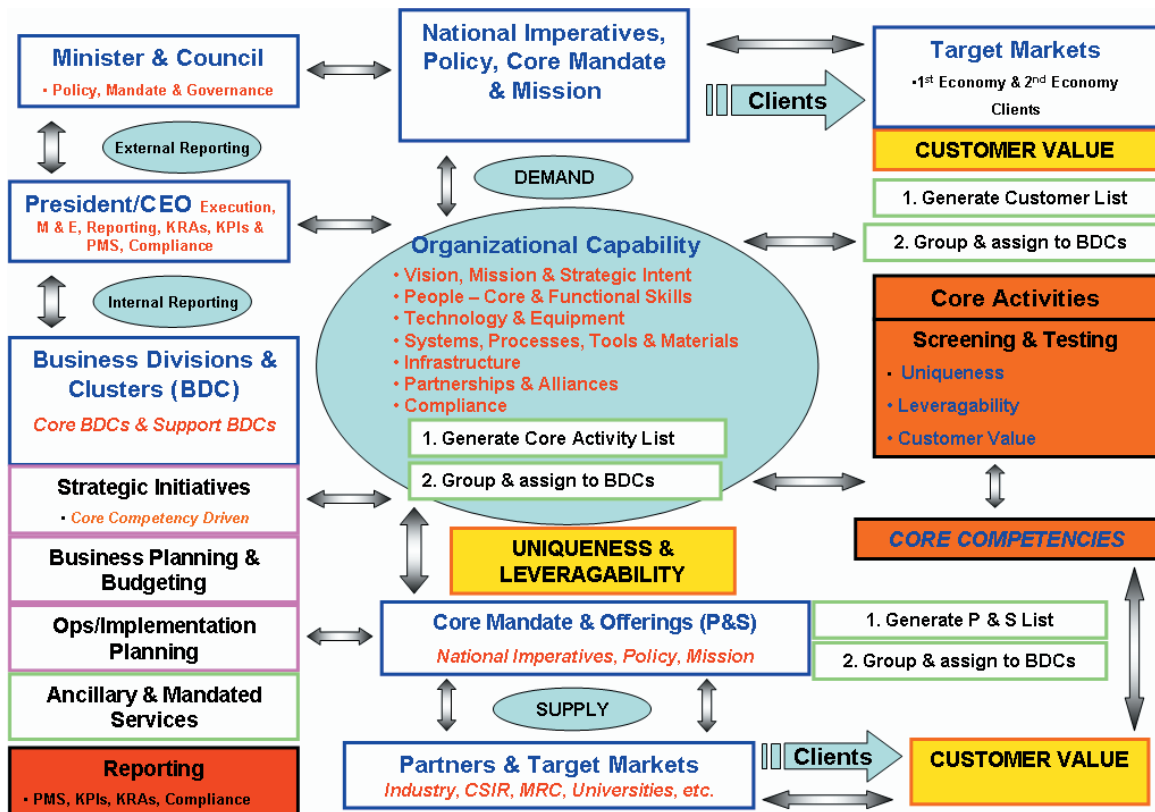


Figure 2: ARC Strategic Planning Process*

The strategic context of the ARC is defined by its own nature and the prescriptions of legislation. There are a number of factors that are key in understanding the model within which the ARC delivers value for customers/ clients (Farmers etc) as well as key stakeholders (Government/ Other government departments/ citizenry).

The challenge is always on how the ARC translates all these factors into one tangible strategy without necessarily losing sight of the goals and objectives that are advocated by various bodies within this overall framework. The discussion on the strategic context aims to identify key issues from a service delivery point of view and implications on any strategic planning process of the ARC.

2.1 The History of the ARC and its Legislative Mandate

The ARC was established by the Agricultural Research Act 86 of 1990 (as amended) and is the principal agricultural research institution in South Africa. It is a schedule 3A public entity in terms of the Public Finance Management Act 1 of 1999, as amended by Act 29 of 1999.

The Act sets out the objectives of the ARC as “conducting of research, development & technology transfer in order to:

- Promote agriculture & industry;
- Contribute to better quality of life;
- Facilitate/ensure natural resource conservation”

This function is carried out through 10 research institutes whose activities are grouped under five divisions: grain and industrial crops, horticulture, livestock, public support services, and sustainable rural livelihoods. The ARC is also responsible for maintaining national assets and undertaking programmes or rendering services that are required from time to time by the department and other stakeholders.

2.2 A Government-wide Agenda

The new governance framework for science and technology has definite implications for the Agricultural Research Council. It is critical to ensure that the research agenda of the ARC is in line with government wide objectives in relation to science and technology as well as agriculture. A brief overview of key government wide programmes and their implications on the ARC are outlined below:

- The **Government’s National Programme of Action** identifies areas which are critical with regards to its mandate of delivering *a better quality of life for all*. The Agriculture Programme of Action clearly identifies the need to, amongst others; ensure that there is food security in order to support its overall goal of providing a better life. There is a specific requirement for the ARC to develop products and provide specific services which are aimed at supporting this overall programme.
- The **National Research and Development Strategy of 2002**, as developed and published by the Government of the Republic of South Africa, identifies a number of challenges with regards to the fields of research and development and they permeate across the whole of government. The strategy document identifies a number of key strategic objectives which provide a basis for:
 - Achieving mastery of technological change in the economy and society (Innovation)
 - Increasing investment in South Africa’s science base (Human Capital Transformation)
 - Creating an effective government science and technology system (Alignment and Delivery)

The strategy states that *Science and technology are critical to the process of sustainable development. There is increasing evidence that the existing policy frameworks for development have significantly underestimated the importance of science and technology and, as a result, development policies have not led*

to sustainable outcomes, or improved the quality of life for the most marginalized people of the developing world¹.

The ARC acknowledges the fact that it is a critical stakeholder within the science and technology system of the Government of South Africa and, as such, must be geared towards innovation and creating the necessary capacity to deliver against challenges related to human capital.

- The ***Strategic Plan for the Department of Agriculture (2006)*** provides a good framework for understanding the role that the ARC has to play in supporting the agricultural sector as well as achieving the goal of creating sustainable communities.

The ARC strategy needs to find resonance with the Department of Agriculture's mission of ensuring access to sufficient, safe and nutritious food; eliminating skewed participation and inequity in the sector; maximising growth, employment and income in agriculture as well as enhancing the sustainable management of natural agricultural resources and ecological systems.

2.3 The African Agenda²

The ***Consolidated Science and Technology Plan of Action*** articulates Africa's common objectives and commitment to collective actions to develop and use science and technology for the socio-economic transformation of the continent and its integration into the world economy. It is based on three interrelated pillars:

- capacity building
- knowledge production, and
- technological innovation.

A key programme cluster in this plan of action focuses on biodiversity, biotechnology and indigenous knowledge, with priorities relating to the development of new technologies and creating capacity to ensure sustainable use of these technologies. The plan also seeks to encourage sharing and transfer of technologies which can contribute to some of the core aspects of socio-economic upliftment on the African continent. The broad goals and objectives of this plan resonate with the ARC's core mandate and are therefore pertinent to the ARC strategy.

¹ National R&D Strategy of 2002, page 7

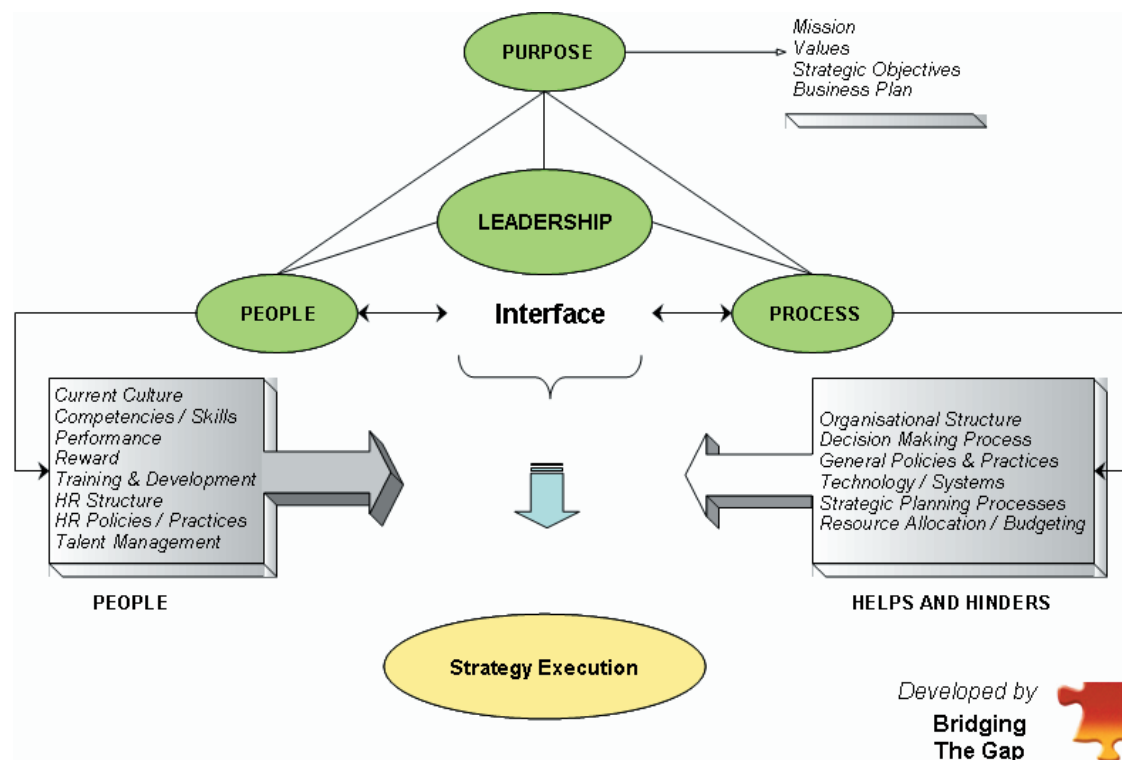
² Based on excerpts from Africa's Consolidated Science and Technology Plan of Action published in August 2005

3 The Strategy of the ARC

The strategy of the ARC has been developed using a logical process aimed at ensuring that government wide and industry specific initiatives are clearly translated into strategic objectives, key result areas as well as key programmes.

This strategy will form the basis for the formulation of operational plans, project plans as well as individual work plans and performance plans. This strategy will form the basis for the management of performance at an institutional level as well as at an individual level.

3.1 Strategy Development Framework



The ARC strategy has been developed in a systematic and logical manner. This process was guided by a customized model which helps to frame an approach to organizational effectiveness through the following key dimensions:

- Organizational Purpose
- People Competencies
- Business Processes
- Leadership

The model emphasises the need for a unified purpose as the basis for making decisions about competencies, business process and leadership. The purpose provides a starting point from which to formulate key strategies against which organisational competencies can be aligned, and in terms of which any necessary re-engineering of business processes and structures can be determined, as well as determining critically required leadership qualities.

3.2 Strategy Development Process

The new strategy of the ARC was developed at two workshops that were held in November 2006 and January 2007 respectively with senior management and representatives of the ARC³. The workshops were structured in such a manner that allowed for high levels of consultation, broad discussions on specific items as well as ensuring the inculcation of a spirit of ownership.

The process was guided by a number of best practice principles as well as the agenda determined by ARC leadership. The product of these sessions is a result of good team work, some intensive introspection, as an understanding by all involved that the ARC must excel in its core business. The conclusions and consolidation of these discussions are outlined in the following sub-sections.

3.2.1 STRATEGIC REVIEWS

One of the critical aspects that form the basis of strategy development for any institution is a need to consider the status of the relevant institution. For the ARC, any strategy development process must take cognisance of inputs from external as well as internally driven reviews and processes. The following are the key reviews conducted and the central points raised in terms of the ARC's purpose and function.

3.2.1.1 The SETI Review

The reviews of Science, Engineering and Technology Institutes (SETI), including the ARC, highlighted a number of issues which are pertinent to the direction and operations of this organization. Briefly, some of these issues are:

- There is a need to implement management process to identify necessary changes in operations and to implement them;
- There are weak linkages to sources of knowledge outside the ARC;
- The ARC has a poor record of disseminating results of own research in international literature;
- PG funds as subsidy for commercial agriculture;
- HR policies and practices out of touch with good management practices;
- Quality and relevance of outputs from research sometimes questionable.

3.2.1.2 Internal Review

ARC senior management employees conducted their own review of the state of the organization. The divisions reviewed their current structure and strategy and identified the key challenges facing each area. These were presented and discussed at the first strategy planning workshop in late November 2006. In summary, the key challenges identified per division were:

³ These workshops were facilitated by Bridging The Gap, an independent service provider.

Division: Public Support Services:

- Changing Consumer trends and economic growth
- Global sourcing of food and deregulation of international trade
- Population increase and reduction in core research infrastructure
- Price inflation
- The impact of the greenhouse effect

Division: Horticulture

- Risk management regional approach required
- Incentives to improve the quality of research
- Create an enabling environment for institutes to operate.
- Decentralise the business development function to institutes.
- Establish research farms in areas that would add value to the ARC.

Division: Livestock

- Creation of a programme development fund
- Expansion of the national database
- Incorporate balance of basic research and core business
- Establish one national database for animal improvement and recording.
- Post doctoral program

Division: Grain and Industrial Crops

- Reduction of overheads
- Delegation of authority
- Improve communication among researchers
- Funding
- Personnel issues

Division: Sustainable Rural Livelihoods

- Technology transfer not streamlined within ARC
- Lack of effective integration of socio economic research into activities.
- Lack of policy in regulating the participation and contribution of researchers
- Lack of clear agreed upon deadlines on reporting on achievements
- Dichotomy between contract research and public research.

Division: Business Development and International Relations

- Lack of policy strategies and frameworks
- No systems to monitor outputs at institutes
- No tracking of organisational wide new businesses
- No IP management strategy

- No commercialisation strategy.

3.2.2 STRATEGIC CONSIDERATIONS

The external and internal reviews provide a situational analysis of the overall context and the range of challenges facing the ARC. The analyses provide a basis for understanding key strategic considerations and choices the ARC needs to make to achieve its core business and legislative mandate. These considerations underpinned the formulation of the ARC vision, mission, strategic objectives and subsequent planning approaches. The following are some of the key considerations that emerged during the strategic planning process:

3.2.2.1 Increased Focus on Basic Research

- The National R&D Strategy states: "*South Africa undertakes about 0,5% of global research. This requires us to strengthen our connectedness to global research networks and to ensure that we develop networks and centres of excellence in the SADC and across the continent. In addition, we need to ensure that we properly protect our intellectual property and indigenous knowledge, and conserve South Africa's unique biodiversity.*"⁴

Basic research is the wellspring of new and often extraordinary discoveries and ideas. It is the environment within which scientists are allowed to explore possibility. Many world-renowned institutions view basic research as one of their core activities, and it is this activity – over the long term – that keeps them at the cutting edge of scientific discovery and innovation.

- In the South African context, the depth and range of problems facing our developing country mean that focus often shifts to applied research aimed at improving or solving immediately visible problems. This generally means that basic research takes a back seat in terms of time as well as resources.
- The ARC needs to allocate resources to basic research to ensure that it increases its ability to compete internationally, and increases its desirability as a potential fellowship venue for internationally recognised agricultural scientists
- Commitment to basic research is a long term strategy, and the outputs do not need to be linked to applied products or technologies in the short or medium term, however, such a commitment would serve South Africa well as a long term investment to development and application of new products or technologies.

⁴ National R&D Strategy of 2002, page 7

3.2.2.2 Human Capital Development

- If the ARC is to become an institution of international repute, it needs to have a clear strategy aimed at attracting and retaining a wide range of excellent scientists.
- Internationally recognised excellence is something that can only be built over time and the ARC must ensure 'opportunities for life' as part of the human resources management model.
- Linked to this is the need to build a support cadre of research leaders and managers who understand the requirements for producing work of excellence and which also takes account of social concerns.
- Keeping high quality staff means the ARC must facilitate the creation of social and political prestige (monetary & non-monetary recognition), for scientists and researchers.
- As part of its contribution to South Africa's development, the ARC needs people who are able to generate and transmit knowledge to ensure that we contribute to creating an informed society.
- Central to the ARC's mandate is the transfer of technology. This requires an Integrated Technology Transfer strategy that will facilitate the dissemination of information and technologies in a seamless manner.

3.2.2.3 Technology Development

- The need to identify areas of technology that need development. Some examples are genomics, bioinformatics, GIS, marker assisted breeding.
- The need to create centres of excellence particularly focused on areas of expertise for the ARC.
- The need to ensure that each institute has unique expertise, i.e. some kind of specialisation or uniqueness.
- The need to broaden the Agricultural Science expertise within and outside the organization.

3.2.2.4 Focus on User Groups

- The need to strengthen technology transfer & information dissemination.
- The need for appropriate infrastructure for innovation (e.g. EDD, Engineering, incubators, GIS centre, Biotech etc)
- The need to establish network & technology missions.
- The need to ensure that there is a targeted Focus on Women and Agrarian reform participants.
- The need to ensure that the ARC is adding value to its customers (competitiveness, food security, sustainable natural resources, etc).

3.2.2.5 Commitment to Agrarian Reform

- Enabling poor farmers to increase productivity.
- Developing solutions and technologies that will assist with diversifying to higher value products.
- Technologies/solutions that increase employment & income opportunities.
- Technologies/solutions that increase access to foods rich in essential micronutrients.
- Research that empowers poor farmers, especially women.

3.3 Vision and Mission

The vision of the ARC is to achieve:

Excellence in Agricultural Research and Development

The ARC's vision reflects its core business and celebrates its unique role, acknowledging its position as the principal agricultural research institution in South Africa. The vision highlights the need to harness ARC capabilities to ensure that it becomes an organization known for its excellence in its core area of business.

This vision is underpinned by the ARC mission:

The Agricultural Research Council is a premier science institution that conducts fundamental and applied research with partners to generate new knowledge, develop human capital and foster innovation in agriculture, through technology development and dissemination, and competitive commercialisation of research results, in support of developing a prosperous agricultural sector.

This articulation of its vision enables the ARC to stress:

- The importance of basic research as much as applied research capabilities;
- The need for a strong partnership model to supplement its internal capabilities;
- Developing the internal capabilities of the ARC through targeted programmes;
- The transfer and dissemination of the products or research results of the ARC to facilitate technology in agriculture and competitiveness of clients;
- The need for the whole agricultural sector (including resource poor farmers) to become sustainable.

3.4 Strategic Thrusts

There are a number of cross cutting strategic areas of focus for the ARC which provides the basis for the formulation of the ARC's strategic thrusts. The strategic thrusts provide a framework within which key initiatives of the ARC need to be developed. It also provides a perspective on strategic focus areas which are non-negotiable to the ARC. These strategic thrusts are:

Thrust a: New and improved agricultural technologies

Thrust b: Transfer the ability to utilise the new and improved technologies

Thrust c: Support for/ to resource-poor farmers

Thrust d: Competitiveness of SA Agriculture

Thrust e: Organisational sustainability and excellence (Internally and externally)

These strategic thrusts will permeate the ARC's strategic objectives, key result areas as well as programme and project outputs, and will be a central element in measurement of impact of ARC activities.

3.5 Strategic Objectives

The strategic objectives of the ARC have been developed in line with its vision, mission and strategic thrusts. They provide a basis for the formulation of detailed programmes, projects and initiatives for the ARC. The following are the strategic objectives of the ARC:

- 1. Generate, develop and apply new knowledge, science and technology**
- 2. Sustainable use of natural resources**
- 3. Enhance nutrition, food security and safety**
- 4. Enhance the ability of the agricultural sector to manage and mitigate agricultural risk**
- 5. Commercialisation of ARC research results**
- 6. Achieve corporate support services excellence**

These strategic objectives are outlined in the table below which also shows their alignment to the ARC’s strategic thrusts.

<div style="text-align: right;">Strategic Thrusts</div> <div style="text-align: left;">Strategic Objectives</div>	a. New and improved agricultural technologies	b. Transfer the ability to utilise the new and improved technologies	c. Support for / to resource-poor farmers	d. Competitiveness of SA Agriculture	e. Organisational sustainability and excellence (Internal/external)
1. Generate, develop and apply new knowledge, science and technology	X			X	X
2. Sustainable use of natural resources	X	X	X	X	X
3. Enhance nutrition, food security and safety	X	X	X	X	X
4. Enhance the ability of the agricultural sector to manage and mitigate agricultural risk	X	X	X	X	X
5. Commercialisation of ARC research results	X	x	x	X	X
6. Achieve corporate support services excellence					X

3.6 Values – the ARC’s T A R G E T

The ARC embraces the Batho Pele principles, and it strives to *maak-n-plan* by finding solutions to agricultural challenges. The people of the ARC plan to deliver their strategy while working within the framework of the following values:

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

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

Respect: Includes equity, integrity, and dignity. We shall conduct our business with integrity (the extent to which the ARC provides information accurately, emphasises impartiality and recognises different points of view).

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

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

Trust: Includes ethics and transparency. We shall ensure and foster trust amongst our employees, stakeholders and shareholder.

4 Strategic Alignment

4.1 Alignment of the ARC Strategy to its Legislative Mandate

In terms of its governing Act, the ARC is tasked with conducting research, development and technology transfer in order to:

- Promote agriculture and industry;
- Contribute to better quality of life;
- Facilitate/ensure natural resource conservation

The objectives and thrusts of this strategic plan can all be directly linked to these three result areas.

4.2 Alignment of the ARC Strategy to DoA Strategy

A quick cross reference between the ARC's identified objectives and the Department of Agriculture's Key Result Areas as set out in its strategy document, revealed a pleasing alignment between the two. DoA expects the following from ARC:

- Research and Development
- Information and Technologies packaged and transferred to farmers
- Effective Decision Support systems and tools

ARC Strategic objective	DoA KRAs
1. Generate, develop and apply new knowledge, science and technology for agriculture	KRA 1: Ensuring access to sufficient, safe and nutritious food KRA 3: Optimising growth, remunerative job opportunities and income in agriculture
2. Sustainable use of natural resources	KRA 4: Enhancing the sustainable management of natural agricultural resources and ecological systems
3. Enhance nutrition, food security and safety	KRA 1: Ensuring access to sufficient, safe and nutritious food
4. Enhance the ability of the agricultural sector to manage and mitigate agricultural risks	KRA 3: Optimising growth, remunerative job opportunities and income in agriculture
5. Commercialisation of ARC research results	KRA 3: Optimising growth, remunerative job opportunities and income in agriculture KRA 2: Eliminating skewed participation and inequity in the sector
6. Achieve corporate support services excellence	KRA 5: Ensuring efficient and effective governance

4.3 Alignment of the ARC Strategy to the National R&D Strategy

The SA Government's R&D Strategy has three strategic objectives. The strategy is indicator based and rests on three pillars:

- Innovation
- Human Capital and transformation in Science, Engineering and Technology (SET)
- Creating an effective government Science and Technology System

A review of the ARC objectives and the content of the National R&D objectives indicate that there is clear alignment between the two strategies.

ARC Strategic objective	National R&D strategic objectives
1. Generate, develop and apply new knowledge, science and technology for agriculture	1. Achieving mastery of technological change in our economy and society (Innovation) 2. Increasing investment in South Africa's science base (Human Capital and Transformation) 3. Creating an effective government science and technology system (Alignment and delivery)
2. Sustainable use of natural resources	1. Achieving mastery of technological change in our economy and society (Innovation) 3. Creating an effective government science and technology system (Alignment and delivery)
3. Enhance nutrition, food security and safety	3. Creating an effective government science and technology system (Alignment and delivery)
4. Enhance the ability of the agricultural sector to manage and mitigate agricultural risks	2. Increasing investment in South Africa's science base (Human Capital and Transformation) 3. Creating an effective government science and technology system (Alignment and delivery)
5. Commercialisation of ARC research results	1. Achieving mastery of technological change in our economy and society (Innovation) 2. Increasing investment in South Africa's science base (Human Capital and Transformation) 3. Creating an effective government science and technology system (Alignment and delivery)
6. Achieve corporate support services excellence	2. Increasing investment in South Africa's science base (Human Capital and Transformation) 3. Creating an effective government science and technology system (Alignment and delivery)

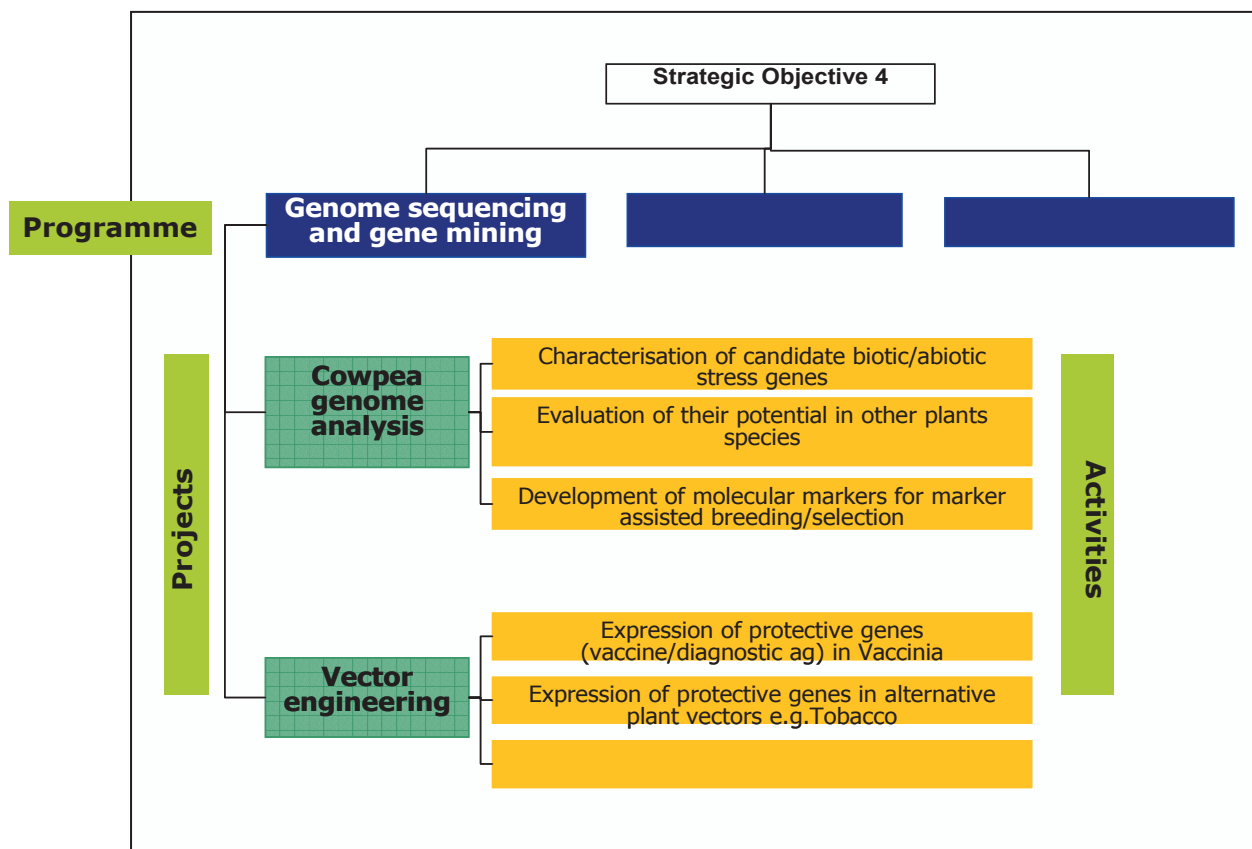
5 Key Result Areas

This section reflects in some detail the areas within which the ARC will deliver and from which it will derive its business and operational plans. The consultative process generated a set of Key Result Areas for each strategic objective. These were then cascaded down to the level of programmes, and sub-programmes or projects to ensure that the outputs could be aligned to the new objectives.

The logic of the alignment of projects to KRA is based on the following definition of programmes and projects. In order to understand the table of activities we need to have a common understanding of what a "Programme" is and how it differs from a "Project".

- **A Programme** is a **grouping of projects** contributing towards a specific theme of relevance to a strategy.
- **A Project** is a **grouping of multidisciplinary activities**, which **collectively** contribute towards a balanced portfolio of research and development on a specific challenge within a strategy.

The relationship can be represented diagrammatically as follows:



5.1.1 OBJECTIVE 1: GENERATE, DEVELOP AND APPLY NEW KNOWLEDGE AND TECHNOLOGY

Background

Agriculture is an intimate part of most peoples' lives in developing countries, and food security is only a dream for millions of the resource poor. Subsequently agriculture is increasingly playing a major role in the economic growth of less developed countries. This necessitates development of new technologies and processes in order to meet the demands for increased food production, increased food security, and poverty alleviation. Thus, since farming is the most important source of income and sustenance for about three quarters of the population of sub-Saharan Africa, there is no doubt that basic agricultural research (including application of biotechnology) can make substantial contributions towards increasing food production by rural resource-poor farmers, while assisting in the preservation of declining resources such as forests, soil, water and arable land.

However, despite its recognised importance, the sector's performance has been declining over the past decade and continues to fall deeper into the crisis. The vision of NEPAD in the Comprehensive African Agricultural Development Programme (CAADP) calls for a 6% annual growth in agricultural productivity in order to stem and reverse the current decline in food production, and incomes of the rural poor in sub-Saharan Africa. The following are among the many challenges facing the development of a prosperous agricultural sector in this region: poverty, declining land and water resources, poor water management, recurrent droughts and floods, inadequate infrastructure, civil strife, HIV/AIDS, plant and animal pests, and outbreaks of animal diseases. There is, therefore, an urgent need to reform our agricultural sector by engaging the entire research community in tackling key constraints to increased agricultural productivity.

The responsibilities and mandate of the ARC, as stated in the South Africa's National Research and Development Strategy, should be to incorporate a balance of basic and applied research in the core business in order to develop technological tools and processes that would reverse the poor performance in agricultural productivity.

Objective scope:

The National Biotechnology Strategy defines Biotechnology as: "*A collection of techniques (tools) that utilize biological systems, living organisms or derivatives thereof to make or modify products or processes for specific use*". This definition is limiting to some extent as it excludes other technologies that could be developed without the engagement of biotechnology or which can complement biotechnology for its full potential to be realized. The ARC therefore needs to engage in **basic research** (including application of biotechnology) that would yield

technological tools/processes that have the potential to lead to increased agricultural productivity in South Africa and beyond, in harmony with other global partners such as FARA, CGIAR and GFAR to mention a few. Basic research:

- Serves as a critical component of a knowledge based economy and people;
- Forms a foundation for the development of biotechnology platform;
- Underpins generation of new (novel) products / processes / technologies;
- Maintenance of ARC competitiveness and relevance;
- Contributes to the ideal of excellence and the body scientific knowledge;
- Creates a potential for publishing in high impact journals (Nature / Science) and enhances our visibility in the world of science;
- Builds a reputation for ARC as a serious scientific role player;
- Makes it possible to use the best that science has to offer in addressing agricultural problems unique to South Africa and Africa;
- ARC scientists becoming recognized through awards or specific performance criteria such as the National Research Foundation system to category A & B;
- ARC being involved and providing leadership in global scientific initiatives or forums; and,
- Potential for generation of new IPR.

Table i: Objective 1: Generate, develop and apply new knowledge and technology

Objective 1: Generate, develop and apply new knowledge and technology		
Key Result Areas	Programmes	
	Projects	
1.1 Accurate prediction of risks (drought/diseases and pests)	1. Development of hyper-spectral image data for agriculture	<ul style="list-style-type: none"> • Development of risk models and systems that ensure continued growth in a changing environment
	2. Applications for airborne multi-spectral imagery (Precision farming)	<ul style="list-style-type: none"> • In field variability mechanisms, matching genotypes to environment (e.g. choosing the right seed/breed for a particular ecosystem)
	3. Modeling systems for water-use efficiency and conservation	<ul style="list-style-type: none"> • Water availability and accessibility/ irrigation
1.2 Increased agricultural productivity	1. Molecular basis for resistance	<ul style="list-style-type: none"> • Determine and exploit the molecular basis of how: <ul style="list-style-type: none"> ❖ plants resist herbicides ❖ pests resist pesticides/insecticide ❖ plants become resistant to pests/diseases ❖ livestock become tolerant to pathogens ❖ pathogens become resistant to antibiotics ❖ Crops/animals thrive under harsh abiotic environment • Monitoring of the development of new pest populations
	2. Developmental Biology	<ul style="list-style-type: none"> • Investigating methods for harvesting, preserving (cryobiology) and propagating genetic resources (e.g. gametes, embryos/ somatic cells/ stem cells and tissues) for possible future cloning
	3. Genome sequencing & gene discovery	<ul style="list-style-type: none"> • Exploiting modern science including genomics/transcriptomics/ proteomics/ reverse genetics/ bioinformatics/ molecular markers and vectors for future development of control interventions
	4. Bio-prospecting on plants and animals	<ul style="list-style-type: none"> • Monitoring/ assessing health of the environment through metagenomics

Objective 1: Generate, develop and apply new knowledge and technology		
Key Result Areas	Programmes	Projects
		<ul style="list-style-type: none"> Investigating unique metabolic processes (metabolomics) Bio-pharming (e.g. producing pharmaceuticals/vaccines in animals and plants) Bio-activity based product innovation (on indigenous & exotic plants)
	5. Bio-control	<ul style="list-style-type: none"> Using biological systems to control: <ul style="list-style-type: none"> ❖ Insects pests ❖ pathogens ❖ disease vectors ❖ weeds ❖ pests
	6. Enhancing soil health	<ul style="list-style-type: none"> Manipulation of soil microbes and chemicals to enhance their utilization by crops
	7. Agricultural mechanization	<ul style="list-style-type: none"> Invent/fabricate new equipment, structures and facilities to support highly efficient science based agricultural production systems
	8. Studies on qualitative and quantitative aspect on crop production	<ul style="list-style-type: none"> Plant/ water/ soil relations Plant physiological studies (including physiological disorders) Effect of biotic and abiotic factors on crop production and fruit quality
	9. Inherent plant productivity	<ul style="list-style-type: none"> Understanding and manipulating factors that control plant growth and development (to improve crop performance an storage quality) Development of new crops and new uses for established crops
	10. Integrated crop protection	<ul style="list-style-type: none"> Plant interaction with insect pests, plant diseases and nematodes

Objective 1: Generate, develop and apply new knowledge and technology		
Key Result Areas	Programmes	Projects
		<ul style="list-style-type: none"> • Plant disease epidemiology and forecasting • Pest ecology and forecasting
	1.1. Environmental interactions	<ul style="list-style-type: none"> • Root development and responses to environmental stress • Plant response to nutrient and water deficiencies
1.3 Improved food quality and quantity	1. Protection against pathogens and insects	<ul style="list-style-type: none"> • Discovery and development of : <ul style="list-style-type: none"> ❖ diagnostics ❖ vaccines ❖ Molecular transformations ❖ Nuclear transfer/cloning and drug targets (in collaboration with private sector) • Refining methods for artificial propagation of animals and crops
1.4 Improved capacity for Decision Support Systems (advisory services)	1. Risk models	<ul style="list-style-type: none"> • Development of programs for analysis of data that leads to more accurate models
1.5 Increased use of renewable energy sources	1. Renewable and bio-energy mechanisms	<ul style="list-style-type: none"> • The use of crops and animal by-products and other raw materials to generate bio-fuels/bio-gas <ul style="list-style-type: none"> ▪ Discovering how to better capture and use of solar and wind power

5.1.2 OBJECTIVE 2: SUSTAINABLE USE OF NATURAL RESOURCES

Background

Natural Agricultural Resources refers to those components of the ecosystem that include soil, climate, water, vegetation, fauna and other biological resources. All agricultural production is reliant on the goods and services provided by the natural agricultural resource base. Productivity is a function of the potential inherent in these resources, and degradation, over exploitation, and mismanagement of the resource results in restrained production and restricted development.

Any improvements in agricultural productivity require a well managed sustainable natural resource base. In South Africa, improvements in agricultural productivity are essential for food security and improved quality of life, better livelihoods as well as peace and security. It's therefore important to avoid adverse impacts on South Africa's natural resources.

Sustainable natural resources management requires an integrated and holistic approach, including effective collaboration between all stakeholders at national, provincial and local levels. To achieve the goal of sustainable natural resource use through an integrated and holistic approach, it is essential to explore all technological and research opportunities available. Innovative solutions, based on well resourced research programmes, are necessary to ensure a competitive agricultural sector, including through sustainable natural resource use. The ARC through its mandate and unique scientific capacity is well positioned to play a leading role in this process.

Objective scope:

The focus of this strategic objective is to improve the efficient use of agricultural natural resources for food production, ensuring their sustainable use and management, reducing poverty and increasing wealth of people and industries dependant on natural resource-based agriculture. The needs and requirements of present and future generations of subsistence, emergent and commercial agricultural industries are addressed through the creation and application of natural resource efficient technologies, models and information systems within the following:

- Dry-land agriculture
- Irrigated agriculture
- Range and livestock
- Aquaculture

- Agricultural energy

The challenge for the ARC is to provide solutions to practical problems which are experienced in the process of utilization, development and protection of natural agricultural resources thereby contributing to productivity and growth in agriculture.

Challenges in natural resource use: The following are the main natural resource-related challenges facing the sector

Soil degradation and desertification: Soil degradation is threatening 11.5% of arable agricultural land in South Africa, creating a severe reduction in sustainable agricultural production. The main cause of soil degradation is a decline in soil organic matter from reduced plant cover as a result of, for example, deforestation, mono-cropping or overgrazing. The various forms of soil degradation include soil erosion from wind or water, decline in soil organic matter, crusting and compaction, as well as chemical degradation such as acidification and nutrient decline. Other manifestations of degradation are observed in salinity and alkalinity, largely associated with irrigation, and desertification.

Agricultural water resource management and use: Agricultural water resources management includes issues pertaining to quantity and quality of water available to agriculture and degree of accessibility. Demand for agricultural water is driven by the demand for agricultural commodities, primarily food. The two major factors contributing to increased food demand are population growth and changes in diets as a result of urbanisation and improvements in living standards. Globally food demand will roughly double by the year 2050. Urbanisation also has an impact on non-agricultural water demand. Because the per capita domestic water demand in cities is generally higher than rural areas, urbanisation will raise demand for domestic water. Urbanisation often coincides with higher demand for industrial water. In water short/ stressed countries such as South Africa this will intensify the competition for water between agriculture and other sectors such as domestic, mining and industry.

Presently in South Africa, close to 60% of the total water resources available annually is diverted to agriculture, while the predicted diverted water to this sector in 2025 is about 40% in favour of other water-using sectors of the economy. Such quantity of expectations, from agricultural sector create, various challenges on management and utilisation of the agricultural water resources in South Africa in the following areas:

- Quality and quantity control and measurement at field, conveyance and source basis;
- Accessibility, availability and assurance of supply at various scales of planning and operation;
- Crop water productivity and efficiency at various planning and operational levels;

- Agricultural water utility equipment, structures, infrastructures and facilities;
- Norms and standard for utilization of agricultural water in various scales of field, conveyance and source; and,
- Management of agricultural water and integrated management of catchments.

Environmental degradation: The main threats to land and bio-diversity are land use change, habitat destruction, veld degradation and mining operations and the introduction and population growth of alien invasive plants and crop pest species, as these affect natural resources as well economic and social development. The other environmental challenges include the injudicious use of agro-chemical substances such as herbicides, pesticides and fertilizers. The negative effects of such chemicals (especially in commercial agricultural areas) will need to be addressed through careful balance of inorganic and organic inputs and proper handling of agro-chemicals.

Climate change and natural disasters: The gradual increase on the earth's surface temperature through greenhouse gases has potentially far-reaching implications for agriculture. Even a relatively small increase in temperature could mean a decrease in agricultural production in some areas. The following are some likely implications:

- Severe effect on precipitation, water runoff and availability
- Emergence of new crop pests, weeds and diseases
- An increase in the frequency of extreme weather events
- Higher food prices due to reduced crop production
- Changes in productivity and functioning of critical ecological systems

Bio-Energy: Industrial agriculture has the potential adverse impact on natural resources such as carbon and other green house gases in the atmosphere. Crops naturally sequester carbon as part of the plants' photosynthetic growth cycle. This carbon can become an energy source for humans and animals or can be converted into bio-energy, with the potential to substitute for fossil fuels. Residuals from agriculture left on the fields can reduce erosion and contribute to soil fertility. Therefore, research on Bio-fuels could significantly impact on natural resources by, inter alia, reducing greenhouse effects, increasing agricultural productivity for rural communities and conserving natural resources.

Strategies and programmes to address the challenges: Potentially the agricultural sector in South Africa is capable of meeting the Millennium Development Goals. The following strategies and programmes will assist in meeting these challenges over the next five years.

- Develop new concepts, technologies, and management practices that will enhance the quality, productivity and sustainability of the Nation's soil, water and air resources.
- Develop site-specific management practices that result in more effective use of nutrients and agrochemicals, as well as rehabilitation of degraded land.
- Deliver integrated pest management strategies that are cost-effective and protect natural resources, human health, and the environment as a whole.
- Develop new methods to mass produce and deliver beneficial insects such as parasites, predators, and pathogens of insect and weed pests, which includes formulation of artificial diets and fermentation (or cell culture) systems for mass production, invention of automated processing, and harvesting equipment, and improving release systems for distribution.
- Develop remote sensing systems for monitoring insect distribution, density, and damage, along with development of economic thresholds, and relate the information to bio-control prospects.
- Develop an understanding of climate change and its impact on agricultural production.
- Develop an understanding of integrated and efficient natural resource based agricultural productivity and production systems.
- Support the optimal use and maintenance of the natural resource based "national assets" and related "national services".

Table ii: Objective 2: Sustainable use of natural resources

Objective 2: Sustainable Use of Natural Resources		
Key Result Areas	Programmes	Projects
2.1 Understanding the agricultural natural resource base	Characterisation and quantification of natural resources	Soil modelling & mapping Water quality & quantity characterization in water stressed catchments Irrigation potential
2.2 Understanding the eco-system functioning	Biodiversity reference collections	Sustainable wetland utilization Characterization of encroachment Alien & weed invasion Maintenance of bio-resources Soil health [beneficial organisms]
2.3 Delivery of natural resource (NR) management solutions	Integrated sustainable use and management of natural resources	Agric water use efficiency Rain water harvesting Land degradation [soil conservation] Rehabilitation of irrigation schemes
	Rehabilitation and remediation of NR	Grey water use in agriculture Rangeland rehabilitation & management
	NR production economics	Profiling of municipalities Production potential
2.4 Well functioning National Assets and natural resources databases	Management of soil, climate and coarse resolution satellite image databases (national assets)	Agro-meteorology Satellite imagery

Objective 2: Sustainable Use of Natural Resources			
Key Result Areas	Programmes	Projects	
2.5 Efficient utilisation of natural resources for improved agricultural productivity	Remote sensing	Land-use planning	
	Natural resource information and decision-support systems	Further development of AGIS [migratory pest monitoring] Promotion of CA practices Modelling impact of CA	
	Conservation agriculture	Mechanization planning and modelling Development of new prototypes	
	Agricultural mechanisation and equipment development	Performance testing – equipment & machinery Hydrological studies on dams & rivers	
	Renewable and bio-energy technology and applications		Alternative energy
			Mapping potential areas for bio-fuel Processing for bio-energy Packaging of technologies and information Databases Training

5.1.3 OBJECTIVE 3: ENHANCE NUTRITION AND FOOD SAFETY

Background

The Department of Agriculture defines food security as 'access for all people at all times to enough food for an active, healthy life'. This includes:

- Food availability: effective or continuous supply of food at both national and household level.
- Food access or effective demand: ability of nation and its households to acquire sufficient food on sustainable basis.
- Reliability of food: utilization and consumption of safe and nutritious food.
- Food distribution: equitable provision of food to points of demand at the right time and place.

Objective scope:

The objective of the Integrated Food Security and Nutrition (IFSNP) Programme is to attain sustainable access to a minimum daily, safe and nutritious food for a healthy, active and better life for all the people of South Africa. This strategy is a product of the Social Development cluster of Ministers [that includes Agriculture and Land Affairs, Health and Social Welfare]. Implementation includes interventions aimed at achieving food security. One such intervention is the development and implementation of the Food Insecurity and Vulnerability Mapping System, which is a decision support tool for designing targeted interventions. A key deliverable within the IFSNP has been the provision of Agriculture Starter Packs to support agricultural production.

Challenges in the areas of enhanced nutrition and food safety:

- Broadening the food base to reduce national dependence on a small basket of foods.
- Improving the inherent nutritional quality of food at source.
- Enabling the expansion of participation in the value chain and the reduction of waste.
- Integration of approaches to maximise impact and adoption of new technologies.

Strategies and programmes to address the challenges: The ARC seeks to address these challenges in order to provide solutions that:

- Are accessible, affordable and usable by the poor in this country;
- Are integrated into a system of production that is sustainable and self-generating; and,

- Provide an integrated approach to the provision of quality food and nutrition that provides the balance of the necessary nutrients (both macro and micro-nutrients) through the seasons.

The ARC recognises that food security is not possible without using improved appropriate animal breeds, locally bred cultivars of staple food crops such as maize, wheat, dry beans and groundnut; indigenous grain crops such as sorghum, cowpea, millet and bambara groundnut; vegetables, *amaranthus*, *cleome spp.*, potato, sweet potato and potato; fruits such as mango, peaches, nuts and others. In addition, research on crop production systems, crop-livestock systems and seed security are essential to achieve food and nutrition security. The development and availability of locally bred crops and improved animals is therefore crucial.

Table iii: Strategic Objective 3: Enhance Nutrition and Food Safety

Objective 3: Enhance Nutrition and Food Safety		
Key Result Areas	Programmes	Projects
3.1 Increased access to and availability of quality and safe nutritious food	<p>Development of new and improved cultivars and use of appropriate animal breeds</p> <p>Development of natural/organic substances/technologies for use in crop and livestock production</p>	<p>Crop and Animal improvement (existing indigenous and new) through genetic modification, production practices and bio-fortification.</p> <p>Biological control Pro-biotic mining Alternative antibiotics, vaccines, and growth stimulants</p>
3.2 Broadening the food base	Diversification of the food base and production systems	Improved production systems: (Multi Cropping / Food Based Models, intercropping, crop-livestock systems, crop rotation, precision farming, Biological/ Organic Farming)
3.3 Improved pre-harvest, harvesting and post-harvest technologies	Development of improved pre harvest, harvest and post harvest technologies, for fresh, stored and processed products (Food quality and safety)	<p>Crop quality improvement: Nutritional, grain, cooking/baking quality</p> <p>Post harvest storage (keeping quality, shelf life) and Storage Facilities.</p> <p>Processing, Fortification and value adding</p> <p>Handling method (Pre- to Post-Harvest)</p> <p>Stunning Procedures</p> <p>Sensory evaluation and biochemical Analysis</p> <p>Residue, toxicology, traceability and decontamination studies</p> <p>Phyto-sanitary and sanitary procedures</p>

Core drivers: Core drivers of the programmes in enhancing nutrition and food safety would be:

Nutritional quality

- Improving the nutritional quality of staple and other foods;
- Improving the by-products of crops/livestock for use in livestock production systems; and,
- Improving the storage life of basic and nutritious foods at the farm/household level.

Broadening the food base

- Enabling the wider acceptance of well adapted food crops/breeds that are suited for production on marginal land and more tolerant to adverse climatic and soil conditions as well as improved pest and disease resistance;
- Enabling increased use of traditional and indigenous foods and the benefits of inter- and multi-cropping production systems; and,
- Enabling the production and consumption of improved nutritious varieties.

Organisational approach: Key elements to the organizational approach for this objective would be:

Plant breeding: The main focus of breeding is to increase the adaptability, nutritional value and quality of crops and animals. In this regard two broad technologies to be used are conventional breeding and biotechnology. Activities would include:

- Screening of a number of breeds and germplasm of varieties of vegetables, fruit, indigenous vegetables, grains and cereals for higher micronutrient content (e.g. B-carotene, iron). Current research revealed variation in nutrient content within species, which suggests great potential for improvement through breeding.
- The nutritional analyses of breeding lines/cultivars/breeds.
- Development of more environmentally adaptable breeds and cultivars (e.g. drought resistant, disease resistant etc). Since breeding is a long-term strategy this will be a continuous process.

Production cost and productivity:

- The main emphasis will be to develop low-cost technologies to produce higher yielding and improved quality crops.
- Improved nutrition and adaptation will be the guiding factor for both crops and livestock.
- Grains used as vegetables will be investigated, e.g. the use of sprouts as supplements to cereal foods and cowpeas leaves as vegetables and livestock feed.

- Adoption of technologies and the total impact of the program on the rural and urban poor will be determined.

Post-harvest activities and nutrient availability:

- Develop appropriate processing technology for identified commodities to ensure minimised nutrient losses, the potential for increased general use, and increased consumption of nutrient dense foods by infants.
- Post harvest activities include seed and plant storage, commercial processing, on-farm processing and preparation.
- New technology for optimized storage/marketing of crops and livestock products.

5.1.4 OBJECTIVE 4: ENHANCE THE ABILITY OF THE AGRICULTURAL SECTOR TO MANAGE AND MITIGATE AGRICULTURAL RISKS

Background

The ARC recognises the fact that its statutory responsibilities for research, technology development and transfer require it to engage with strategic and long term research questions to the national systems of agriculture. This encompasses the ability to foresee future challenges to the agricultural sector and developing appropriate advice and technologies to alleviate and or mitigate the negative impacts of these challenges.

Objective scope:

Develop and transfer technological solutions to increase the agricultural sector's potential to mitigate the effects of risks and threats to agricultural production chain by natural disasters, diseases, pests and agricultural practices.

**Table iv: Objective 4:
Enhance the ability of the agricultural sector to manage and mitigate agricultural risks**

Objective 4: Enhance the ability of the agricultural sector to manage and mitigate agricultural risks		
Key Result Areas	Programmes	Projects
4.1 Provision of products and services relating to climate change and its impact	Modelling of natural resources for agricultural production	Effect of irrigation on agricultural production Water efficiency use for agriculture Prediction models Disaster assessment and monitoring
	Climate change and agricultural risk management	Development of adaptation and mitigation strategies Development of fire, heat and flood mitigation strategies Hydrological studies on water availability for agricultural production
4.2 Provision of strategies and models for prediction and management of pests, diseases, weeds and alien invasives	Natural resource information and decision support systems	GIS and remote sensing models that support decision making for agriculture
	Natural resource monitoring, auditing and impact assessment	Rangeland condition assessment and monitoring Surveys to determinate the impact of natural enemies on agricultural pests Quantity and quality monitoring of natural resources
4.2 Provision of strategies and models for prediction and management of pests, diseases, weeds and alien invasives	Collection, cataloguing and maintenance of agricultural biodiversity	Biosystematics of agricultural pests and their natural enemies Maintenance of gene banks Maintenance of reference collections
	Earth observation and remote sensing	Application of satellite images in agriculture Use of remote sensing in agriculture

Objective 4: Enhance the ability of the agricultural sector to manage and mitigate agricultural risks		
Key Result Areas	Programmes	Projects
4.3 Provide expert technical advisory services to support the management of climate variability and natural disasters	Integrated weed management	Control of alien invasive weeds Weed control in plant production systems
	Integrated crop and animal disease and pest management	Integrated pest management Integrated disease management Integrated toxicity management Epidemiological studies
	Scenario and mitigation modeling and planning	Rangeland rehabilitation Scenario prediction models
	Disaster and risk management in agriculture	Models for predicting drought, climate change and floods. Stocking rate variation based on vegetation availability Water risk management systems for water-stressed catchments
	Monitoring of natural resources and impact assessment	AGIS development Disaster impact assessment Development and applications of airborne multi-spectral imagery
	Prediction and quantification of risk	Prediction of toxicity, pest and disease outbreaks

5.1.1.5 OBJECTIVE 5: COMMERCIALISATION OF ARC RESEARCH RESULTS

Objective scope: The focus of this strategic objective is to explore the possibilities of turning ARC research results into tradeable commodities in order to expand the ARC's income generation capacity, and to enhance its international credibility.

Table v: Objective 5: Commercialisation of ARC research results

Objective 5: Commercialisation of ARC research results		
Key Result Areas	Programmes	Projects
5.1 Growing ARC income through exploitation of technical improvements and innovations	Business process modelling	<ul style="list-style-type: none"> • Development and management of ARC systems for commercialisation • Commercialisation system performance evaluation
	Identify specific solutions (products and services) to meet customer needs	<ul style="list-style-type: none"> • Identification of existing and new ARC technologies and products (including byproducts and infrastructure) for potential commercialization • Development and management of ARC technology database
	Business environment analysis	<ul style="list-style-type: none"> • Market intelligence to determine potential markets • Forecasting
	Marketing	<ul style="list-style-type: none"> • Development of value propositions, promotional documentation, prospectuses • Customer relationship management (CRM)
	Information and knowledge management	<ul style="list-style-type: none"> • Management of ARC information and knowledge • Broadcast communication about ARC products and services • IP rights management and licensing
5.2 Maximizing business performance of the	Facilitation creation of new enterprises (esp. BEE) to exploit	<ul style="list-style-type: none"> • Business advisory service • Socio-economic research

Objective 5: Commercialisation of ARC research results		
Key Result Areas	Programmes	Projects
agricultural sector	research results	<ul style="list-style-type: none"> • Identification of most appropriate commercialization models (incubators, co-operative, franchising etc.)
	Joint ventures	<ul style="list-style-type: none"> • Development of structured agreements to develop turn-key commercial products (partnerships with DTI, Land Bank, SEDA)
	Monitoring and evaluation	<ul style="list-style-type: none"> • Impact assessment

Objective 6: Achieve corporate support services excellence

Objective scope:

The success of the ARC's performance is predicated upon the effective and efficient internal support services. This means various elements internal to organizational support must operate in a seamless and effective manner. In the ARC, this will be measured through internal customer satisfaction monitoring systems. For example, an effective and seamless support service should create an environment where the scientists and researchers are not hampered by lack of internal services. In other words, ARC scientist and researchers should not *notice the existence and operation of organizational systems and processes*. Support services need to consistently deliver solutions that increase productivity, improve effectiveness, accountability and transparency for the organization.

Finance is at the heart of the ARC and its operational management. Therefore, an effectively managed and run finance division is critical to the ongoing success of the ARC, particularly with respect to ensuring compliance to all regulations and meeting service delivery needs.

Monitoring and reporting on ARC performance at all levels through a variety of mechanisms will be an important role for corporate support. For example, Balanced Scorecards create a strong link between corporate strategy and the objectives necessary to execute against that strategy, both vertically and across the ARC. Similarly, the South African Excellence Model, currently being utilized by the Department of Agriculture, will assist the ARC in meeting the objectives of the shareholder department. Scorecards align the actions of executives in a common direction and provide a powerful tool for accountability.

Supporting strategies in Corporate Support Services: The following strategies will be managed and monitored as part of the successful delivery of services:

- Asset Management
- Supply Chain Management and Resourcing
- Human Capital Development
- Stakeholder Management and Engagement
- Corporate Risk Management

The main focuses of corporate services work in the next period will be:

- Simple, efficient, effective and appropriate administrative systems and processes, and a Management Information System to support data storage of all kinds across the ARC.
- Monitoring and evaluation of performance at every level of the ARC

- Capacity building for existing staff to ensure that they can deliver against the requirements of the ARC strategy.
- Attraction and retention of high quality staff through appropriate recognition, development and promotion opportunities and effective leadership.
- Collection, consolidation and dissemination of information relevant to all of the different internal and external customer groupings.
- Marketing and networking to support the commercialization of ARC products and technologies.
- Identification of internationally recognized awards and quality standards such as ISO/IEC 20000, and support to the divisions in the attainment of these.

Table vi: Achieve corporate support services excellence

Objective 6: Achieve corporate support services excellence		
Key Result Areas	Programmes	Sub programme/project
<p>6.1 Attracting, developing and retaining appropriate Human Capital</p>	<p>Human Capital Alignment Plan and align our workforce with the Corporate Strategy</p>	<p>Measure people, processes and performance against corporate or divisional strategy. Provide a contextual framework system to enhance enterprise-wide synergies and collaboration. Collaboration with HR & Admin division to embed knowledge management into HR processes and practices. Knowledge management strategy</p>
	<p>Development of Intellectual Capital Human Resource Development, Performance Appraisal</p>	<p>Develop key measurement criteria and tools Establish the baseline information for better organisational modeling Consolidate operational data from integrated systems and multiple point solution applications to create master database. Define and develop cost and profitability indicators tied to our workforce and all workforce-related activities</p>
	<p>HR/Business Alignment Manage and Monitor key Human Resource processes</p>	<p>Embed knowledge management into all business processes Recognition and reward for knowledge sharing Collaboration with HR & Admin division to embed knowledge management into HR process and practices. Collaborate with HR in the development of programs and policies to retain skilled employees & retirees</p>
	<p>Intellectual Capacity retention and centres of excellence</p>	<p>Review academic promotions procedures, reward and recognition. Develop an approach for nurturing leadership skills at all management levels.</p>

Objective 6: Achieve corporate support services excellence		
Key Result Areas	Programmes	Sub programme/project
	Staff development and training Communication and implementation of equity targets – best practice support	Develop effective mentoring and coaching programmes for new scientists and professionals. Re-focus staff development activities to support the achievement of the ARC's strategic goals Produce exemplars to disseminate good practice in the production of job descriptions Undertake the ARC employee survey Introduce a Employee Assistance Programme to support staff
6.2 Integrated Information and Knowledge Management (People, Processes and Systems)	Business Intelligence and Performance Management Corporate Performance Management	Corporate Services Knowledge Management Disseminate ARC information and knowledge effectively and efficiently Customer and Channel (Marketing and Customer Service): Market and support our products and services more effectively Corporate Management (Finance, Information Communication Technology, Human Resources, Supply Chain Management and Strategy) Supply Chain (Procurement, Logistics, Social Responsibility): Efficiently manage and optimize our supply chain management systems Performance Management system: Effective individual performance management linking directly to the organisation's key strategic objectives. Legal Services: Efficiently manage all legal related issues in the organisation

Objective 6: Achieve corporate support services excellence		
Key Result Areas	Programmes	Sub programme/project
	Customer Analytics	<p>Surveys: Obtain valuable and profitable insights to enhance customer profitability and identify new revenue opportunities with customer analytics</p> <p>Ensure Internal and External Customer Satisfaction</p> <p>Business Development, Marketing and Communications</p> <p>International and Government Relations</p> <p>Improvement of Supply Chain Management, Legal Services, and ICT</p> <p>Human Resource and Admin</p> <p>Improve the way information is managed in the organization</p>
	Finance Analytics	<p>Key elements include:</p> <ul style="list-style-type: none"> Financial control, consolidation and reporting Dashboards Forecasting, Multi Year Financial Planning and Annual Budget Financial Analysis (income statement, balance sheet, cash flow) Financial management
	Supply Chain Analytics Leverage existing data from all of your systems to gain insight into your supply chain, reduce operating costs, increase revenues, and improve organisational effectiveness	<p>Supply Chain Management</p> <p>Corporate Social Responsibility Management.</p> <p>Corporate Social Responsibility Management solutions to assess risk and measure</p> <p>Corporate Social Responsibility (CSR) effectiveness by storing and managing internal and external audits, certifications, training, and corrective action plans.</p> <p>SMME and BEE supplier opportunities through integrated procurement for multi-service requirements of the ARC.</p>

Objective 6: Achieve corporate support services excellence		
Key Result Areas	Programmes	Sub programme/project
		<p>Supplier Performance/Vendor Scorecards to accurately measure the effectiveness of our suppliers and vendors.</p> <p>Supply Chain Effectiveness Analytics Lower costs and enhance supply chain responsiveness with Supply Chain Effectiveness Analytics.</p>
Strategic ICT Services Dependence and reliance on ICT systems, solutions and support has reached mission critical levels		<p>Information Communication Technology: Develop requirement specifications to meet core requirements</p> <p>Disseminate ARC knowledge through the internet and intranet</p> <p>Development of a knowledge management portal</p> <p>Strategic Information Systems Planning and Enterprise Architecture</p> <p>ICT Operational Effectiveness</p> <p>Software and Technology Selection services</p>
Service Management Processes		<p>ISO/IEC 20000</p> <p>Implementing ISO/IEC 20000 to promote and manage a culture of continuous service improvement. To provide a sound solution for exceptional and sustainable IT Service Management and responsible IT and Corporate Governance.</p>
Enterprise Management Information and Risk Management Facilities Management		<p>Information Communication Technology</p> <p>Business Intelligence Roadmaps to enhance corporate decision making and profitability.</p>

Objective 6: Achieve corporate support services excellence		
Key Result Areas	Programmes	Sub programme/project
	(Immovable and movable)	<p>Executive Dashboards: to display the ARC's critical performance measures concisely and accurately. Management gains a real-time view into key performance indicators, trends, forecasts and alerts essential for making executive decisions.</p> <p>Embed a risk management culture in all processes</p> <p>Asset Management strategy</p> <p>Total Quality Management and Occupational Health and Safety</p>
6.3 Ensuring compliance with statutory requirements, standards, policies and procedures	Legislative and regulatory scanning and interpretation	<p>Monitoring</p> <p>Policies</p> <p>New developments</p> <p>Review and report compliance</p> <p>Audit and PFMA compliance</p>
	Develop policies, standard operating procedures and standards	Provide this to all central office systems as well as to all Institutes
	Benchmarking / adaptation to changing business environment	<p>Communication of SOPs</p> <p>Functional environmental Analysis / scanning and gap analysis</p> <p>Provision of best practice information and support to all divisions</p> <p>Communication of requirements</p>
	Ensuring appropriate internal capacities and capabilities	<p>Setting standards (including policies and procedures)</p> <p>Resourcing, and Development of functional systems</p> <p>Relevant capacity building</p>

5.1.6 NATIONAL ASSETS AND NATIONAL SERVICES

The ARC is responsible for maintaining a range of National Assets and providing a set of what is commonly termed National Services. These are critical elements of the ARC's daily operations, and they will continue to be maintained and provided as per mandates. It is also assumed that their delivery and quality will be monitored and evaluated as an ongoing part of overall ARC quality management systems. This means they do not appear as a specific strategic objective.

5.1.6.1 Animal Production Institute

National Assets maintained	National Services provided
<ul style="list-style-type: none"> • National Databank for stock and game identification • Conservation of adapted and indigenous livestock breeds • National culture collection of beneficial gastro-intestinal and food fermentation organisms • Survey and information on genetic resources • Plant voucher specimen collection and vegetation database • National forage gene bank 	<ul style="list-style-type: none"> • Animal Improvement and Recording facility • Integrated Registration and Genetic Information System (INTERGIS) • Detection of genetic defects under the Animal Improvement Act 62 of 1998.

5.1.6.2 Onderstepoort Veterinary Institute

National Assets maintained	National Services provided
<ul style="list-style-type: none"> • National Tick collection • National Helminth collection • Serum bank (Virology) • Insect collection (Entomology) • Antigen bank (Virology) • DNA Database for Arbo viruses 	<ul style="list-style-type: none"> • Exotic Diseases Division, Research and production of FMD vaccine • Blood Vaccines Production Unit • Rabies OIE Reference Laboratory and diagnostic laboratory • Rift valley OIE Reference Laboratory • Blue tongue OIE Reference Laboratory • African horse sickness OIE Reference Laboratory • Lumpy skin disease OIE Reference Laboratory • African swine fever OIE Reference Laboratory

5.1.6.3 Crop Divisions

National Assets maintained	National Services provided
<ul style="list-style-type: none"> • Indigenous plants and vegetable gene banks : Indigenous bulb flower gene Bank Medicinal plant, Indigenous vegetables and Cassava, Vegetable, Sweet potato, Potato and Fynbos gene bank • Protein Seeds gene banks Groundnuts, Sunflower, Soya beans, Dry beans, Bambara, Cowpeas • Summer Grain genebanks Maize, Sorghum, Millet • Tropical Crops genebank Avocado, Banana, Citrus, Coffee, Exotics, Granadilla, Guava, Litchi, Macadamia, Mango, Pecan • Industrial Crops gene banks Cotton, Cassava, Hemp, Tobacco, Flax • Small Grain gene bank Wheat, Barley, Oats, Rye, Triticale, durum, Pathogen Biotype Bank (Stem, Leave and Stripe), Entomopathogenic Collections • Grapevine gene bank • Deciduous fruit gene bank • Yeast gene bank 	<ul style="list-style-type: none"> • Research with respect to: <ul style="list-style-type: none"> ◦ Generation of new varieties; ◦ Harvesting of genes for possible transfer (genetic modification); ◦ Taxonomy; ◦ Bio-systematics; ◦ Ecology and; ◦ Bio-diversity. • Identification of unknown species for the purpose of: <ul style="list-style-type: none"> ◦ Import and export control of agricultural inputs and products and ◦ Generating new varieties.

5.1.6.4 Natural Resources and Engineering

National Assets maintained	National Services provided
<ul style="list-style-type: none"> • Agrometeorological network, databanks and information systems • Land Type Surveys • NOAA satellite image databases • National collection of arachnids • National collection of nematodes • National collection of fungi • National microbial genebanks • Irrigation and equipment testing • Tractor and farm implement test facilities • Renewable energy centre 	<ul style="list-style-type: none"> • Agro meteorological weather data and information • Soil and land type information • Satellite imagery for agricultural mapping • Phyto – sanitary and quarantine support • Diagnostic support • Quality assurance of equipment and irrigation infrastructure • Testing services of farm implements and tractors

6 How do we make the strategy work?

6.1 Critical Success Factors

The composite package of the way an organisation understands, manages and communicates, all contribute to its eventual success or failure. An organisation's critical success factors are the critical resources and capabilities needed to efficiently and effectively deliver its strategy. There are a few fundamentals that must be in place, particularly at the highest level of the organisation. If these are established at the level of senior management, then there is a good chance that the same good practice will be cascaded to the operational levels. The fundamentals for any organisation include:

- Understanding the needs of stakeholders and customers
- Effective internal and external communication
- Strategy ownership by governance structures and senior management
- Strategic resource allocation and utilisation
- Appropriate structure to delivery on strategy
- Strategic management, including performance management, monitoring, evaluation and reporting
- Relevant internal culture and value system

Conversely, strategic plans can fail to be realized successfully, and this is often because of one or more of the following:

- Failure to understand the customer due to inadequate market research or the lack of a real need for the product
- Inability to predict environmental reaction
- Over-estimation of resource competence and failure to develop new employee and management skills
- Failure to coordinate due to inadequate reporting and control relationships and inflexible organisational structure not flexible enough
- Failure to obtain senior management commitment
- Failure to obtain employee commitment
- Under-estimation of time requirements
- Failure to follow the plan
- Failure to manage change
- Poor communications
- Failure to focus or inability or unwillingness to make choices which are true to the strategic mission (i.e. to do fewer things, better), leads to mediocrity, inability to compete
- Unrealistic expectations

6.1.1 PRIORITY ACTIONS TO FACILITATE STRATEGY IMPLEMENTATION

With this in mind, the ARC has identified the following priority activities to ensure the successful implementation of the new strategy:

- The ARC will undertake to publicise the new strategy internally as well as externally. **Communication of the strategy** will be cascaded through out the ARC institutes through relevant communication structures. Consideration will be given to the introduction of new communication mechanisms to support this initiative.
- The proposed **organisational structure** or any structural changes will be made against the backdrop of the new strategy, and all additional structural requirements or amendments must be aligned to the strategy.
- The **resourcing strategy** will include identifying critical resource requirements and competencies needed for delivery. This will form the basis for any skills development or capacity building initiatives within the ARC.
- Organisational **cultural re-engineering** will be undertaken to develop and inculcate a new dispensation to support effective implementation of the new strategy. A critical aspect will be the development of an appropriate set of ARC **values**.
- The strategy will be cascaded down to individual work plans and performance agreements which will be used as a basis for the **management of performance** of staff within the ARC.
- An overall **Change management** plan will be drafted and implemented in order to create an enabling environment for implementing the new strategy.

6.2 Strategic Management

6.2.1 CAPABILITIES

The role of strategic management is to ensure that the organisation has a direction, is able to get there, and can tell others about its success. Also key at this level is the capacity and capability to deal with change and people within the context of changing environments. Strategic management capability must include some element of the core business expertise of the organisation, but cutting edge expertise is not required. The following capabilities – in order or priority – are required for the ARC at the level of strategic management:

- Leadership and visioning capability
- Managing change capability
- Capability to critically monitor performance
- Management capability
- Scientific capability

6.2.2 ROLE OF THE CEO

The CEO is the primary interface between the ARC and its external stakeholders, and the person who provides internal stakeholders with direction and an enables their delivery.

This is a role involving responsibility for maintaining legislative functions, as well as strong visionary, leadership and influencing requirements, and an ability to clearly and appropriately delegate responsibilities. A central element of the CEO's functioning in the next period will be to drive a process of change and innovation, making the ARC an organisation with international credibility. At the same time, he will have to provide guidance and leadership to those inside, containing and managing his organisation in the process.

6.2.3 EXECUTIVE MANAGEMENT BELOW THE CEO

Roles at this level involve clear understanding of the strategic context and an ability to support the CEO in this area, but also an ability to accept delegated responsibilities, to translate strategy into delivery frameworks, and to support operational managers. In other words, this level of management is the primary interface between strategy and operations, and a critical capability is monitoring performance of the organisation and managing overall operational performance. In the ARC there are two key areas of work at this level:

- Co-ordination and delivery of the ARC's core mandate
- Co-ordination of the operational support functions of the ARC

6.3 Operational Management

6.3.1 CAPABILITIES

The role of operational management is to ensure that the different divisions, institutes, departments, programmes and projects actually produce products and outputs of the required quality, quantity, on time and in budget – in other words, the nuts and bolts of production. Critical capabilities at this level are:

- Managing change capability
- Capability to evaluate performance
- People management capability
- Resources and process management capability
- Scientific capability

6.3.2 OPERATIONAL PLANNING

Operational plans will be aimed at delivery of the KRA's in the Strategic Objectives, and will cover the period 1 April 2007 to 31 March 2008. Each operational plan should include the following elements:

- Programme;
- Sub – Programme (Project);
- Key Outputs (Deliverables);
- Key Milestones/events (time frame and quantifiable);
- Performance Indicators; and,
- Budget MTEF (amount).

6.3.2.1 Targets, Indicators, Review Milestones

Each operational plan will include a set of clearly defined indicators with specifically measurable targets. These indicators and targets should be independently verifiable, and should also address the cross cutting strategic thrusts. The operational plans include:

- start and end dates for all projects and, if relevant, timeframes for programmes
- key project and programme milestones
- key project and programme review dates, when delivery will be monitored and targets adjusted

6.4 *Reporting against the Strategy*

6.4.1 CROSS-CUTTING INDICATORS OF SUCCESS

While each strategic objective will have its own set of specific and measurable targets and indicators of success, there are a set of indicators which can be measured across the ARC, and which will provide a sense of the ARC's growing ability to hold its own among international leaders in agricultural science and technology research and development. Specific targets will be set against these indicators at an institute level, and these can then be reported on at the level of ARC.

Indicator	Target
Articles published in scientific journals/publications	At least 300 peer reviewed publications annually At least 1200 non peer reviewed publications
Technologies developed and implemented	60 % of Commercial farmers actively use 60 % of Resource-poor farmers actively use
Patents and other Intellectual Property	100 % patents & other IP registered per institute/year
International recognition of ARC scientists and researcher	20 % keynote addresses delivered by ARC personnel 30 invited papers per annum 20 ARC personnel invited to chair symposia
Internationally recognised post-graduate degrees	50 post graduate degrees obtained by ARC personnel (including interns and fellows)
Marketable products produced and released	80 % of products produces and on sale / year
Request for collaboration / materials / licensing of technology / post doctoral attraction / referees	80 % requests annually

6.4.2 THE ARC BALANCED SCORECARD

The ARC has adopted the Department of Science and Technology' Balanced Scorecard format, which further ensures alignment of its outputs to the Department's and national

priorities and goals. The aim of this high-level document is to enable managers throughout the institution to cascade their objectives and outputs against those in the scorecard. The scorecard measures outputs in the following categories:

Key Result Area	KPI
Stakeholder perspective	
Fulfilling the Council mandate	<ul style="list-style-type: none"> • Narrative, as part of the CEO's report • Application of funds table
Support of the NSI / R&D Strategy goals	<ul style="list-style-type: none"> • NSI goals table
Ensuring quality of policy and decision making	<ul style="list-style-type: none"> • Decision quality table
Financial perspective	
Financial sustainability	<ul style="list-style-type: none"> • Key financial reports: Income Statement, Cash Flow, Balance Sheet
	<ul style="list-style-type: none"> • Sources of income table
	<ul style="list-style-type: none"> • Ratio of contract income to total
Organisational perspective	
Overhead efficiency	<ul style="list-style-type: none"> • Ratio of overhead cost to total cost
	<ul style="list-style-type: none"> • Proportion of researchers to total staff
	<ul style="list-style-type: none"> • Salaries to total expenditure
Best practice	<ul style="list-style-type: none"> • Results of Quality Audit
Customer service / Quality	<ul style="list-style-type: none"> • Results of Customer Satisfaction Index survey
Learning and growth	
Quality of Scientific Output	<ul style="list-style-type: none"> • Scientific output table
Scientific Capacity	<ul style="list-style-type: none"> • Qualification of staff table
External relations	<ul style="list-style-type: none"> • External relations table
Transformation	
Organisational demographics	<ul style="list-style-type: none"> • Demographics table

Scorecard results will also be reported to the DOA in the following categories:

- Funding allocations per strategic objective, as well as against the categories of Management of national assets; Provision of national services; and Ring-fenced projects, and other strategic initiatives as per the shareholder request.
- Outputs that impact on quality of life.
- Outputs that impact on growth and wealth creation.
- Outputs that impact on other national priorities.
- Outputs that meet the customer needs, particularly in the agricultural sector.

6.5 Organisational Structure

The strategy development process participants agreed that it was important for the structure of the ARC to talk to its core purpose and, at a practical level, the delivery of the outputs required for the strategic objectives. This meant that the role of strategic management would be undertaken by the CEO and his direct reports. Operational management currently is the remit of the R&T managers, and this is probably the

appropriate level. However, the extent to which the different institutes are appropriately resourced is not yet absolutely clear. It is known that there is surplus capacity and under-utilised buildings and properties in some areas. Whether these resources can be directed at new requirements based on the strategic objectives must be determined.

The CEO, together with his management team, has initiated a process to determine functionality of all resources against the requirements of the strategic objectives.

6.5.1 GOVERNANCE

The Minister of Agriculture as the Executive Authority has appointed the ARC Council (Board), which governs the organization. The powers and functions of the Council are stipulated in the Agricultural Research Council Act, 1990 (Act No. 86 of 1990 as amended by Act 27 of 2001) and the Public Finance Management Act, 1999 (Act no. 1 of 1999 as amended) and further elaborated in the Council Charter. Briefly the powers and functions of the Council could be summarized as follows:

- To ensure good corporate governance in accordance with all relevant legislation and policies, including the King II report;
- To serve as the Accounting Authority;
- To determine the policy and objectives of the ARC;
- To approve the organization's strategic plan and annual performance plans;
- To set performance targets for the organization and the President;
- To oversee and evaluate the performance of the organization and the President;
- To ensure annual reporting to the Executive Authority on the organization's governance and performance.

AGRICULTURAL RESEARCH COUNCIL
 BUDGET OVERVIEW FOR THE MTEF PERIOD
 CONSOLIDATED (CORE STRATEGIC PROGRAMS, STAKEHOLDER FUNDING AND EXTERNAL INCOME)
 CONSOLIDATED INCOME AND EXPENDITURE ESTIMATE

PROGRAMS	Sub-Programme	Medium-term expenditure estimate		
		2007/08	2008/09	2009/10
		R'000	R'000	R'000
PROGRAMS	Generate, develop and apply new knowledge, science and technology	116,849	121,523	128,814
	Sustainable use of natural resources	163,588	170,132	180,339
	Enhance nutrition, food security and safety	155,798	162,030	171,751
	Enhance the ability of the agricultural sector to manage and mitigate agricultural risk	163,588	170,132	180,340
	Commercialisation of ARC research results	101,268	105,319	111,639
	Achieve corporate support services excellence	107,899	111,015	115,877
	TOTAL EXPENDITURE	808,990	840,151	888,760
	Climate Monitoring	1,113	1,166	1,244
	Diagnostic, Analytical, Quarantine Services (DAQS)	15,797	16,171	16,719
	Crop Forecasting	5,678	5,905	6,301
FUNDING	Intergis	1,809	1,896	2,023
	Gene banks, National Collections, Inventories, Databanks, Surveys and Information Systems (DoA)	10,500	11,004	11,742
	Gene banks, National Collections, Inventories, Databanks, Surveys and Information Systems (DST)	43,000	43,000	43,000
	Reference Laboratories, Exotic Disease and FMD Facility (DoA)	20,000	24,000	–
	VAT	54,676	57,300	61,141
	SADC	3,000	3,000	3,000
	Baseline allocation	375,926	394,114	420,738
	Accumulated surplus	9,810	5,487	29,232
	ARC	267,681	277,108	293,620
	TOTAL FUNDING	808,990	840,151	888,760

AGRICULTURAL RESEARCH COUNCIL
 BUDGET OVERVIEW FOR THE MTEF PERIOD
 CONSOLIDATED (CORE STRATEGIC PROGRAMS, STAKEHOLDER FUNDING AND EXTERNAL INCOME)
 CONSOLIDATED INCOME AND EXPENDITURE ESTIMATE (continued)

PROGRAMS	Sub-Programme	Medium-term expenditure estimate		
		2007/08	2008/09	2009/10
		R'000	R'000	R'000
	Current			
Economic Classification	Compensation of Employees	434,402	461,701	502,330
	Goods and Services	287,450	288,004	290,863
	Use of Infrastructure (Depreciation)	29,652	30,660	32,193
	Payment for Capital Assets			
	Acquisition	57,486	59,786	63,373
	TOTAL	808,990	840,151	888,760
	Current			
Standard Items of Expenditure	Compensation of Employees – Core Research	365,766	388,752	422,962
	Compensation of Employees – Administrative Support	68,636	72,949	79,368
	Goods and Services	237,872	235,947	236,204
	Use of Infrastructure (Depreciation)	29,652	30,660	32,193
	Professional Services	49,578	52,057	54,660
	Capital Assets	57,486	59,786	63,373
	TOTAL	808,990	840,151	888,760

Bibliography

1. The Agricultural Research Act 86 of 1990 (As Amended)
2. Government of South Africa Website:
 - a. www.gov.za (Focus on the Programme of Action and Reports thereof)
 - b. <http://www.info.gov.za/aboutgovt/poa/report/index.html>
3. South Africa's National Research and Development Strategy as developed and published in August 2002 by the Government of the Republic of South Africa
4. Africa's Science And Technology Consolidated Plan Of Action – a consolidation of science and technology programmes of the African Union (AU) Commission and the New Partnership for Africa's Development (NEPAD)
5. The Agricultural Research Council's annual report for the period 2005/06
6. The 2006 Strategic Plan for the Department of Agriculture
7. SARS - <http://www.sars.gov.za/budget/documents/budget/2006/ene/Vote%2025%20Agriculture.pdf>



ARC • LNR

Excellence in Research and Development

PO Box 8783, Pretoria, 0001

Telephone: +27 12 427 9700

Fax: +27 12 430 5814

ISBN-13 978-1-86849-353-1

www.arc.agric.za