

**RESEARCH AND
DEVELOPMENT PLAN FOR THE
PORK INDUSTRY
IN SOUTH AFRICA
2012 - 2018**

**RED MEAT RESEARCH AND
DEVELOPMENT (RMRD)
PLANNING COMMITTEE (R & D)
PORK**



CONTENTS

	Page
EXECUTIVE SUMMARY	4
1. STATEMENT OF INTENT	5
1.1 VISION	5
1.2 MISSION	5
2. BACKGROUND	5
2.1 INDUSTRY STRUCTURES	5
2.2 BACKGROUND AND DEVELOPMENT IN THE SOUTH AFRICAN RED MEAT INDUSTRY REGARDING THE FUNDING OF R & D	6
2.2.1 Structures concerned with R & D	6
2.2.2 RMIF and RMLA	6
2.2.3 RMRDT	7
2.2.4 Project and Planning Committees and SAPPO's (R & D) Portfolio Committee	7
2.2.5 Research Institutions	7
3. MOTIVATION FOR R & D	7
4. RESEARCH AND DEVELOPMENT OBJECTIVES / PURPOSE	8
4.1 PRIMARY GOALS AND ASSOCIATED CONSTRAINTS	8
4.2 SECONDARY GOALS AND ASSOCIATED CONSTRAINTS	8
5. INDUSTRY R & D CHALLENGES AND INTERVENTIONS	9
5.1 FOCUS AREA 1: SUSTAINABLE ANIMAL RESOURCE CONSERVATION AND UTILIZATION	9
5.1.1 Component: Pig genetic resources	9
5.1.2 Component: Environmental protection	10
5.2 FOCUS AREA 2: LIVESTOCK PRODUCTION WITH GLOBAL COMPETITIVENESS	10
5.2.1 Component: Pig recording and Improvement	10
5.2.2 Component: Reproductive efficiency (MS)	10
5.2.3 Component: Genetics and physiology of product development	11
5.2.4 Component: Genetic improvement	11
5.2.5 Component: Nutrient intake and utilization	11
5.2.6 Component: Integrated models for more efficient management	12
5.2.7 Component: Pig housing	12
5.3 FOCUS AREA 3: ANIMAL HEALTH AND WELFARE	13
5.3.1 Component: Pathogen detection	13

5.3.2	Component: Microbial genomics (viral, bacterial and protozoa)	13
5.3.3	Component: Epidemiology of pig disease	13
5.3.4	Component: Genetic resistance to disease	13
5.3.5	Component: Disease control strategies (vaccines)	14
5.3.6	Component: Mycotoxins	14
5.3.7	Component: Pig Welfare	14
5.4	FOCUS AREA 4: ANIMAL PRODUCTS AND VALUE ADDING	14
5.4.1	Component: Intrinsic quality of pork	14
5.4.2	Component: Product technology and shelf life	15
5.5	FOCUS AREA 5: PORK SAFETY, QUALITY AND VALUE	15
5.5.1	Component: Microbial pathogens	15
5.5.2	Component: Chemical residues	16
5.5.3	Component: Composition of pork, bio-availability of nutrients and sensory appraisal	16
5.5.4	Component: Equipment, materials and infrastructure	16
5.6	FOCUS AREA 6: CONSUMERISM, MARKET DEVELOPMENT AND TRADE	16
5.6.1	Component: Value chains	16
5.6.2	Component: Market analyses	17
5.6.3	Component: Risk analysis and management	17
5.7	FOCUS AREA 7: LIVESTOCK- BASED TECHNOLOGY TRANSFER AND DISSEMINATION	17
5.7.1	Component: Information systems	17
5.8	FOCUS AREA 8: CLIMATE CHANGE AND SUSTAINABLE LIVESTOCK PRODUCTION	17
5.8.1	Component: Climate change	17
6.	FINANCIAL PLAN	18
6.1	ESTIMATE OF FUNDS REQUIRED FOR R & D	18
6.2	FUNDING MODEL	18
6.3	FUNDING SOURCES	19
7.	MONITORING RESEARCH AND DEVELOPMENT	20
7.1	EVALUATION AND MONITORING OF R & D PROJECTS	20
7.2	DISSEMINATION OF RESEARCH AND DEVELOPMENT RESULTS	20
8.	RECORD OF PORK PROJECTS	21
8.1	RESEARCH INSTITUTIONS	21
8.2	LIST OF PROJECTS ON PIGS / PORK (1998 TO 2007)	21

EXECUTIVE SUMMARY

The Business Plan provides information on the areas of R & D where interventions are required. The outcomes and results of these interventions are considered as necessary and relevant to support the vision and mission of the pork industry, namely, to become a more profitable and sustainable industry through an increased local market share and an improved export initiative.

The industry structures are described, as are the RMRDT structure and procedures to prioritize, evaluate and fund R & D projects. Research focus and projects are categorized under eight Research Focus Areas which relate to national objectives:

- Sustainable animal resource conservation and utilization
- Livestock production with global competitiveness
- Animal health and welfare
- Animal products and value adding
- Pork meat safety, quality and value
- Consumerism, market development and trade
- Livestock-based technology transfer and dissemination
- Climate change and sustainable livestock production

The need for funds and an estimate of requirements are expounded upon from several perspectives. This should provide a basis for discussion when funding methods and options are considered, e.g. the request for a statutory levy.

1. STATEMENT OF INTENT

1.1 VISION

To be a broad-based and dynamic service provider or facilitator representing and supporting the South African pig industry in quest for profitability and sustainability through an increased local market share and an improved export initiative.

1.2 MISSION

To serve the interests of South Africa's pig industry by:

- introducing methods and measures to improve the competitiveness of the industry
- promoting the consumption of pork and pork products among consumers
- encouraging research
- disseminating information among pig farmers and establishing links to coordinate with role-players in the supply chain.

2. BACKGROUND

2.1 INDUSTRY STRUCTURES

Role players in the pork industry are the SA Pork Producers' Organisation (SAPPO), SA Meat Processors Association (SAMPA), Pig Breeders Society (PBS), SA Meat Industry Company (SAMIC) and the Pig Veterinary Society (PVS). All these organisations have constitutions and are bodies corporate with full autonomy regarding aspects affecting the industry. In brief, their structure and functions are as follows:

- SAPPO consists of five provincial organisations namely 1) Premier Pork Producers' Organisation, 2) Cape Pork Producers' Association, 3) KwaZulu-Natal Pork Producers' Organisation, 4) Free State Pork Producers' Organisation and, 5) Eastern Cape Pork Producers' Association.

It is financially self-sufficient through voluntary / compulsory contributions. It serves as a mouthpiece for commercial pork producers, irrespective of size, ethnic origin or locality. SAPPO strives to facilitate the efficient and profitable production and orderly marketing of pork to enable producers to obtain the best prices, benefits and stability.

- SAMPA is a voluntary association of stakeholders in the meat processing and related industries. It was founded in 1945 as the SA Meat Packers Association, but was later renamed the SA Meat Processors Association which is more descriptive of the operations of its members. Full membership requires involvement in the meat processing business in South Africa. Associate membership is available to establishments who have an interest in the industry. SAMPA is registered as a Section 21 company and operates according to the policies determined by its Annual General Meeting within the parameters of its constitution.

The PBS is a voluntary association for persons engaged in the breeding of pigs in South Africa. The Society is affiliated with SA Stud Book and is responsible for the registration of all animals meeting the minimum performance and requirements laid down by the Society. The PBS also functions to promote the breeding and genetic improvement of pigs in South Africa and generally to foster the pig industry's interests.

SAMIC is registered as a Section 21 company and is managed by a board of directors representing the entire spectrum of the meat industry. SAMIC's establishment resulted from a need for an umbrella organisation that would ensure the effectiveness and survival of the industry in a deregulated environment. SAMIC operates as a national organisation for the red meat industry and is a service provider, facilitator and communicator for all whom it represents.

The PVS is a voluntary organisation for veterinarians interested in the pig industry and the improvement of performance of pig herds. The Society forms a group within the national South African Veterinary Association.

2.2 BACKGROUND AND DEVELOPMENT IN THE SOUTH AFRICAN RED MEAT INDUSTRY REGARDING THE FUNDING OF R & D

Since the 1930's the organized Red Meat Industry in South Africa contributed financially to R & D when the Meat Board supported the developmental research of the Dorper sheep. Through ensuing years, the Meat Board, various individual organisations like cattle breeders' associations, SAMIC, RMRDT (Red Meat Research and Development Trust of SA) and since 2006, the RMIF (Red Meat Industry Forum of SA) and SAPPO's R & D Port Folio Committee contributed financially to R & D concerned with red meat production processes and products derived from red meat producing livestock. These included the funding of the establishment and functioning of Livestock Improvement Schemes (like the central performance testing stations for beef cattle and pigs), research facilities (at universities and the Meat Industry Centre at Irene) and the execution of numerous research projects – many of them leading to post graduate qualifications of research personnel. The Red Meat Industry does not do the research itself but outsources the task to recognised research institutions, like institutes of the ARC (Agricultural Research Council), universities and Provincial Departments of Agriculture. (See Item 8.2 for the names of specific research institutions where pig / pork projects were / are done). The process is facilitated by RMRD SA since 2009. RMRD SA refers to the service provider administrating the research funds deriving from the RMRDT, the Statutory Levy and other funding schemes.

2.2.1 Structures concerned with R & D

The following structures are involved in the planning of R & D, and the obtaining and distribution of funds:

- Red Meat Industry Forum (RMIF)
- Red Meat Levy Administrator (RMLA)
- Red Meat Research and Development Trust (RMRDT)
- RMRDT – Project Committee
- RMRDT Planning Committee (R & D) Cattle & Small-stock
- RMRDT Planning Committee (R & D) Pork Industry
- South African Producers Organisation: R & D Port Folio Committee (SAPPO)

2.2.2 RMIF and RMLA

- The Red Meat Industry Forum of South Africa (RMIF) is an association of 12 organisations and associations involved with the Red Meat Industry. It was formally constituted in 1997 in accordance with provisions in the Marketing of Agricultural Products Act no 47 of 1996 (as amended). It is thus regarded by the government as an affected party. It is the central body of the Red Meat Industry where policy decisions regarding matters affecting the organisation and functioning of the Red Meat Industry are deliberated and decisions taken. During 2005 the Forum applied to the Minister of Agriculture to institute statutory measures, one being the implementation of a levy on slaughter stock and their products. Part of the proceeds of the levy funds is designated to R & D.

The RMIF recognised that R & D and technology transfer should be done continuously on red meat production processes and on the products of red meat producing livestock. They acknowledged that these functions are cardinal to the progress of any industry. The absence of these would cause eventual industry stagnation, loss of market share and loss of the multiplying effect in the agricultural sector. The annual allocation from the RMRDT to fund industry agreed

upon research projects was considered as insufficient to affect any real progress. Hence it was agreed that part of the levy funds would also be designated to R & D.

- The RMLA (Red Meat Levy Administrator) is an agent which is employed by the Forum to collect and distribute the levy funds according to approvals / decisions of the latter. The Forum considers and approves business plans of, amongst others, the Planning Committee (R & D) Cattle & Small-Stock, Planning Committee (R & D) Pork and SAPPO (which has a section on R & D). These plans contain the research projects to be conducted as well as budgets for them. As funds become available from the collections of levies, the RMLA transfers funds for certain projects to the accounts of the RMRDT and SAPPO for further distribution to the research institutions which do the research.

It was estimated that about R3,4 m could be collected annually for R & D purposes.

2.2.3 RMRDT

The Red Meat Research and Development Trust of South Africa (RMRDT) was established in 1997, through the initiative of the Meat Board's Members in preparation for the envisaged closing of the Board in accordance with the Marketing of Agricultural Products Act no 47 of 1996, as amended. The Meat Board donated R15m to the Trust. The interest on this capital plus monies accrued over time is used annually to support research projects of merit. The tasks of the Trustees of the Trust are to manage the financial affairs (including proper investment of funds), to approve the project budget as presented by the Planning Committees, and to make the funds available for the research projects to be conducted by the research institutions. Since 1998, between R1 m and R2 m was allocated annually to R & D projects. (See addendum).

2.2.4 Project and Planning Committees and SAPPO's (R & D) Portfolio Committee

Various committees have been formed to assist the RMRDT Trustees and the RMIF Council in deciding on funds for R & D. The composition of these committees is representative of the various role players in the Red Meat Industry as well as of the groupings in the research fraternity (ARC and Universities). These committees plan the research, evaluate and prioritise research project proposals and protocols, consider and approve budgets for individual projects, monitor progress and evaluate final reports of research projects. In addition to these, SAPPO has its own R & D Portfolio Committee which functions in parallel with the Planning Committee (R & D) Pork. Eventually these committees inform the providers of funds (RMIF and RMRDT) which projects should be funded. (See Item 8.2 for a list of R & D projects concerned with pigs / pork which have been funded since 1998).

2.2.5 Research Institutions

Their functions are to:

- design project protocols in accordance with the needs identified by the industry;
- submit project proposals and protocols to the Planning Committees for evaluation;
- execute research, within the contractual obligations of the RMRDT;
- submit timeously progress and final reports to the Planning Committees for evaluation;
- prepare articles and other material for publication.

3. MOTIVATION FOR R & D

An interpretation of the definition of research and development (R & D) as defined in the Agricultural Research Act gives substance to the importance thereof for the pig industry: "R & D is the furtherance, accumulation and improvement of knowledge to develop new, modify or adapt existing technologies to support the advancement of the industry in general and, more specifically, to assist with meeting its

goals and objectives". Thus, R & D must be integrated into the mission of the industry and its deliverables aligned with the targets and achievable goals set by the industry.

In the recent strategy exercise of SAPPO, the importance of relevant and sustainable R & D programmes has been recognized and introduced to ensure advancement of the industry. Other programmes (excluding those with a managerial aim) include communication, industry monitoring, export support, promotion, information and statistics, and empowerment. This document, in response, will provide goal-driven implementation R & D plans with deliverables and expected outcomes.

4. RESEARCH AND DEVELOPMENT OBJECTIVES / PURPOSE

A broad and encompassing visionary goal would be a competitive and profitable pig industry that grows, and supplies safe, fresh and processed products of good quality in concert with a diversified domestic and international consumer demand. Associated goals would be empowerment through promotion of new entrepreneurs and job creation, and conservation of resources to ensure long term sustainability and viability of the industry. Elements of these statements provide natural linkages with the focus areas of constraints and challenges that should be addressed.

4.1 PRIMARY GOALS AND ASSOCIATED CONSTRAINTS

The pig industry, as any other industry, has the responsibility and commitment to deliver on the core strategies of the Strategic Plan for South African Agriculture, namely to:

- enhance equitable access and participation in agriculture
- improve global competitiveness and profitability, and
- ensure sustainable resource management

Within these core strategies are implicated those that have been defined above as visionary and associated goals with the primary aim of creating wealth, prosperity for those involved in the industry, a sustainable natural and competitive environment, and safe, sound and wholesome quality food for those who utilize products of the industry.

Of concern is that pig production in the developing sector is still in its infancy if considered in terms of viable intensive production systems as well as in terms of total contribution to the pork economy. The estimated contribution of the communal areas to the total numbers of pigs is about 26%, with significant numbers only in the Eastern Cape and Limpopo provinces. These are primarily housed in extensive systems with low turnover, the off take being largely consumed on site and in the immediate vicinity. A major challenge would be to establish viable commercial units with associated processing and retail outlets in partnership with black entrepreneurs and shareholding by suppliers, to support job creation and participation in the mainstream supply chain and / or export markets. Such units will also be in a better position to promote pork in the rural and peri-urban environment to promote higher per capita consumption. It will, furthermore, contribute to a culture of safe production and processing practices especially in combination with pressure measures such as traceability and HACCP as a red meat safety, quality and value management system. Secondary benefits would be the establishment of or linkages with suppliers such as feed, pharmaceutical and construction companies.

4.2 SECONDARY GOALS AND ASSOCIATED CONSTRAINTS

The per capita consumption of pork at 3.1 kg per year is low in comparison to European standards, mainly because of poor pork consumption by particular groups. Marketing therefore, should be addressed in a different way. The right target group is of paramount importance, for example the black market with strategies to scientifically promote pork as the alternative to white meat. The market is also not sufficiently diversified and is in fact limited, because of insufficient distribution points and no coordinated export strategy. Demand, furthermore, is apparently also low because of a negative

consumer perception that pork is unhealthy, variable in quality, not well displayed and product options limited.

Some of these constraints appear to be poor coordination and a lack of common goals between producers, input suppliers and those participating in the value-adding chain. At worst, there are sometimes clashes of interest and such should be addressed as a matter of urgency.

Inconsistency in quality of products may relate to PSE pork, poor colour and fat distribution, careless slaughtering, incompetent deboning, unprofessional display of cuts and irregular re-evaluation of the classification system for pork. The problem may be exaggerated by some slaughter facilities that are not up to standard, inappropriate pig genetics, poor pre-slaughter handling of pigs and the wrong production practices. A major goal would be to systematically analyze major flaws in the production chain and to put in place food quality management measures through collective actions of all role players.

Food quality management embraces ideally the integrated use of technological disciplines and managerial sciences. A balanced approach is a techno-managerial approach to red meat safety, quality and value. The aim of this is to guarantee that quality requirements are realized by the quality system in place, so that customer expectations on red meat safety, quality and value are not only met, but also exceeded. The philosophies of a technical approach (good manufacturing practice codes) are blended with the management focus of the International Standard Organization Series (ISO), through total commitment to the HACCP managerial approach to total food quality management.

The profitability of production in intensive systems is highly dependant on size of operation, turn over and input costs. These put high demands on production efficiency which requires continuous improvement in genetics, nutrition, health, management, housing and the number of slaughter stock in relation to maintenance costs of sows and boars. Increased efficiency in production and processing should ensure an affordable and viable alternative to white meat, which would be the major challenge if pork is to increase its market share, particularly in the comparatively unexploited emerging sector market.

The export market provides a further dimension to a diversified market, with benefits in selling to markets that have high demand for pork and foreign currency entering the country. The identification and development of such markets should be investigated carefully with suitable contacts, partnerships and relevant information to ensure sustainability.

5. INDUSTRY R & D CHALLENGES AND INTERVENTIONS

5.1 FOCUS AREA 1: SUSTAINABLE ANIMAL RESOURCE CONSERVATION AND UTILIZATION

5.1.1 Component: Pig genetic resources

The gene pool of breeds and strains of both foreign and local origin should be protected and screened for more efficient use. This should be supplemented with biological criteria and economic variables to ensure viability and sustainability of new, small scale and larger high turnover operations.

Outcomes

		Priority
5.1.1.1	A diverse gene pool from which selections can be made effectively is maintained.	B
5.1.1.2	The sustainability of genetic material for particular circumstances, markets (consumer needs) and farm operations is established.	B
5.1.1.3	Genetic potential for intensive farming practices is identified and evaluated.	B
5.1.1.4	Maintenance of a well managed and secure gene bank (semen and embryos) with a support data base.	B
5.1.1.5	The conservation and utilization of indigenous pig genetic resources used in	C

extensive farming practices.

- | | | |
|---------|---|---|
| 5.1.1.6 | Utilization of genetic resources through setting of breeding objectives for both intensive and extensive farming practices. | B |
|---------|---|---|

5.1.2 Component: Environmental Protection

Waste management and prevention of pollution or eutrophication are paramount to ensure sustainable small and large pig production systems. Research in this regard should be specific for particular circumstances, but also holistic to support integrated approaches. Recycling of nutrients should be maximized for sustainability.

Outcomes

	Priority
5.1.2.1	Information and methodology to manage waste and effluent from piggeries. A
5.1.2.2	Information and methodology to reclaim polluted resources (where applicable). A
5.1.2.3	Appropriate equipment and infrastructure enabling sustainable and environment-friendly production systems A
5.1.2.4	Information and methodology to convert biowaste in usable energy. A

5.2 FOCUS AREA 2: LIVESTOCK PRODUCTION WITH GLOBAL COMPETITIVENESS

5.2.1 Component: Pig Recording and Improvement

The goal is to develop and maintain the National Integrated and Genetic Information System (INTERGIS) for pigs. This includes recording of baseline performance, strategic decision support, health monitoring, traceability, individual herd management and genetic improvement.

Outcomes

	Priority
5.2.1.1	Maintenance / construction of a fully accessible database capable of supplying information related to strategic decision processes, traceability, management decisions and genetic improvement. B
5.2.1.2	A control system for data reliability based on international guidelines. C
5.2.1.3	Enhancement of the functionalities of the national data base by the development of user-friendly interfaces to enable efficient data usage by producers. B
5.2.1.4	Identification of genes and gene markers related to economically important traits (e.g. test service for malignant hyperthermia (MH) expanded to all pig producers in South Africa. B

5.2.2 Component: Reproductive efficiency (MS)

The overall goal is to improve reproductive efficiency of pigs. Research will focus on improvement through genetics, nutrition, health and management within the constraints of a particular environment. Research advances and new (bio) technologies will be developed to reduce losses due to reproduction problems (e.g. seasonal infertility)

Outcomes

	Priority
5.2.2.1	Improved cryo preservation, sexing, in vitro production and transfer technology of embryos. C
5.2.2.2	The relationship between fatness and the reproduction capacity of the sow over her reproductive life established. B

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|---------|---|---|
| 5.2.2.3 | The problem of seasonal infertility solved or well managed. | B |
| 5.2.2.4 | Production of semen and embryos and application of sexed semen and embryos in production systems. | B |

5.2.3 Component: Genetics and physiology of product development

New knowledge is needed to understand the genetics affecting meat development and improve the control and manipulation of physiological systems supporting muscling, growth and metabolism in pigs. Research will focus on identifying genes that influence a quality product (e.g. the MH gene and PSE pork) factors directing nutrient partitioning toward protein and less fat to improve efficiency, enhanced nutrient composition and palatability / tenderness of pork.

Outcomes

	Priority
5.2.3.1 Development and implementation of technology that can measure meat quality characteristics / physical, (candidate genes) on live animals for breeding purposes.	A
5.2.3.2 Leaner boars, gilts, castrates with higher growth and meat yield, and better feed efficiency selected.	A
5.2.3.3 The genetics, variability and physiology of nutrient composition and meat quality characteristics of pork understood.	A
5.2.3.4 MH gene eliminated from SA pig herds.	A
5.2.3.5 Continuous selection against heredity deficiencies such as scrotal hernia, atresia ani, foot deficiencies, prolapse and sensitivity to stress.	A

5.2.4 Component: Genetic improvement

The primary objectives are to accelerate the selection response towards efficient and profitable production of healthy, nutritious and palatable pork, in association with healthy and vigorous growing pigs while maintaining high fertility levels.

Outcomes

	Priority
5.2.4.1 Property developed selection criteria and breeding objectives to accelerate the selection response towards efficient and profitable pork production by using <ul style="list-style-type: none"> ▪ operational statistical models ▪ breeding plans 	B
5.2.4.2 Information systems and decision support models for continuous improvement in small and large operations.	B
5.2.4.3 Genetic progress within closed (control) pig herds for the most important pig breeds continuously estimated.	C

5.2.5 Component: Nutrient intake and utilization

Nutrition is the single most costly component in livestock production. Sub optimal nutrition causes production losses and increases disease susceptibility. Research is required in the following areas to improve pig nutrition:

- a) Chemical composition and availability of nutrients in current potential and waste products;
- b) Evaluation of protein sources, protein mixtures and amino acids;
- c) Identification and elimination of antinutrients such as antitrypsin, alkaloids, glycosinolates, saponins and tannins;

- d) Quantification of nutrient utilization through usage of the ideal protein concept;
- e) Usage of lower energy feedstuffs (fibrous) for particular purposes such as small scale and outdoor operations;
- f) Nutritional requirements as they change with genetic improvement and management;
- g) Development / evaluation of (alternative) non-antibiotic growth promoters and health enhancers (feed additives, prebiotics and biotherapeutics);
- h) Identification and evaluation of alternative feed sources;
- i) Development of feeding strategies for optimal production in tropical and sub-tropical environments.

Outcomes

		Priority
5.2.5.1	New or improved analytical techniques to define feedstuff composition and address requirements imposed by changing circumstances.	B
5.2.5.2	Data bank of feedstuffs quantified in terms of composition, bio availability of nutrients and antinutrients.	B
5.2.5.3	Information and methodology to test and eliminate anti nutrients in pig diets.	B
5.2.5.4	Improved definition of dietary and nutrient needs of pigs.	B
5.2.5.5	Information on new and non-conventional feed sources, feed additives and biotherapeutics for specific purposes or systems and global compliance.	B
5.2.5.6	The influence of adverse environmental conditions (e.g. high temperatures on the nutrition of pigs, e.g. the sow) qualified.	B

5.2.6 Component: Integrated models for more efficient management

Efficient pig production encompasses a vast number of factors including biological, environmental, input, market and infrastructure elements. These are difficult to integrate for effective decision support without the aid of computer based technology. Integrated models will assist decisions and strategies that will yield the greatest economic return and identify gaps in scientific knowledge in different systems.

Outcomes

		Priority
5.2.6.1	Information systems for continuous improvement in intensive and extensive pig production systems.	B
5.2.6.2	Decision support models developed for small and large operations.	B
5.2.6.3	Practical guidelines and computer software to enable efficient managerial and economical decisions for different scenarios.	B

5.2.7 Component: Pig housing

Housing and associated infrastructure should be designed and tested to ensure an optimal environment for pig growth, production and reproduction in different production systems.

Outcomes

		Priority
5.2.7.1	Designs and information on appropriate housing and facilities.	B
5.2.7.2	Appropriate equipment developed for different circumstances and systems.	B

5.3 FOCUS AREA 3: ANIMAL HEALTH AND WELFARE

5.3.1 Component: Pathogen detection and microbial genomics (viral, bacterial and protozoa)

The development and introduction of new, rapid, sensitive and specific serologic and molecular diagnostic tests through a microbial genomic approach. This should be supported by a routine diagnostic service for pigs in a well-equipped laboratory.

The availability of microbial genome sequences using high – throughput sequencing technologies will provide a battery of new tools to study microbial pathogenesis, the evolution of disease and assist in the development of new diagnostic and control approaches.

Outcomes

	Priority
5.3.1.1 Sequence data for the genome of priority pathogens of pigs that allow development of databases for use in diagnostic test development, molecular epidemiology and new approaches to vaccine development.	B
5.3.1.2 New, rapid, sensitive and specific diagnostic tests developed that will reduce the time needed to detect pathogens and diagnose diseases.	A
5.3.1.3 Development and implementation of improved vaccines, diagnostic methods and control approaches of microbial based pig diseases.	B

5.3.2 Component: Epidemiology of pig diseases

To develop new control strategies to prevent disease by monitoring and surveillance of pig diseases on a national scale. This should be assisted by a well – equipped serology, bacteriology and histopathology service. In the research component, molecular diagnostic tools based on pathogen genome sequences and recombinant antigens will allow rapid identification and characterization of pathogens as well as back tracing of pathogens to their source of origin.

Outcomes

	Priority
5.3.2.1 More cost effective pig disease control strategies will become possible through epidemiological surveillance, risk analysis and impact assessment.	A

5.3.3 Component: Genetic resistance to disease

Host immunological and physiological responses will be used to identify pigs resistant to the lethal effects of pathogens.

Outcomes

	Priority
5.3.3.1 Identification of genetic disease resistance in pig breeds and strains will contribute to the formulation of breeding strategies to improve resistance and lower the economic impact of certain diseases.	B
5.3.3.2 Pig strains resistant to certain diseases established.	B

5.3.4 Component: Disease control strategies (vaccines)

To develop, implement and support a strong recombinant vaccine initiative based on knowledge generated through a sound molecular approach. This should be supported by the importation and local testing of effective pig disease vaccines on the international market.

Outcomes

	Priority
5.3.4.1 New recombinant vaccines with improved safety and efficacy developed.	B
5.3.4.2 International vaccines tested and cleared for use in the SA pig industry.	B

5.3.5 Component: Mycotoxins

The presence of mycotoxins in pig feeds is a direct threat to pigs and an indirect threat to red meat safety, quality and value. Careful control and monitoring of mould growth and mycotoxin levels are necessary to prevent / minimize contamination. Research should also focus on methods of modifying or transforming mycotoxins to non-toxic substances.

Outcomes

	Priority
5.3.5.1 The control of mould growth and mycotoxins in pig feed, formulation and storage.	B

5.3.6 Component: Pig welfare

Research and techniques to support or improve cost effective and humane treatment in housing, handling, transport, health care, pre slaughter and slaughter are paramount to reduce input costs and increase meat quality in pigs.

Outcomes

	Priority
5.3.6.1 Appropriate housing and infrastructure to cope with the welfare requirements of faster growing, more efficient genotypes and for different production systems.	A
5.3.6.2 Appropriate infrastructure and equipment for optimal practices during handling, transport and slaughtering of pigs to ensure the desired meat quality.	A
5.3.6.3 Appropriate infrastructure, equipment, information and standards for the humane and cost effective handling of pigs.	A
5.3.6.4 Developing optimal animal welfare practices in raising the pigs from farrowing to slaughter.	A

5.4 FOCUS AREA 4: ANIMAL PRODUCTS AND VALUE ADDING

5.4.1 Component: Intrinsic quality of pork

Research should define the roles of product composition, molecular structure and physical state in determining quality and functionality. Genetic improvement and research of processes should maintain or enhance meat product quality during harvest, storage, transport and marketing.

Outcomes

	Priority
5.4.1.1 New knowledge derived from a better understanding of the structure, properties and function of meat components to facilitate development of a variety of new products.	A
5.4.1.2 Better understanding of the inherent mechanisms that maintain quality characteristics of pork should allow for genetic manipulation to maximize desired traits, to limit variability in quality characteristics and to improve processes that can extend the life of these desirable traits.	B

5.4.2 Component: Product technology and shelf life

Research should enhance knowledge of meat development and processing and specifically emphasize new and novel pork products that can enter niche export markets but also underutilized and underdeveloped local markets. Techniques and management procedures to extend product shelf life for both markets are required.

Outcomes

		Priority
5.4.2.1	Affordable and suitable meat and meat-containing products to satisfy the needs of sophisticated domestic and international consumers.	A
5.4.2.2	Improved products and processes of extending shelf life during storage to optimize nutritional value and safety, to reduce waste, improve efficiency and allow new uses that are currently limited.	A

5.5. FOCUS AREA 5: PORK SAFETY, QUALITY AND VALUE**5.5.1 Component: Microbial pathogens**

Pork should ideally be free of any traces of pathogens and spoilage organisms. Research should emphasize development of reliable and rapid methods to detect and eliminate pathogens throughout the production (live animal) and pre harvest, harvest and post harvest process. Monitoring and service programmes should focus on quality surveys, establishment of sustainable surveillance programmes, HACCP training and the use of microbial indicators as red meat safety, quality and value and quality standards to ensure safe fresh and processed pig meat products.

Outcomes

		Priority
5.5.1.1	The means to ensure that fresh and processed meat is safe for consumers and that it meets domestic and foreign regulatory requirements.	B
5.5.1.2	Information on pathogens and microbial safety of fresh and processed meat.	B
5.5.1.3	Negligible levels of pathogens on live animals being presented for slaughter.	B
5.5.1.4	Established data banks and benchmarks for monitoring the safety of fresh and processed meat.	B
5.5.1.5	Scientific information on which to base guidance or HACCP training programmes that effectively control the presence of pathogens in the production and processing processes.	B
5.5.1.6	Decreased risk of food-borne illness, which enhances public confidence in fresh and processed meat.	B

5.5.2 Component: Chemical residues

The objective is to reduce the risk of chemical residues from drugs, feed additives and environmental contaminants. Surveys, surveillance programmes as well as cost-effective and user-friendly methods of detection are major goals.

Outcomes

		Priority
5.5.2.1	Information on chemical residues in fresh and processed meat.	B
5.5.2.2	Negligible levels of chemical residues in pig feed and the live animal presented for slaughter.	B
5.5.2.3	Methods to monitor cost effectively the accumulation of chemical residues in pig production systems.	B

5.5.3 Component: Composition of pork, bio-availability of nutrients and sensory appraisal

Information on the nutritional composition of fresh and processed pig meat products and the bio availability of these nutrients are essential for dieticians to design menus, for promotion and to inform the consumer. This should be supported by sensory appraisal to determine consumer acceptance.

Outcomes

		Priority
5.5.3.1	Improved scientific basis for more effective guidance to the consumer regarding fresh and processed meat.	B
5.5.3.2	Information to more effectively promote the advantages and palatability of fresh and processed meat.	B
5.5.3.3	Information to expand the diversity of pork options on the menu.	B

5.5.4 Component: Equipment, materials and infrastructure

Infrastructure and equipment are required to ensure that fresh and processed meat can be handled, stored and processed with limited microbial contamination in order to reduce risks and increase shelf life.

Outcomes

		Priority
5.5.4.1	Infrastructure, materials, equipment and systems that meet the requirements and specifications	B

5.6 FOCUS AREA 6: CONSUMERISM, MARKET DEVELOPMENT AND TRADE**5.6.1 Component: Value chains**

The macro and micro marketing environment and forces driving the marketing of livestock products have changed drastically since 1994. Traditional trends in prices are no longer applicable and consumer preferences and buying patterns have also changed. Within this milieu the pig industry must find its niche to continue selling at a profit. Research should focus on understanding the market better and identifying opportunity gaps. The informal and global market should also be considered.

Outcomes

		Priority
5.6.1.1	A proper understanding of changing market trends, domestically and internationally, to ensure and support strategic management and marketing in the Pig Industry.	B
5.6.1.2	Improve the ability of the Pig Industry to act pro-actively on changes in market trends, rather than re-actively.	B
5.6.1.3	Better understanding by the primary pig producer of change in the market and market trends. This will nurture better relationships amongst role players	B
5.6.1.4	Growth and sustainability of the export market.	B

5.6.2 Component: Market analysis

Probably the most intriguing science is that which attempts to understand the behaviour of consumers. It entails continuous investigation to understand how consumers behave to different market stimuli. Consumer behaviour involves, amongst other things, issues pertaining to food safety considerations, product quality, buying patterns and fashion statements. Adam Smith stated that "Consumption is the sole end and purpose of all production". Hence the success of production and market penetration to a large extent will be determined by the success with which consumer preferences and whims have been taken into account or researched.

Outcomes

		Priority
5.6.2.1	New or adapted pig meat products on the market matching consumer preferences and buying patterns.	B
5.6.2.2	Strengthened backward and forward linkages to support growth and sustainability in the industry.	B
5.6.2.3	Market research at consumer level.	B

5.6.3 Component: Risk analysis and management

The Pig industry needs to manage markets, labour etc. Central to these management functions are decisions related to risk bearing. Research should focus on identification and evaluation of the range of options available to deal with risk and the implementation of effective measures to overcome risk.

Outcomes

		Priority
5.6.3.1	Early warning systems and recommendations to assist the pig industry.	B
5.6.3.2	Knowledge on markets and knowledge on risk and impact analysis to decrease risk associated with pig production.	B

5.7 FOCUS AREA 7 : LIVESTOCK-BASED TECHNOLOGY TRANSFER AND DISSEMINATION**5.7.1 Component: Information systems and technology transfer**

Research results for the pig industry should be captured in databases and analysed and packaged in ways, e.g. Internet, software and website, to facilitate improved access to and dissemination of information.

Outcomes

		Priority
5.7.1.1	Well-planned and managed information databases capturing research results for modeling and technology transfer usage, in association with other information.	B
5.7.1.2	Information and educational material for the pig industry on software, audio-visual collections and the printed media.	B
5.7.1.3	Indoor and outdoor farming systems.	A
5.7.1.4	New and non-conventional feed sources.	A
5.7.1.5	Disease control and animal welfare.	A
5.7.1.6	Markets and market access.	A
5.7.1.7	Knowledge of limiting risk in spreading diseases from / to small and emerging pig production enterprises.	A

5.8 FOCUS AREA 8 : Climate change and sustainable Livestock Production**5.8.1 Component: Climate change**

Climate change represents a feedback-loop within which livestock production both contributes to the problem and suffers from the consequences. The pork industry is not going to escape the adverse effects of climate change and should pro-actively respond to this challenge.

Outcomes

	<i>Priority</i>
5.8.1.1 The influence of adverse environmental conditions on pig production, seasonal infertility, high temperatures and nutrition, aflatoxins, etc.	A
5.8.1.2 Carbon footprint	A
5.8.1.3 Water footprint	A

6. FINANCIAL PLAN

6.1 ESTIMATE OF FUNDS REQUIRED FOR R & D

Reliable estimates can only be obtained once prioritization of projects has been done. However, an estimate for budgeting purposes and future needs is required. Several approaches may be followed:

According to the Green Paper on Science and Technology (1995), government's expenditure on R & D as a proportion of GDP is about 0.73%, whereas total expenditure on agricultural R & D according to the Foresight on Agriculture and Agroprocessing of DACST (1997) amounted to 1.04%. Both figures have been considered way below what should be spent on R & D if agriculture is to be taken forward. Figures of 2% plus of GDP are the most recent indicators.

If rounded figures of 0.75, 1.05 and 2% are used and the gross value of the pig industry as R875 million (2001/02), estimates for R & D requirements come to respectively R6.56, R9.19 and R17.5 million. From an analysis of project costs about 15% are operational costs and 85% account for infrastructure, personnel and overheads, which are ideally borne by the government supported research institutions. If so, the operational (running) costs which should be provided by the industry amount to respectively R0.98, R1.38 and R 2.63 million. However, government contribution has been decreasing, which requires an escalation of about 50%, bringing the estimates to between R1.5 and R4 million.

From the two quotes above one may deduct that government's contribution to R & D costs amounts to about 70% (0.73/1.04). Thus, for a 1% of GDP contribution, the 30% which must be provided by the industry will be R2.63 million; if it is 2% of GDP the amount will be R5.25 million.

In an analysis of project costs for the pig industry funded by the RMRDT since 1995 (scaled for inflation and escalations), the average total cost per project was R265 000. Because of limited funds, the RMRDT could contribute to only about 60% * of projects done for the pig industry, which indicates that the capacity of the R & D institutions is about 15 to 20 projects per year. If multiplied by R265 000, the total investment is R3.98 to R5.3 million of which 30% amounts to respectively R1.19 and R 1.59 million.

These approaches differ substantially in their estimates of what is required, which emphasizes the importance of prioritization. They nevertheless provide some framework of what could be expected, ie. about R2 to R3 million as a realistic average and maybe lower when prioritized.

* *Figure estimated from projects where funds were applied from the RMRDT plus projects where funds were not applied for.*

6.2 FUNDING MODEL

Whereas the calculations above provide some basis for a rough estimate, it should be realized that a particular ratio between government's responsibility (say 70%) and that of the industry (say 30%) has no substance. Whereas some responsibility is accepted by government for maintenance and infrastructure and for personnel and other capacity requirements, a strong user-pay principle is being established. In this context distinction is made between R & D that benefits the industry specifically and R & D that is more generic, ie. is for the benefit of the country. A third category is R & D for the emerging sector that cannot pay, at least for some time on the road to competitiveness.

Peripheral to these are aspects of the responsibility of government to provide an “enabling environment” within which the industry can prosper.

Examples of these categories could be the development of new products by a research institution to diversify the product choice of the consumer (not to be confused with a confidential request by a particular company which falls outside the scope of funding arrangements) which is 100% the concern of the industry, as are promotional and market research. Quality of the product presents interesting possibilities: as quality per se is industry specific. In order to ensure a quality product there are peripheral or associated issues that often need to be addressed simultaneously such as red meat safety, quality and value, HACCP humane treatment of animals, etc, which are part of government’s responsibility to provide an enabling environment. Thus, depending on the contents of a particular project in this context the ratio between government and industry support can vary. Both the pig improvement scheme and maintenance of the health of the national herd have large government support components, because they relate to public assets, biodiversity, genetic resources, biosecurity and other aspects of an enabling environment. Funding of projects for the emerging sector would be primarily government responsibility although one can often make a case that benefits of such projects can also accrue to the established (commercial) sector. The envisaged projects should be categorized along these lines to link them with government and industry goals and objectives and budgeted accordingly.

6.3 FUNDING SOURCES

There are a number of sources that can be exploited apart from what is available through the generation of a levy, RMRDT and the funds provided through the research institution itself. These have particular goals that should be considered when funding is applied for. For example, the Innovation Fund and the funds supplied by DST to the Biotechnology Research Industry Centers (BRIC’s) have in common the goal to make an industry or company more competitive, the THRIP fund where the DTI is the funder has in addition to competitiveness , capacity building as a major objective. Funds available from institutions such as the Land Bank, Development Bank and donor organizations such as USAID are earmarked for development projects to empower people.

The principle is, once R & D projects are defined according to the guidelines described in 6.2, it would be much easier to motivate them also in terms of the goals of these funding sources and thereby potentially improve the total funding pool to take the pig industry forward.

7. MONITORING RESEARCH AND DEVELOPMENT

7.1 EVALUATION AND MONITORING OF R & D PROJECTS

The Planning Committees have through the years developed procedures according to which proposals and protocols for research projects, progress reports, final reports and popular articles for publication are judged.

These procedures are adapted when needed. They are considered efficient and will still be used.

7.2 DISSEMINATION OF RESEARCH AND DEVELOPMENT RESULTS

During the course of a project, it generally occurs that the research personnel take part in information days, present posters or papers at symposia and even publish technical or scientific articles. These must all be mentioned in the progress and final reports to the Planning Committees. Copies of published material are also submitted to the Committees at their regular meetings for the attention of the representatives of the various role-players’ associations. (Outputs from the research projects from 1998 to 2006, are tabled in the addendum),

The submission of a popular article together with a final report of a project has been made compulsory. Both these are evaluated to form a opinion of the final report and the value of the project to the particular sector of the Red Meat Industry.

Following approval of the final report and article by Committee members, these then are to be entered into the SAMIC website. Where appropriate, specific commodity organisations (e.g. RPO, NERPO, RMAA and SAPPO), can then also publish these material in their media of choice.

8. RECORD OF PORK PROJECTS

8.1 RESEARCH INSTITUTIONS

The RMRDT and SAPPO's R & D Portfolio Committee outsource research to institutions to do specific research projects. The names of such institutions are in the list of projects.

8.2. LIST OF PROJECTS ON PIGS / PORK (1998 TO 2011)

1. ARC-OVI (Onderstepoort Veterinary Institute)

- Genetic characteristics of African swine fever virus (Completed)
- Immunofluorescence tests to detect African swine fever (Completed)
- Diagnostic test exotic diseases - PRRS (Completed)
- Molecular epidemiology of ASF virus (Completed)
- ASF virus in soft tampons - Dr L Heath (Completed)
- Genetic characterisation of FMD and ASF viruses (Completed)

2. ARC-API (Animal Production Institute: Animal Improvement)

- Livestock Improvement Schemes – Beef Cattle, Mutton Sheep, Pigs (Completed)
- Seasonal infertility in pigs (Completed)
- BLUPs on pig traits (Completed)
- MH-gene status in SA pigs
- Freezing boar semen (Completed)
- Literature study: pig Leanness IGF2 gene status in South Africa (Completed)
- Pig Leanness Insulin-like growth factor (Active)

3. ARC-API (Animal Production Institute: Nutrition and Food Science)

- Decreased protein in pig diets (Completed)
- Probiotics in a porcine gastro-intestinal model (Active)

4. Elsenburg ADI (Agricultural Developmental Institute)

- NIRS (Near infrared spectroscopy) for feedstuffs for farm animals (Completed)

5. UFS (University of Free State)

- Survey of pork fat quality (Department Food Science) (Completed)
- Demand relations of red meat products in South Africa (CIAMD - Centre in International Agricultural Marketing and Development) (Completed)
- Future Red Meat Industry policies (CIAMD) (Completed)
- CLA and pig production efficiency (Active)

6. US (University of Stellenbosch)

- PSE Pork in whole muscle products (Literature study – Department of Animal Science) (Completed)

- Nutrition of post wean piglets (Department Animal Science) (Completed)
- Peptides for increased meat shelf life (Department Microbiology, Faculty Biological Science) (Completed)

7. UP (Pretoria University)

- Electrical stunning of pigs
- Heme iron of sheep, beef and pork meat (Active)

8. SASBLIA (South African Studbook and Livestock Improvement Association)

- INTERGIS: Performance: Beef cattle, small-stock, pigs (Completed)

9. UNIV KZN

- Response to balanced protein by pigs - Prof Rob Gous (Completed)

10. Other

- Trans fatty acids – Dr I van Heerden



RMRD SA