RESEARCH AND DEVELOPMENT PLAN FOR THE LARGE STOCK AND SMALL STOCK MEAT INDUSTRIES IN SOUTH AFRICA

RMRD
PLANNING COMMITTEE (R & D)
CATTLE AND SMALL STOCK

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1. EXECUTIVE SUMMARY

The red meat industry acknowledges the need for R & D and technology transfer. As there is invariably a scarcity of funds to do these, systems were implemented through which the industry contributes financially to R & D projects of merit. The funds available derive from the interest on the Red Meat Research and Development Trust of South Africa (RMRDT) and from statutory levies. The Red Meat Industry Forum (RMIF) applied for the establishment of these levies on slaughter stock and their products.

This document serves as business plan for R & D for the large stock (cattle) and small-stock (sheep and goats) meat industries and was compiled (in 2004) and revised (in 2008) by the Planning Committee (R & D) Cattle & Small-stock.

1a. VISION

A profitable and sustainable Large and Small Stock Meat Industry contributing to a prosperous and socially viable South African Community.

1b. MISSION

To ensure that the South African Large and Small Stock Meat Industries have the technology and know how to deliver, in a profitable and sustainable manner, the products which are highly desired by consumers.

To develop world-class research, development and technology transfer programmes to address the following focus areas:

1. Sustainable natural resource utilization

2. Livestock production with global competitiveness

3. Animal health and welfare

4. Animal products quality and value adding

5. Red meat safety, Nutritional quality and Value

6. Consumerism, market development and Trade

7. Unlocking the Red Meat Potential through Commercialization, Technology Transfer and Training

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) 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 outsource the task to recognised research institutions, like institutes of the ARC

(Agricultural Research Council), universities and Provincial Departments of Agriculture. (See addendum for the names of specific research institutions).

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)

- Red Meat Research and Development Trust – Project Committee (RMRDT-PC)

- Red Meat Research and Development Trust: Planning Committee (R & D) Cattle & Small-stock

- Red Meat Research and Development Trust: Planning Committee (R & D) Pork Industry

- South African Pork Producers Organisation : R & D Portfolio Committee (SAPPO)

2.1.1 RMIF and RMLA

The Red Meat Industry Forum of South Africa 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 its approvals / decisions. 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.

2.1.2 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 R 15 million 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 compiled by the Planning Committees, and to make the funds available for the

research projects to be conducted by the research institutions. Since 1998, between R 1 million and R 2 million was allocated annually to R & D projects. (See addendum).

2.1.3   Project and Planning Committees and SAPPO's Portfolio Committee

Various committees have been formed to assist the RMRDT Trustees and the RMIF Council in deciding on funds for R & D. The compositions of these committees are 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 identify the research required, evaluate and prioritize 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 addendum for a list of R & D projects which has been funded since 1998).

2.2   OVERVIEW OF THE SOUTH AFRICAN RED MEAT INDUSTRY

Introduction

The Republic comprises a total surface area of 1 224 997 square kilometres or 122,5 million hectares. Of this, approximately 84 percent or 103 million hectares is available for farming. A large part of the Republic is not suitable for crop cultivation, with the result that approximately only 11 percent can be cultivated. The greater part of South Africa is only suitable for extensive stock farming, be it beef cattle, sheep, goats or game. It is therefore not a coincidence that the Integrated Sustainable Rural Development Strategy (ISRDS, 2004) identified livestock farming as the agricultural enterprise with the most likely chance of improving household food security and addressing poverty alleviation in the small-scale communal farming areas of South Africa.

Animal production in the world compared to Africa and the RSA

The Republic currently produces 17,3 percent of the total meat produced on the continent of Africa and 1 percent of global meat production. With a livestock industry contributing 43,6 percent to the total domestic agricultural production and providing 36 per cent of the population's protein needs, it is logical that the Red Meat Industry has reached a stage where not only the quantitative aspects of production are important but also where more emphasis will have to be placed on the biological and technological aspects affecting meat quality characteristics.

Gross value of certain individual agricultural products

During the past 12-year period (i.e. 1995 / 1996 to 2005 / 2006) the contribution of meat to the total gross value of agricultural products has increased from 25,4 percent to 33,8 percent. All meat categories experienced more than a 100 percent growth in nominal value, except the pig category. The main driver was white meat. Meats share of private consumption expenditure has declined between 1995 / 1996 to 2005 / 2006 from 31,93 percent to 28,04 percent. The share of bread and grain products in private consumption expenditure on the other hand increased from 23,12 percent to 29,51 percent over the same timeframe. For other products the share of private consumption expenditure changed as follows : sugar down by 1,59 percent, dairy and eggs up by 2,53 percent, potatoes down by 0,52 percent and vegetables and fruits down by 1,08 percent.

Scope of the Industry

The availability of statistics, and in particular that applicable to herd size, herd composition and the number of animals slaughtered, pertaining to the large and small stock sector remains a problem since the abolishment of the Meat Board in 1997. Data published by the National Department of

Agriculture is according to several experts in the red meat industry not an accurate reflection of the actual state of affairs in the industry.

With the aforementioned in mind this section attempts to provide a broad overview of the sector and is based on expert opinion obtained from several industry stakeholders. Cognisance needs therefore to be taken that the statistics presented is not necessarily an exact indication of for example herd numbers or slaughterings, but provides a broader scope of what is believed to be the current state of the industry. Industry stakeholders are currently in the process to work close together with the relevant government departments in an effort to rectify the poor state of statistics pertaining to the red meat industry.

It is believed that total cattle numbers in South Africa ranged between 13.6 to 13.8 million head over the past 5 years. Cognisance should be taken that the cattle sub-sector is highly dualistic. According to expert opinion 35 to 40 percent of the total herd is owned by subsistence or emerging farmers, i.e. approximately 5.5 million animals. Research on several aspects of the emerging sector has shown that this sector has not reached its full potential. For example it is estimated that off-take in this sector varies between 7.5 percent and 10 percent, which is significantly lower that the estimated 25 percent in the commercial sector. If the aforementioned assumptions hold, and it is assumed that total off-take goes for slaughtering then between 2.4 and 2.6 million cattle were slaughtered in South Africa annually over the last number of years.

Sheep numbers averaged about 25 million over the number years with an estimated 13 percent of animals in the subsistence and emerging sector; this is about 3 million lower than ten years ago. The main reasons provided for the drop in sheep numbers is stock theft, problems animals and vermin, i.e. the financial implication of the latter three reasons caused farmers to invest in other agricultural enterprises. Goat numbers are believed to be around 2.5 million. If the average off-take prior to deregulation is taken a proxy for sheep and goat slaughterings then approximately 6.3 million sheep and goats were slaughtered annually over the past few years.

Both the consumption of large and small stock remained relatively stable, but firm over the past few years. Total beef consumption is believed to be approximately 640 000 tons and total sheep consumption approximately 160 000 tons. Per capita consumption for beef and sheep is respectively 13.5 and 3.4 kg; this is slightly up from the beginning of the century. Total beef and per capita consumption as reported by the National Department of Agriculture is significantly higher, but as indicated it is believed that this is an over estimation. An important observation is that the current figures on consumption indicates that the decline in total and per capita consumption has probably been revered, but that much still needs to be done to ensure sustainable growth in consumption.

South Africa remains a net importer of products derived from large and small-stock. Imported meat from cattle averaged around 32 000 ton per year since 2003 (this includes meat from other SACU countries). Live imports from Namibia varied significantly, but on average imports totalled 170 000 annually since 2003. Sheep meat imports into South Africa average 50 000 tons annually since 2003. Cognisance should be taken that the introduction of the Namibian Small Stock Marketing Scheme had a significant impact on the number of live animals imported, i.e. since 2004 with the introduction of the Scheme live imports from Namibia nearly halved.

An important issue to take cognisance of within the South Africa socio-political-economic environment is that the potential of the animals in the subsistence and emerging sub-sectors has not be unlocked. The following challenges will have to be addressed first:

➢ Lack of adequate and suitable land for grazing

➢ Lack of appropriate credit and other financial support facilities

➢ Limited government support in creating an enabling environment for the sector to develop

➢ Lack of appropriate knowledge and skills for livestock production

➢ Limited accessible marketing system

— ➢ Limited infrastructure

3. RED MEAT VALUE CHAINS

The consumer's decision to buy meat forms the basis of and is the initiating event in the subsequent development of the meat industry chain. Due to the heterogeneous composition of consumer groups, consumers have widely divergent expectations of the product, their understanding of "value" being the most important criteria, i.e. the quantity and quality characteristics of the product relative to other types of food and consumer commodities. In this value package the consumer requires a reasonable price in a marketing service that is attractive and contains the necessary information. Ultimately the consumer eats meat because he / she like it.

The quantity and quality characteristics of red meat that eventually reach the consumers are affected by one or more of the various pre-slaughter and post-slaughter factors. These factors are the genetics, physiology and environment of the animal, the slaughtering process; and finally the storage, processing, marketing and consumption conditions of the meat. Figure 1 shows the links in the Value Chain of beef as an example, namely producers, middlemen and consumers.

All facets of research on red meat production and the products of red meat producing livestock should therefore attempt to fully take into account the effect of all the links. The more familiar factors can be controlled, whereas research on the less familiar factors requires urgent attention.

48 million consumers : per head beef consumption – 13,5 kg per year

Formal consumers (Premium beef markets and food service)

(640,000 tonnes produced domestically : 32,000 tonnes imported per year)

Informal consumers

Meat Processors (495 abattoirs throughout South Africa)

Total slaughterings 2,4 to 2,8 million

Meat Processors (Local butchers, on-farm slaughter)

Feedlot Sector (75% of off take, based on maize by-products)

Successful emerging farmers

Communal or leased grazing communities

Private farms and Agribusiness sector

170 000 weaner calves from Namibia

6,7 million beef cattle Mainly "composite" breeds and crosses (1,5 million dairy cattle)

5,5 million cattle Mainly indigenous and Zebu breeds

Commercial cattle Breeders

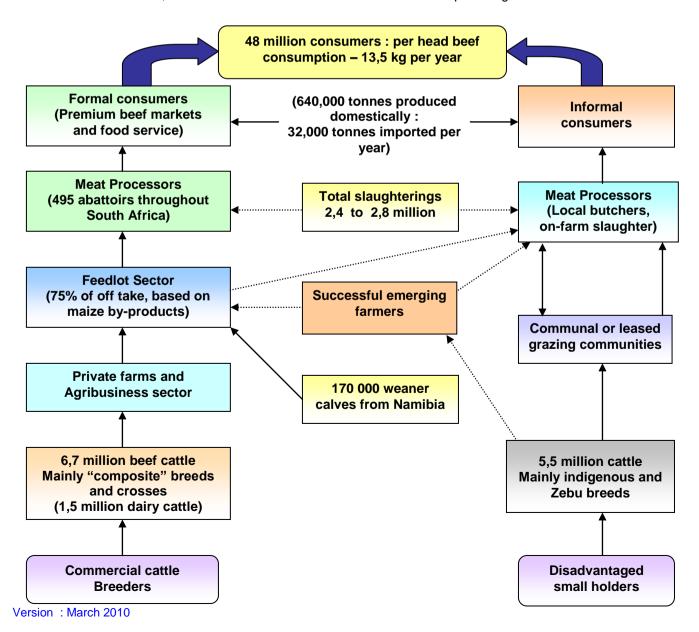Disadvantaged small holders

Version : March 2010

FIGURE 1 : Beef Value Chain (Adapted from Ford, 2006)

Broad Objectives for the South African Red Meat Industry

The aim of the Red Meat Industry is to provide sought-after red meat products at affordable prices taking into account the local consumer preferences, international standards and the conservation of the environment. The specific aim of the RMRDT and its Project Committee is to co-ordinate and fund research projects.

Focus areas for research across the total spectrum of sectors which are involved in the Red Meat Industry have been identified and within focus areas, outcomes or projects are prioritised (see Chapters 4 and 5).

4.   RESEARCH, DEVELOPMENT AND TECHNOLOGY TRANSFER FOCUS AREAS

Research is focused on the furtherance, accumulation and improvement of knowledge in the livestock and related sciences through original and other investigations and methods of a scientific nature with the advancement of livestock production as the objective. Development is closely linked to research as it refers to activities by which knowledge acquired through research is utilized. Technology transfer refers to the transfer of knowledge and techniques and processes for the application thereof.

- **Focus Area 1 : Sustainable natural resource utilisation**

  The environment, i.e. land, water and climate, creates a particular type of vegetation with its unique problems and production potential for animal production. The vegetation resource forms the basis for the livestock industry in the RSA. Stock farming should therefore be carried out within the confines of the environment. The degree to which the vegetation resource within a particular environment is utilised, has a direct effect on its productivity in terms of wool, meat, mohair, etc. To promote animal production and minimise stock farming risks, we should allow ourselves to be led primarily by the natural resource. Allowing ourselves to be led by other factors without placing the primary factor, namely the vegetation resource and its condition, first, will lead to regret at a later stage on the part of those involved in animal production in the long term. The environment provides (supply) and the animals require (demand) a specific quantity of feed of a particular quality. If the supply and demand is not synchronised, no breeding, animal health or stock management programme will be able to rectify this imbalance.

  South Africa is blessed with a rich diversity of flora and fauna, some with enormous potential in providing adapted and unique favourable characteristics to the overall plant and animal gene pool. These should be identified and conserved to sustain biodiversity and be utilised in genetic advancement programmes to promote improved and sustainable small and large livestock production systems. Research and development should aim to sensibly combine indigenous favourable genes with adapted exotic ones to enable more efficient and competitive livestock, food and fibre production systems, in addition to enhancing the economic stability of rural farmers and communities.

- **Focus Area 2 : Livestock production with global competitiveness**

  Production of foods and fibre derived from livestock has a major impact on the South African agricultural economy. Identification and use of livestock with appropriate genotypes will have a major impact on quality of products used for food, fibre, international competitiveness and efficiency of production. Research integrating nutrition, genetics, reproduction, physiology, microbiology, immunology, molecular biology and the production system and environment interaction, lead to increased production efficiency, sustainability, animal and environmental well-being and high quality products that are imperative for the economical viability of animal agriculture.

Agricultural production is increasingly practiced in such a systems relationship by optimising the entire production chain form the primary production systems, through post harvesting, transport and marketing to value adding both on and off farm. Production systems R & D is the combination of genetic improvement with sound natural resource utilization (both animals and plants) nutrition, forage management, physiology, product technology and economics of production. This will ensure a sustainable production enterprise through the best allocation of limited resources. This new concept of production systems must be developed into a scientific discipline that encompasses the different research disciplines. The focus must be the furtherance of animal science and related disciplines through innovative systems research and other investigations.

- **Focus Area 3 : Animal Health and Welfare**

Efficient and profitable farming as well as safe and wholesome products require that animal health is maintained at an optimum level. Zoonoses are a potential threat to human health and therefore need appropriate measures to prevent human infection. Both domestic and international trade is also partly dependent on the control, eradication or prevention of certain diseases which have international importance, like Foot and Mouth Disease. These diseases require a range of effective measures to limit or eliminate their impact on the industry. Safeguarding the livestock industry from animal disease by promoting animal health ensures sustainable and profitable production as well as competitiveness in the market. Ensuring animal welfare is essential to farming systems, firstly because it is ethically correct, secondly because it underlies good production, and thirdly because it is expected by consumers.

Optimal animal health can only be realised provided that there is sufficient knowledge and expertise available regarding the causes, contributory factors and effective diagnosis of each disease. The influence of management practices, nutrition, socio-economics, and genetic resistance or resilience on many diseases, are major factors which determine the impact of health or disease on livestock farming. This knowledge underpins the understanding of the epidemiology of diseases and their economic effects on production and animal welfare. The effects of diseases on animal products as they in turn affect human health are also essential components. Such knowledge enables the establishment of safe, cost-effective, reliable, practical and appropriate diagnostic procedures and control measures to be implemented. To be acceptable, control measures (whether they be eradication, limitation, surveillance, official control, preventive or treatment-based) must also be safe, cost-effective, reliable, practical and appropriate for existing conditions. Animal welfare can only be assured when there is sufficient knowledge of the behavioural and other requirements of animals and how this is affected by various farming systems and practices.

- **Focus Area 4 : Animal Products, Quality and Value-adding**

Livestock production faces increasing competition in the domestic and global market place. South Africa, with no price support systems should move beyond only larger greater quantities of livestock commodities produced as cheaply as possible. Higher quality products and commodities must be converted into useful value-added food and non-food products to target the sophisticated and export market. Products must also be protected from contamination or loss of quality post harvest to ensure marketability and consumer acceptance. Research must also be responsive to consumer demands for high quality, safe products that are produced in an environmentally friendly manner.

- **Focus Area 5 : Red Meat Safety, Nutritional Quality and Value**

Red meat safety problems can cause either human illness or economic losses and threaten the international competitiveness of agricultural products. Red meat safety and in particular the control of food borne pathogens and residues, must therefore be an important concern in research programmes. Red meat safety links with quality/value to support food security and healthy diet. Studies to maximize quality/value and identify nutritional and medicinal attributes in indigenous and other substances are also important.

- **Focus Area 6 : Consumerism, Market Development and Trade**

  Animal production contributed, on average, 43 percent to the gross value of agricultural production from 1995/96 to 1999/2000 – the highest of all the agricultural sub-sectors.

  Furthermore, approximately 70 percent of South Africa's total area of 1.2 million km² is only suitable for livestock production. Hence, the livestock industry in South Africa is crucial for creating livelihoods and increased levels of welfare for the total population. This sector could play a vitally important role in alleviating poverty in South Africa by means of income generation and as source of protein. In addition, this sector could greatly contribute towards job creation, directly and indirectly, on primary and secondary levels through its backward and forward linkages in the economy. This sector also stands to gain from the globalised environment by means of export opportunities that exist since South Africa is known to produce good quality meat products. Research support should therefore assist in targeting or developing sustainable markets for enterprises (including SMME's) so as to enable this sector to play its rightful role in the economy.

- **Focus Area 7 : Unlocking the Red Meat Potential through Commercialization, Technology Transfer and Training**

  Past experience has shown that the most limiting factors to commercialisation of the emerging red meat sector are the supply-side constraints; such as lack of appropriate infrastructure, poor access to production animals and inputs, poor access to usable technical and market information and to well-functioning marketing and credit systems. The purpose of commercialising the emerging red meat sector is to address these constraints and ensure that farmers produce efficiently, have easy access to all the available markets and can make informed choices on which ones to use.

  Secondly and equally important, commercialisation of the emerging sector should encourage efficient utilisation of the natural resources (especially the veld) both on privately controlled-land and communal land-based enterprises. Therefore, the major areas of focus should be to ensure that the farmers are able to run viable livestock enterprises that are environmentally and economically sustainable.

  Development programmes for commercialising the emerging sector should be cognisant of the fact that it is not homogenous but consists of the following groups :

  - Emerging livestock farmers on private land. These either own the land or lease it and hence have some autonomy over their livestock enterprises.

  - Commercially-oriented producers on communal land. Their access to and use of grazing land and livestock infrastructure is highly influenced by the community in which they farm

  - Predominately subsistence livestock keepers on communal land for whom livestock production is not considered as major income generator.

  However, whether from subsistence or commercially-oriented production systems, the red meat industry would like to see that as many as possible of the market ready livestock enter the food chain. Ultimately, the competitiveness of the sector should be improved to the extent that the producers and society at large benefit.

  Results and information accumulated from research and development have only meaning if properly disseminated to the public at large. In terms of the red meat programme, this include the farming community and associated industries, such as the food industry. Sometimes information is easily accessible and understandable to the recipient. More often the information and knowledge require innovative ways of presentation to be understandable and utilisable by on the one hand the uninformed, even illiterate, user and on the other hand the highly sophisticated commercial or industrial operation. Innovative ways may require research to establish optimal ways of dissemination. Innovative ways may also mean "packaging" of information for easy and maximum exposure, through eg. computerised and visual techniques.

5. RESEARCH, DEVELOPMENT AND TECHNOLOGY TRANSFER PER FOCUS AREA

5.1 Focus Area 1 : Sustainable natural resource utilisation

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.1.1 Forage resources and management	The production potential of rangelands is limited and can be optimised by making available adapted, nutritious, and highly productive forages. New forage and pasture cultivars and ecovars with higher nutritive quality and resistance to diseases, insects and tolerances to limiting conditions (low fertility, drought, etc.) and competition from other plants (weeds and mixtures), are needed to optimise the efficiency of utilisation of veld by livestock. Management of forage availability from pastures, veld and conserved forages to maximise seasonal distribution, yield and quality is one of the greatest limitations in enhancing livestock productivity. New forage production and management practices are needed to assist farmers to maximise economic efficiencies and facilitate the integration of veld livestock production systems.	5.1.1.1 Complete fodder flow programmes using alternative forages to complement shortcomings (quality and quantity) of veld to improve the efficiency of a livestock production system.	A
		5.1.1.2 Breeding and release of new forage and pasture cultivars with higher nutritive quality, resistance to diseases and pests, and tolerant to limiting conditions (soil fertility, drought, competition from weeds, etc).	B
		5.1.1.3 Acquire, preserve, evaluate describe and enhance genetic resources and develop new knowledge and technologies to increase the productive capacity and usefulness of plants as forages.	C
		5.1.1.4 Pasture systems whereby production is optimised per unit area (kg meat/ha) with highest profit.	B
		5.1.1.5 Improved forage management strategies to maximise efficiency in livestock production systems with minimum negative impact on the environment.	B
5.1.2 Veld monitoring and management	Environmentally sound management of livestock on veld types is fundamental to sustainable livestock production. Veld monitoring and management systems are needed to help pastoralists maximise economic efficiencies in livestock production while avoiding negative impacts on the environment. Increased knowledge of the natural processes (competition, fire, herbivore impact, carbon and nutrient cycling, water use, energy capture and flow and vegetation change) which control productivity and promote stability of veld types is required to develop better approaches to their management. A thorough understanding of the basic biology veld types is needed to provide the pastoralist with the best information for managing pastures and veld.	5.1.2.1 Techniques to rehabilitate non productive areas and avoid further degradation by improving veld condition to maximise livestock production.	B
		5.1.2.2 To provide pastoralists with veld management strategies to maximise the productivity of veld and thus the efficiency and competitiveness of their livestock enterprise and simultaneously prevent degradation of the resource.	B
		5.1.2.3 Provide the stock farmer with information regarding the interaction between the animal, the vegetation resource and the impact of the variable climatic factors on the quantity, quality and consistency of feed availability and so adapt his management to minimise the financial risk.	B
5.1.3 Pastoral risk management and decision support systems	Management decision-making by pastoralists would be greatly enhanced by the availability of risk identification / evaluation and decision support systems. The provision and development of databases based on sound research results should provide the necessary inputs for the development of risk management and decision support tools.	5.1.3.1 Provide prediction models whereby the stock farmer can be timeously informed of environmental risks (eg. drought) so as to employ strategies to minimise the negative consequences on his production system and future resource productivity.	B
		5.1.3.2 Provide data on alternative forage sources re species, varieties, agronomic requirements, management requirements, stocking rates and expected profit margins / ha for a range of production systems.	B
5.1.4 Livestock genetic resources	South Africa's diverse gene pool of indigenous and locally developed livestock breeds and strains of foreign origin should be protected and screened for more efficient commercial use. These aims should be supplemented with biological criteria and economic variables (eg. using deterministic and stochastic	5.1.4.1 All livestock breeds and strains characterised in terms of FAO specifications (where applicable).	C
		5.1.4.2 Setting up of systems and models dealing with breeding plans for small populations of livestock species to counter inbreeding.	C

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.1.4 Livestock genetic resources (Continue)	models) to ensure viability and sustainability of new or smaller settlements and to manage risk in high turnover operations.	5.1.4.3 Setting of breeding objectives and proper gene flow planning, thereby securing commercialisation and utilization of animal genetic resources	B
		5.1.4.4 Linkage of livestock production information (including INTERGIS) to National Agricultural Geographical Information System (AGIS).	C
5.1.5 Environmental protection	Protection of the environment (in terms of waste management and prevention of erosion and pollution) and maintenance of biodiversity are paramount for plant and animal resources, and in sustainable small and large livestock production systems. Research to combat these adverse influences should be specific for particular circumstances but also holistic to support integrated approaches.	5.1.5.1 Information and methodology to prevent erosion and pollution and to manage agricultural wastes and effluents.	B
		5.1.5.2 Information and methodology to reclaim eroded and polluted resources.	D
		5.1.5.3 Methods to manage livestock losses through predators / problem animals	D

5.2 Focus Area 2 : Livestock production with global competitiveness

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.2.1 Animal Recording and Improvement	Sustainable development of more productive and efficient livestock herds / flocks will be required to increase production. This will involve both identification of immediate tactical management activities to improve production and productivity (output per unit of input) of current herds, as well as re-establishment of long-term strategic programmes of comparative evaluation and continued genetic improvement. In both cases, accurate and consistent decisions based on objective information and a thorough understanding of the key input-output relationships involved in livestock production will be required. Recording performance is required to provide information for sound decision-making and to establish key input-output relationships. It is also particularly important to provide the comprehensive and consistent information that is necessary to fairly compare indigenous exotic germplasm and to support long-term genetic improvement towards an appropriate bio-economic development objective. The goal is to establish and maintain the National Integrated Registration and Genetic Information System (INTERGIS) on behalf of the National Department of Agriculture and Livestock Industry. It is performed in accordance with established guidelines of the International Committee for animal recording and the FAO. This includes recording of pedigrees, baseline performance, strategic decision support, health monitoring, traceability, individual herd management and genetic improvement (individual herds / flocks and the national herd / flock).	5.2.1.1 A national database, accessible to all relevant users with the following properties and functionalities: ▪ Supply of information needed for strategic purposes ▪ Traceability to trace back animal products to their origin as well as possible sources for contamination ▪ Linkage with animal health observations ▪ Supply primary users with information needed for management decisions and the genetic improvement of their stock (using mathematical and genetic markers methodology and genetic markers	B
		5.2.1.2 Maintenance of proper national beef cattle and small-stock recording schemes that collect and verify appropriate production and reproduction information to establish baseline performance, to compare production alternatives and to improve animal and veld management.	B
		5.2.1.3 Enhancement of the functionalities of the national database on beef cattle and small-stock by the development of user-friendly interfaces to enable efficient data interaction by users (Integrated information System).	C
		5.2.1.4 Merging of the INTERGIS with specifications of the Animal Identification Act and application of a complete national web based traceability system.	B

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES		PRIORITY
5.2.2 Reproductive efficiency	The overall goal is to improve reproductive efficiency of livestock. Research will focus on improving reproductive performance of livestock through genetics, nutrition, health and management within the constraints of a particular environment. Research advances and new biotechnologies will be developed to reduce losses due to reproduction problems in all species and maximise output of high quality products.	5.2.2.1	Physiological processes contributing to efficiency differences among animals in terms of reproduction rate understood and quantified.	C
		5.2.2.2	Reduced cost systems for managing replacement animals in the breeding herd established.	B
		5.2.2.3	Improved reproduction components and parameters for use in production prediction models.	C
		5.2.2.4	Improved cryopreservation, sexing, and in vitro production of semen and embryos.	C
5.2.3 Maintenance and enhancement of genetic variation	Livestock are produced in a wide array of environments and management systems. The efficiency of livestock has dramatically improved due to advances in genetic selection programmes. Maintaining genetic diversity is essential for providing livestock food and fibre products in the future, by having livestock that will perform efficiently in different climates, production systems and when exposed to new diseases, and provide quality products that meet the changing demands of consumers.	5.2.3.1	Identification of genes or gene markers related to economically important traits.	A
		5.2.3.2	Fitting of operational statistical models in order to estimate genetic (co) variance components and breeding value predictions based on phenotypic measurements, pedigree information and knowledge of gene markers.	B
		5.2.3.3	Development of breeding objectives and selection goals based on the genetic (co) variance structures and economic values.	B
		5.2.3.4	Properly designed gene flow actions through breeding plans based on population parameters.	C
		5.2.3.5	Develop and maintain a gene bank and supporting database to preserve genetic diversity and identification.	C
5.2.4 Animal Growth and development	Suboptimal growth and development are limiting factors in beef cattle and small stock productivity. Basic information regarding developmental processes in cattle and sheep is largely lacking. Research should be aimed to increase the understanding of the biological mechanism underlying normal growth and development of the musculosketal system, lactation, digestion, and nutrient metabolism.	5.2.4.1	New knowledge available to improve cattle and small-stock production and the control and manipulation of muscle growth, metabolism, and mammary function.	C
		5.2.4.2	Proper understanding of specific nutrient regulated biological responses.	C
5.2.5 Genetic improvement	The primary objectives are to accelerate the selection response toward efficient and profitable production of healthy, nutritious and palatable livestock products and fibre production and to improve the health and well-being of livestock through enhanced adaptation to different production environments and greater resistance to diseases.	5.2.5.1	Properly developed selection criteria and breeding objectives to accelerate the selection response towards efficient and profitable beef cattle production.	A
		5.2.5.2	Development of genetic tools to : ▪ breed beef cattle and small-stock that are resistant or tolerant to major diseases ▪ utilize differences between breeds and within breeds , which enables their adoption into practical and economical breeding programmes to improve the suitability of livestock to their environment ▪ lower the impact of disease by breeding animals more suited to the farming environment.	A
5.2.6 Nutrient intake and utilisation	The most efficient supplementation of nutrition for every production cycle must be established, since nutrition is the single most costly component in livestock production. Sub optimal nutrition causes production losses and increases disease susceptibility. Research is required on nutrient intake and utilization to improve livestock nutrition	5.2.6.1	Chemical composition and availability of nutrients in current and potential feedstuffs, and waste products;	A
		5.2.6.2	Methods to screen and study nutrient damage through treatment and anti-nutritional factors;	C
		5.2.6.3	Nutritional requirements of ruminants	D
		5.2.6.4	Biofuel residues as feeds sources, with specific emphasis on low input feeding systems	D

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.2.6 Nutrient intake and utilisation (Continue)		5.2.6.5 More efficient use of nutrients, especially for production functions;	C
		5.2.6.6 Usage of feed supplements, additives, prebiotics and biotherapeutics.	A
		5.2.6.7 Optimising feed intake and digestive efficiency.	C
5.2.7 DNA Technology and Services	DNA Markers can be used to select for economically important traits and disease resistance. Here use can be made of Quantitative Trait Loci (QTLs). A QTL is a "locus that affects a measurable trait that shows continuous variation. The measurable trait depends on the cumulative action of many genes". Marker assisted selection can accelerate genetic progress. It is envisaged that disease resistance and other economically important traits can be identified using QTLs. DNA profiling can be used to confirm parentage, including case of multi-sire mating in beef cattle herds and is a powerful instrument in the identification of individual animals. The micro satellites used for the profiles should be standardized according to the International Society of Animal Genetics (ISAG), otherwise results between laboratories are not comparable. The establishment of DNA profiles is an accepted tool for use by the SAPS in stock theft cases and is generally accepted as evidence by the courts.	5.2.7.1 DNA technology established and expanded: • as a deterrent for stock theft. (e.g. LidCat) • for genetic detection (e.g. of species) and modification including GMO detection and services. 5.2.7.2 Marker identification and QTL detection for utilization in the genetic improvement of animals 5.2.7.3 Studies on micro satellites as useful criteria for marker assisted selection for beef quality.	A A B
5.2.8 A systems approach to livestock production	A systems approach can be defined as the utilization of the principles of genetics, nutrition, physiology, genetic resources, range and forage management, product technology and economics to support practical and profitable animal production by integrating research into farming practice. This will ensure a sustainable production enterprise through the best allocation of limited resources, and fulfils an important coordination function between the different disciplines of animal production.	5.2.8.1 Studies of the whole enterprise and production cycle of animals 5.2.8.2 Understanding of species interaction (including wildlife) in the farming enterprise 5.2.8.3 Studies on integrated crop/ animal production systems 5.2.8.4 Decision support systems to assess the impact of selection decisions on the efficiency of the production systems since many economic relevant traits interact, such as the use of sires that modify energy requirements (through altered weaning weight, mature weight, milk production, etc) will influence stocking rates.	B C C A
5.2.9 Herd management	Efficient livestock production encompasses a vast number of factors including biological, environmental, input, market and infrastructure elements	5.2.9.1 Improved management techniques related to health, reproduction, selection, gene flow, economic and other market related aspects established	B
5.2.10 Infrastructure, equipment and practices for animal production	Sustainable animal production requires provision of cost effective, appropriate infrastructure and equipment to ensure an optimal environment for animal growth / production. This includes systems to provide food and water.	5.2.10.1 Design equipment and working methods to decrease the epidemic of stock theft, eg Animal identification systems that are cost effective, easy to use, robust, reliable and secure (eg RFID ear tags)	C
		5.2.10.2 Appropriate software systems for accessibility by industry and relevant institutions (eg SAPS) to expand management possibilities associated with animal identification, eg Systems that can monitor unauthorised movement of animals	A

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5.3 Focus area 3: Animal health and welfare

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES		PRIORITY
5.3.1 Animal welfare	Establishment and refinement of all farming or processing practices which lead to the introduction and maintenance of acceptable animal welfare standards, commensurate with good farming practice and profitability. This is also essential for ensuring consumer acceptance and international trade in animal products. This includes management, nutrition, housing, shelter, handling, farm procedures, reproduction, health care, transport, preslaughter handling and slaughter. The recommendations must be based in part on the animal's needs and in part on the owner's or operators needs. They should take cognizance of the "5 Freedoms" ("freedom" from pain and discomfort, hunger and thirst, injury and disease, fear and distress, and to perform essential behavioural patterns) as well as "the 3 R's" (Reduce, Refine, Replace).	5.3.1.1	Establishment and codification into law of comprehensive national minimum and optimum standards for management, nutrition, housing, shelter, handling, farm procedures, reproduction, health care, transport, preslaughter handling and slaughter. These guidelines must compare favourably with similar codes set up internationally.	C
		5.3.1.2	Improvements in production and processing practices which lead to improvements in animal welfare commensurate with producer efficiency or profits. Establishment and improvement of cost-effective and humane measures to provide livestock with acceptable shelter, handling management, health care, transport, preslaughter handling and slaughter. This will result in better consumer acceptance and more effective use of inputs.	D
5.3.2 Aetiological Studies	This comprises the development and refinement of knowledge using appropriate cutting-edge technology (like molecular biotechnology) of the essential cause (the pathogen or toxin) which together with the sufficient causes (contributory factors) gives enough epidemiological knowledge to enable appropriate control measures to be taken.	5.3.2.1	Precise genetic characterization of microscopic pathogens to enable appropriate epidemiological studies, diagnostic tests and vaccine or other control measures to be undertaken.	C
		5.3.2.2	Proper genetic characterization of important ectoparasites as this knowledge may affect surveillance, diagnosis or control measures.	B
		5.3.2.3	Full genetic characterisation of important endoparasites as this knowledge may affect surveillance, diagnosis or control measures.	B+
		5.3.2.4	Accurate Identification of toxins which influence animal production.	C
		5.3.2.5	Development of appropriate knowledge bases of disease prevalence and surveillance for identified important diseases.	C
		5.3.2.6	Implementation of disease status certification systems in support of livestock trade.	B
		5.3.2.7	Knowledge of geographic or evolutionary origins of pathogens and changes which occur in respect of virulence, resistance to treatment or response to vaccines, and disease transmission.	B
		5.3.2.8	Recognition of disease conditions previously unknown in South Africa.	C
5.3.3 Animal / Pathogen / Environment Interactions	Knowledge of all the contributory (sufficient cause) factors which contribute to the establishment and severity of disease is vital to understanding and controlling important diseases. Understanding immunological response, including at cellular and molecular level, allows inter alia for better vaccine development. Knowledge of vector/host/pathogen interactions allows for the understanding of the epidemiology of diseases and thus enables risk assessment to be undertaken. Effects of toxins from any source (plants, feed, organisms, environment) depend on many factors which must be understood to devise effective control or prevention. The ability of the host to resist diseases or their effects (resistance and resilience) forms a vital part of understanding these interactions. The impact of nutrition and management is also an essential part of this interaction.	5.3.3.1	The influence of contributory influences like nutrition and management are elucidated and available for practical implementation to lower the impact of diseases.	C
		5.3.3.2	Knowledge of all environmental interactions enables the development of better, integrated and holistic disease control strategies.	C
		5.3.3.3	The influence of disease on production economics will be quantified and therefore national risk assessment and control measures can be undertaken.	C

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.3.3 Animal / Pathogen / Environment Interactions (Continue)	The financial impact of disease and control measures must also be understood and calculated to ensure that diagnostic, surveillance and control measures are optimized.		
5.3.4 Diagnostics	The improvement of existing or introduction of new diagnostic technology to enable the rapid, precise, sensitive, reliable, practical and cost-effective identification of a range of pathogens or toxins will contribute to better disease control.	5.3.4.1 The establishment of efficient diagnostic tests using appropriate technology to enable the detection of a range of important diseases.	A
		5.3.4.2 This technology will enable effective disease or toxin monitoring, and thus disease status certification, which may impact on the economics of the industry.	C
		5.3.4.3 Good diagnostic procedures enable the accurate determination of the economic impact of disease on animal production.	B
5.3.5 Disease control strategies	Control strategies must be developed which are sustainable, biologically sound, economically justifiable, ecologically acceptable, internationally recognized and fully integrated with practical farming and product processing systems. Such strategies demand a comprehensive knowledge and the availability of technology for determining the aetiological factors which contribute towards disease, as well as appropriate diagnostic and surveillance methods.	5.3.5.1 Effective, reliable and cost-efficient vaccines become available, using appropriate available technologies.	A
		5.3.5.2 Alternative and complementary strategies are developed to control diseases on a holistic, sustainable and integrated basis.	C
		5.3.5.3 Management and nutritional strategies are established to minimise the impact of disease.	C
		5.3.5.4 New and / or improved systems and drugs to treat diseases.	B

5.4 Focus area 4: Animal products, quality and value-adding

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.4.1 Product characteristics	Research should clarify 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 product quality during harvest, storage, transport and marketing.	5.4.1.1 New knowledge derived from a better understanding of the microstructure and biochemistry of muscle and fat and their relationships with meat quality characteristics facilitate development of a variety of new products.	C
		5.4.1.2 Better understanding of the inherent mechanisms that maintain quality characteristics of meat should allow for genetic manipulation to maximise desired traits, to limit variability in quality characteristics and to improve processes that can extend the life of these desirable traits.	B
		5.4.1.3 Improved knowledge regarding the genetic control of value-added traits to assist in developing new and improved meat and other livestock products.	C
5.4.2 Product technology and shelf life	Research should enhance knowledge of product development and processing, and specifically emphasise new and novel products that can enter niche export markets on the one hand but also underdeveloped local markets. Improved techniques and management procedures to extend product shelf life for both markets are urgently needed.	5.4.2.1 Affordable and suitable meat and meat-containing products to satisfy the needs of sophisticated domestic and international consumers and the needs of the meat processors to obtain suitable carcass balancing.	B C
		5.4.2.2 Improved products and processes of extending shelf life during storage to optimise nutritional value and safety, to reduce waste, improve efficiency and allow new uses that are currently limited or not feasible.	

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.4.3 New processes, new uses and value added products	Innovative processes should be created and existing ones adopted to manufacture new or value-added products. Application of these innovative technologies could expand the range and value of livestock products and reduce the ratio of cost of production to market value. Sources of natural products are expected to be identified for use as nutraceuticals, pharmaceuticals, biopesticides and other innovative applications.	5.4.3.1 New technologies to convert processed by-products into useful value-added products such as fat substitutes, high-quality animal feeds, improved textiles, hides and skins, pharmaceutical ingredients, enzymes and cosmetics.	A
		5.4.3.2 Useful products from low value and waste products such as slaughter offal to increase the overall efficiency of utilisation.	C
5.4.4 Genetics and physiology of product development	New knowledge is needed to understand the genetics affecting product development and improve control and manipulation of physiological systems supporting muscling, growth, metabolism, and mammary function. Research will focus on identifying genes that influence product, factors directing nutrient partitioning toward protein and less fat to improve efficiency, enhanced nutrient composition in livestock products and improved meat tenderness.	5.4.4.1 Meat with less fat and/or better distribution (inter-muscular fat).	C
		5.4.4.2 Development and implementation of technology that can measure meat quality characteristics on live animals for breeding purposes.	A
		5.4.4.3 Assessment of genetic variation in meat quality and the evaluation of the role of candidate genes in beef characteristics with a view to breed for improved product quality.	A
		5.4.4.4 The characterisation of South African beef genotypes for genes associated with beef quality characteristics.	A

5.5 Focus area 5: Red meat safety, nutritional quality and value

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.5.1 Microbial pathogens (Link with focus area: Animal health and Welfare)	Among the desirable qualities of foods is the absence of pathogens and spoilage organisms. Urgent research is required to reliable and rapid methods to detect and eliminate pathogens in/on livestock throughout the pre-harvesting and post-harvesting processes. Monitoring and service programmes should focus on quality surveys, establishment of sustainable surveillance programmes, meat safety systems and the use of microbial indicators as food safety and quality standards to ensure safe foods.	5.5.1.1 The means to ensure that the food supply is safe for consumers and that food and feed meet foreign and domestic regulatory requirements.	A
		5.5.1.2 Information on microbial and chemical safety of foods and feeds.	B
		5.5.1.3 Established databanks and benchmarks for monitoring the safety of foods.	C
5.5.2 Chemical residues	The objective is to reduce the risks of chemical residues from drugs, food additives, herbicides, pesticides and environmental contaminants. Surveys, surveillance programmes as well as cost-effective and user-friendly methods of detection are major goals. There is also a need to study the behaviour of these residues in soils, plants and animals because of long-term accumulation.	5.5.2.1 Minimal pathogen and chemical residues in livestock being presented for slaughter.	C
		5.5.2.2 Scientific information on which to base guidance or meat safety programmes that effectively controls the presence of pathogens and toxic residues in livestock foods.	C
5.5.3 Composition of red meat, bio-availability of nutrients and sensory appraisal.	Information on the nutritional composition of foods and bio-availability of nutrients is essential for food programmes, preventative medicine and dietetics, and the provision of appropriate diets for individuals and communities. Extensive information is required for key, restaurant, fast and indigenous foods. These, in addition, need to be sensory appraised to determine consumer acceptance and, where applicable, to recommend modification.	5.5.3.1 Decreased risk of food-induced illness (e. g. high cholesterol), which enhances public confidence in animal food supply.	A
		5.5.3.2 Improved scientific basis for more effective food assistance programmes by making available a comprehensive database to dieticians and nutritionists.	C

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.5.4 Health promoting properties of red meat	A more nutritious red meat supply can be generated by defining the basis for modifying the health promoting properties of foods, which can be achieved through biotechnology, genetics and new food processing techniques. Foods, which promote health beyond providing basic nutrition, are known as "functional" foods. They have the potential to promote health in ways not anticipated by traditional nutrition science. The development of functional foods using functional food ingredients / substances / properties is needed. Amongst others, this may assist in strengthening the human immune system to combat the contraction or transfer of eg. HIV and AIDS and malnutrition related diseases.	5.5.4.1 Generate a more nutritious red meat supply by conducting research that defines the basis for modifying the health promoting properties of foods and food components, and make beneficial changes in the composition of foods (using biotechnology, genetics and processing techniques). 5.5.4.2 Extended dietary guidance to nutritionally vulnerable communities.	C C
5.5.5 Equipment, materials and infrastructure	Infrastructure and equipment should be designed and built to ensure that products can be handled, stored and processed to limit bacterial contamination of products in order to reduce health risks and increase shelf life.	5.5.5.1 Infrastructure, materials, equipment and systems to ensure the safe handling and storage of animal products.	C

5.6 Focus area 6: Market Development, Consumerism, and Trade

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.6.1 Value chain analyses	The macro and micro marketing environment and forces driving the marketing of livestock products have changed drastically since 1994. Traditional trends in processes are no longer applicable, whilst consumers' tastes and preferences have also changed. Within this milieu producers and firms must find markets where they can sell their products at a profit. Research should focus on understanding the commodities' and products' markets better and identifying opportunity gaps. This also entails investigation into up-to-date and relevant processes and structures that could support the supply chain from a marketing point of view.	5.6.1.1 A proper understanding of changing market trends, domestically and internationally: • :to ensure and support strategic management and marketing in the Red Meat Industry. • to act pro-actively on changes in market trends, rather than re-actively. • to nurture better relationships amongst role players	A
5.6.2 Risk analysis and management	The agricultural firm is faced with the management of market, labour, etc. Central to these management functions are decisions related to risk bearing. Risk and uncertainty are products of imperfect knowledge. Hence, sources of imperfect knowledge need to be identified and addressed. Risk management therefore considers the chances that the risk will occur and secondly access consequences given current risk management practices. Research should focus on identification of the range of options for treating each particular risk, evaluation of different options, make recommendation on selecting the most suitable one, and monitoring implementation.	5.6.2.1 Increased ability of industry to identify possible risk factors that could compromise existing businesses. 5.6.2.2 Increased ability to quantify different risk elements and provide guidance accordingly to mitigate risk. .	C C

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.6.3 International trade	South Africa has clearly demonstrated its willingness and enthusiasm to participate in Free Trade Agreements with other countries. In addition, South Africa is also member of the WTO that governs international trade rules to which South Africa must comply, eg. sanitary and phytosanatory standards, reducing tariffs, improved market access and reducing support to farmers. That will surely have an impact on supply, demand and prices of livestock products in South Africa. There also exists a need to establish South Africa's international competitiveness and to link it to factors that may influence it. This also involves, for example, the issue of traceability and it could be implemented. It is vitally important that research is focused on such issues in a pro-active manner so as to guide producers, agribusiness and policy makers of the possible outcomes.	5.6.3.1 Proper evaluation of policies and trade agreements to measure the possible implications for the industry.	C
		5.6.3.2 Provide support to government during trade negotiations that involves the Red Meat Industry.	C
		5.6.3.3 Generate relevant and applicable information related to the possible impact and opportunities that may arise from globalisation that could support decisions by role-players.	C
		5.6.3.4 Export support: • Enhance the state of knowledge pertaining to export, producers, regulations, market requirements, etc. to support management of existing and new exporter orientated companies / firms, as well as government. • Act as source of information (e.g. standards and regulations) to support government	D
5.6.4 Consumer behaviour	Probably the most intriguing science understands 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 fashion statements by Adam Smith 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 of how consumer preferences and whims have been taken into account or researched.	5.6.4.1 New or adapted products on the market adhering to consumer preferences and tastes.	B
		5.6.4.2 Improve the ability of role players to adhere to what consumers want in an affordable and sustainable manner.	C
		5.6.4.3 Provision of information that could be fed back into the production and processing systems.	C
5.6.5 Policy assessment	Policy assessment is crucial for proper governance, not only for government, but also for producers and agribusiness. Policies provide the guidelines for strategic planning, but on the other hand could hamper industry potential. Hence research aimed at analysing the impact of policies could greatly enhance the ability of this industry to function properly in a dynamic environment. Also, such research could improve the ability of government to identify necessary changes in policies needed for sustainable development.	5.6.5.1 Policies that are conducive to growth and wealth creation in the Red Meat Industry, as well as protecting the environment.	C
		5.6.5.2 Continuous improvement in modelling systems to determine the impact of exogenous and policy changes	C

5.7 Focus area 7: Unlocking the Potential of Red Meat through Commercialization, Technology Transfer and Training

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.7.1 Commercialization (formal and informal markets) of the emerging sector	Successful development depends on effective integration of technology, functionality and resource use. It is important to understand the differences between the commercial and non-commercial livestock sector. Understanding the differences is essential for efficient market development and research since the two sectors may require different approaches for wealth creation.	5.7.1.1 Access to information and removal of constraints that limits market development and access to commercial markets.	C
		5.7.1.2 Appropriate methods to commercialize, empower and build capacity within farmer groups, e.g. ▪ Capacity building through Continuous Improvement and Innovation ▪ Correct pastoral risk management as a result of the availability of risk identification / evaluation and decision support systems. ▪ Revival of dual purpose beef and dairy ranching production systems	A

NUMBER / COMPONENT	OBJECTIVE STATEMENTS	OUTCOMES	PRIORITY
5.7.1 Commercialization (formal and informal markets) of the emerging sector (Continue)		5.7.1.3 Increased competitiveness through coordinated technical farmer support programmes.	C
		5.7.1.4 Sustainable extensive and intensive production systems through on- and off-farm research and development.	B
		5.7.1.5 Novel products for the second economy to penetrate markets and promote consumer health.	C
		5.7.1.6 Alternative feed sources and alternative feedstuffs (e. g. to replace maize).	D
		5.7.1.7 Grassroots innovations that focus on bottom-up solutions for sustainable development that respond to local situations and the interest and values of the communities.	C
5.7.2 Technology Transfer and training	The needs of the beef and small stock industry workforce should be anticipated to provide information, products, services, and educational material. Innovative ways should be developed to assist with user friendly technology transfer. Research results should be captured in database and analysed and packaged in ways that will facilitate improved access to and dissemination of information. These systems should also enable preservation of valuable and important documents and work to ensure availability of such collections to current and future interest	5.7.2.1 Well-planned and managed information databases that is accessible	A
		5.7.2.2 Production manuals and educational material on software, audio-visual collections and the printed medium.	A
		5.7.2.3 Valuable livestock agricultural documents stored in computerised and hard copy format.	C
		5.7.2.4 Innovative information products and IP items developed.	C
		5.7.2.5 Customised material to fit the needs of all sectors (and levels) of the Beef Cattle Industry.	C
		5.7.2.6 Assistance programs and training for emerging and commercial producers.	
5.7.3 Integrated models for more efficient management	The amount of information on livestock production efficiency is difficult to use without the aid of computer-based technology. This technology application is needed to improve management decisions and strategies that will yield the greatest economic return. Such models will contribute to identifying gaps in scientific knowledge. Furthermore, since "organic" farming is becoming more important in the national and global context, relevant concepts and practices should be addressed primarily through integrated systems and modelling.	5.7.3.1 Information and decision support systems for continuous improvement in small, large, organic and intensive operations.	B
		5.7.3.2 Utilization of biological and economic parameters in computer simulations to optimize beef production units.	C
		5.7.3.3 Provision of decision support systems for managing climate impact and risk of livestock production.	B

6. MONITORING RESEARCH AND DEVELOPMENT

6.1 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.

Focus Areas and Components are not prioritized and only Outcomes within Focus Areas will be prioritized as:
- A – Critical
- B – Essential

- C – Important
- D - Valuable

Projects on Outcomes of all priority categories can be funded, but the chances that A prioritized project proposals will be funded are higher than those prioritized as B, C or D.

6.2 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 organizations (e.g. RPO, NERPO, RMAA), can then also publish these material in their media of choice.

7. POLICY AND PROCEDURES RELATING TO THE FUNDING OF PROJECTS

7.1 PLANNING COMMITTEE

The Planning Committee (R & D) Cattle and Small stock is appointed by the Project Committee and consists of subject specialists and industry representatives. Different Working Groups have been established to deal with the different focus areas. Their function is to do the detailed work on research needs, project planning, evaluation, monitoring and budgeting as required by the Project Committee.

This involves:

➤ Identification of research needs

➤ Evaluating project proposals

➤ Prioritising projects

➤ Evaluating project protocols

➤ Allocating funds to specific projects

➤ Evaluating project progress and final reports

➤ Ensuring that results are made known

The Planning Committee moderates and approves the recommendations of the different Working Groups and is responsible for the final acceptance, prioritization and allocation of funds to the different projects.

7.2 FUNDING POLICY

The policy of the RMRDT is to finance projects executed by any recognised research institution, dealing with agricultural research. Such institutions include the Department of Agriculture, Provincial Departments of Agriculture, Institutes of the Agricultural Research Council, all Universities and Agricultural Colleges.

Funding for research and development is made available from the RMRDT and RMLA. In the case of RMRDT funds the policy is to maintain the proportion of the initial capital from the various species' when financing projects for the various sectors, which was as follows:

Beef	65,67%
Small-stock	15,28%
Pork	9,02%
Hides, Skins and Leather	10,03%

In cases where a project is directed at more than one "species", the funds for the project are allocated proportionally from the funds of the "species" concerned. In the event of shortage of funds from a particular "species fund" to fully fund such a project, the Planning Committees can decide whether they would fund more than their agreed portion for a particular project.

7.2 1   Use of Funds

Generally, project funds can be divided into personnel costs, overhead costs and operational costs. Only in exceptional circumstances will the RMRDT or RMLA fund 100% of such costs of a project. The approach is that projects are supported but it was expected from the research institution to be suitably equipped with the appropriate personnel and equipment. Part of the operational costs of a project will be funded, eg. costs of experimental animals, feed, laboratory consumables, computer software, etc.

Funding is also provided for technology transfer opportunities focusing on the project, e. g. workshops, seminars, popular articles and publications.

Funding of capital equipment and the establishing of demonstration units are normally not considered. Such requirements should nevertheless be stated in the budget submission of the projects.

No overhead costs will be funded and personnel costs will only be considered when project based contract appointments are required to execute the project. This must be clearly stated in the budget and must be indicated as a separate cost item and not included in the salaries. If scientific expertise is required from outside the institution (local or abroad) for specific aspects of the project and it has financial implications, such expenses will also be considered for funding on condition it is stated as such in the protocol.

Attendance of national and international Congresses, Conferences, Symposia, etc will not be funded unless the purpose of attendance is to present the findings of a funded project at a scientific gathering. Such funding will be limited to one person and one event and will be within reasonable amounts.

The funding of routine operations in functional service laboratories (e.g. Diagnostic Laboratories) and schemes (e. g. Livestock Improvement Schemes and Range and Forage Units) is generally not considered.

7.2.2   Requirements for Project Leaders

Project leaders should have a tertiary qualification (degree or diploma) from a recognized tertiary institution. In the case where the project leader is a student, an alternative project leader who is in the employment of a recognised research institution, must also be indicated and this alternative project leader must undertake to complete the research if the student fails to do so.

All veterinarians and para-veterinary workers are required to be registered with, or authorized by the South African Veterinary Council in terms of the Veterinary and Para-Veterinary Professions Act (Act 19 of 1992) before they can work in their profession. Similarly, the Natural Scientific Professions Act, (Act 27 of 2003) that came into effect on 16 February 2004, requires all natural scientists to register as such with the South African Council for Natural Scientific Professions. The Act does not give time limits within which scientists must register with the Council after the commencement of the act, however it is clear that natural scientists must register for them to practice in any of the fields mentioned in the Act.

The Engineering Profession Act (Act 46 of 2000) also requires compulsory registration of all persons practicing their profession.

As from 2009 it will thus be required that the project leader be registered with the relevant professional council. If the project leader is not registered with the relevant council, an alternative

project leader that is registered must be nominated to sign off all progress and final reports as well as any publications that may emanate from the research.

7.2.3 Ethical Committee

Animal experimentation must be conducted within standard ethical norms, where applicable. A statement indicating that the Ethical Committee of the institution has approved the project must be included in the Methodology section. Where the institution does not have an Ethical Committee, a declaration of compliance must be included in the Methodology section.

7.2.4 Duration of Funding

Al projects will be funded for a maximum of three years. If the continued funding of a project is required after three years, a submission for the further funding of the project will be required which will be evaluated according to the policy and procedures related to the funding of projects that are applicable at that stage.

7.3 THE TYPES OF R & D PROJECTS THAT ARE FUNDED

"Research" has the meaning of the definition in the Agricultural Research Act namely the "furtherance, accumulation and improvement of knowledge in the agricultural and related sciences through original and other investigations and methods of a scientific nature with the advancement of agriculture as its object".

Similarly "Development" means "the activity by which knowledge acquired through research is utilized" and "Technology Transfer" means "the transfer of knowledge, and techniques and processes for the application thereof".

7.3.1 Industry-orientated Research

Financial support is given to projects which aim to improve the production, marketing, processing and quality of slaughter stock and their products, irrespective of whether such slaughter stock and their products have been produced by commercial or resource-limited producers, and irrespective of whether such marketing and processing are done in the formal or informal sector.

The general approach is to give financial support to specific research projects of which the results are expected to have a practical application in the Red Meat Industry (industry orientation) by, amongst other things, more efficient production of slaughter stock and improved utilisation of red meat, red meat processed products and other products of slaughter stock.

In this regard, the needs of the appropriate industry are to be established at grass roots level and conveyed to the Planning Committee.

7.3.2 Problem-orientated Research

In certain cases, specific research can be commissioned by the client (e. g. a producers organization), with the aim of solving a specific problem. In such cases the full cost of research can be covered, if it is required. In this way highly qualified professional scientists at research institutions are deployed to solve a specific problem.

7.3.3 Fundamental Research

Fundamental (explorative) research by primarily postgraduate students at tertiary and research institutions may be supported as well as post-graduate assistantships in connection with projects which are being funded by the RMRDT, provided it is related to the needs of the industry.

7.3.4 Research of National Importance

Although it is expected that the State is responsible for funding research of national importance, the RMRDT does fund research of national importance to complement funding by the State. The RMRDT is further inclined to favour those projects which are of general concern, rather than of own affairs (by an individual role-player organisation). The RMRDT relies, however, heavily upon the opinion of the individual role-player organizations for motivating the importance of specific projects for the particular industry.

7.4   PROCEDURES

The procedure entails the following steps :

- Call for project proposals
- Project idea and proposal
- Evaluation of project proposal
- Project protocol requested
- Evaluation of project protocol and allocating of funds
- Approval of funds
- Compiling agreement
- Supplying funds
- Evaluation of progress
- Evaluation of final report

7.4.1   Appraisal Process

Standard forms are used for project proposals and protocols as well as for progress and final reports.

The following are considered when a project proposal / protocol is considered and prioritized :

- **Necessity of the Research**

  (1)   The extent / severity / importance of the problem

  (2)   The uniqueness of the problem

  (3)   The extent of the information already available

  (4)   Who is already working on the problem?

- **Composition of the Research Team**

  (1)   Is there proper coordination?

  (2)   Extent of collaboration with other groups

  (3)   The track record of the proposers will be taken into account

  (4)   The expertise of the team is important, i.e. are there enough experts involved?

- **Infrastructure of the Institution**

  (1)   Facilities in place at the institution

  (2)   Equipment available at the institution

- **Time Scale**

  (1)   Duration of project - is it realistic, necessary and affordable?

- **Financial Support**

  (1)   Are other funders already involved? (It is an indication of trust in the capacity of the research team)

  (2)   Are there commercialization possibilities?

  (3)   Value for money - e.g. impact of results in relation to investment by RMRDT

- **Experimental Design**

  (1)   Welfare and ethics

  (2)   Correctness of design

(3) Correct test methodology

(4) Correct statistical analysis

- **Proforma Submission**

    (1) All proposals / protocols should be submitted in the standardized formats of the RMRDT for completeness and uniformity. If not, they may not be evaluated

- **Prognosis**

    (1) What are the chances of success?

    (2) What would be the impact on the sector?

The protocol form makes provision for long and short term objectives. Annual progress reports are measured against the achievement of short-term goals, and final reports against the achievement of long-term goals.

Annual reporting is accompanied by the re-application for funds and offers the opportunity to alter certain aspects in the specific project protocol – as long as this does not substantially alter the programme and contributes to the achievement of goals, it can be readily approved.

Should the progress be unsatisfactory, it shall be the task of the Trust (through the Project Committee and Planning Committee) to terminate funding of that project – even if money has already been spent on it.

The RMRDT reserves the right to cancel any agreement and claim from the recipient recovery of all funds already paid, together with accumulated interest, as well as any other damages that may have been suffered as a result of the foregoing.

7.5   TIME SCHEDULE

The Planning Committee will meet at least twice a year and project proposals, protocols, progress reports and final reports can be submitted for consideration at any of its meetings. Such documents must reach RMRD-Project Committee at least 6 weeks before a meeting. The documentation will then be distributed to the different Working Groups for their inputs and the conveners of the Working Groups must return their consolidated inputs to the RMRDT-Project Committee at least 2 weeks before a meeting.

Once a project proposal has been accepted in principle the RMRDT-Project Committee will inform the project leader and the responsible institution, and will furnish them the specific date on which a full protocol must be submitted.

When a protocol has been accepted the RMRD-Project Committee will see to it that the Agreement is signed as soon as possible. The agreement will include the due dates for progress reports and the final report and the project leader will be reminded annually of these due dates.

ADDENDUM

1. ANNUAL BUDGETS FOR R & D PROJECTS (INPUTS) 1998 TO 2007

Projects are evaluated by the Planning Committees. They also prioritize the various projects according to *inter alia,* merit, importance and urgency for the specific sector or whole Red Meat Industry within the appropriate "species" funds (beef cattle, small-stock, pigs or hides and skins).

Expenses for other items are also budgeted e.g. travel costs for attending meetings, bank costs, an administrative stipend to SAMIC and others.

The following amounts were budgeted for projects in the period 1998 to 2007 :

	R
1998	1 352 735
1999	2 158 643
2000	2 208 963
2001	2 110 419
2002	972 699
2003	1 001 321
2004	1 378 871
2005	1 448 000
2006	2 548 510 (RMRDT + RMLA)
2007	2 793 770 (RMRDT + RMLA)

The amounts shown in the table were not all necessarily spent in a particular financial year. In some cases, funding of projects was terminated before payments; there were also cases where funds had been returned to the funder due to none or poor performance by the research institution.

2. OUTPUTS FOR 1998 TO 2006

Progress reports of research projects are regularly supplied by the research institutions to the appropriate committee and final reports are supplied at the completion of a project. These are evaluated by the committees and in most instances the results of the R & D projects were thought to be of value for the Red Meat Industry. Many of the outputs like scientific and popular articles are delivered long after completion of a project. Even these are followed and noted by the committees. The outputs (1998 to 2006) for the projects which were completed by 2006 are listed in the following table;

1. Saleable products/services/consultancies	26 cases
2. Technology transfer occasions (e.g. Farmers' days)	109 opportunities
3. Reports to Industry	40
4. Popular articles and other media releases	144
5. Scientific articles	43
6. Theses	13
7. Conferences, symposia	111
8. Literature reviews	5

2.1 RESEARCH INSTITUTIONS

The RMRDT outsource research to institutions to do specific research projects.   The names of such institutions are in the list of projects.

2.2 LIST OF PROJECTS

2.2.1 ARC-OVI (Onderstepoort Veterinary Institute)

BSE Survey (Completed)

Combating measles – Diagnosis of measles in cattle / Testing vaccines   (Terminated)

Worm control by management practices (completed)

Characterising LSD virus (lumpy skin disease) (Completed)

MVV / Jaogsiekte in sheep (completed)

PCR diagnostics of venereal diseases in bulls (Completed)

Biting midges & 3DSS (3 day stiffness disease) (Completed)

Studies on snotsiekte

Field evaluation of FMD vaccine in cattle (Completed)

Custom-made FMD vaccines (Completed)

Tracing the origin of FMD infected buffalo (Completed)

Improved heartwater vaccine / heartwater programme (Completed)

Testing heartwater free animals (Completed)

Genetic characteristics of African swine fever virus (Completed)

Immunofluorescence tests to detect African swine fever (Completed)

Serological survey of SA pigs (Completed)

Diagnostic tests exotic diseases: PRRS, FMD

Molecular epidemiology of ASF virus (Completed)

FMD Cattle vaccine stability and suitability

FMD Diagnostic test for cattle

Attenuated live heartwater vaccine for cattle and small stock

Recombinant heartwater vaccine for cattle, sheep and goats

ASF Virus in soft tampans

2.2.2 ARC-API (Animal Production Institute : Animal Improvement)

Estimation breeding values of beef cattle   (Completed)

National genetic evaluation of livestock reproduction traits (Completed)

Genetic evaluation development in beef cattle (Completed)

Beef carcasses traits in feedlot profitability (Completed)

Kaonafatsho ya Dikgomo (N Sotho for cattle improvement) Completed)

Optimal cattle herd compositions for emerging farmers (Completed)

Estimation breeding values small-stock (Completed)

Genetic beef quality characteristics (ACIAR) (Completed)

Genetic evaluation small-stock traits (Completed)

Livestock Improvement Schemes – Beef Cattle, Mutton Sheep, Pigs (Completed)

Selection indices in beef cattle

Selection genetic resistance against internal parasites in sheep (In conjunction with Grootfontein Agricultural Institute)

Internal parasites detection in sheep (Terminated)

Identifying poor tenderness herd sires (QTL's) Literature review (Completed)

Seasonal infertility in pigs (Completed)

BLUPS on pig traits   (Completed)

MH-gene status in S A pigs

Freezing boar semen (Completed)

2.2.3   ARC-API (Animal Production Institute : Range and Forage)

Legumes (*Desmanthus*) in rural pastures of small farmers (Completed)

Stocking rate development model and validation for cattle (RMLA funded)

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

Tenderness indigenous and other beef breeds (Completed)

Decreased protein in pig diets (Completed)

Characteristics of white and yellow fat (literature study) (Completed)

Optimum electrical stunning norms for pigs (Terminated)

Growth stimulants and meat tenderness (literature study) (Completed)

Nurtients SA Sheep meat (RMLA funded)

Beef Tenderness model

2.2.5   Elsenburg ADI (Agriculture Developmental Institute)

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

Woollen slaughter lambs genotypes (Completed)

2.2.6   Grootfontein ADI (Agricultural Development Institute)

Bypass protein for female small-stock (Completed)

Development of a method to estimate breeding values for resistance / resilience of sheep to internal parasites

2.2.7   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)

Competitiveness of the Red Meat Industry (CIAMD)   (Completed)

Risk decision support system – cattle farming (RMLA funded)

2.2.8   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)

2.2.9 UP (Pretoria University)

Survey livestock systems of emergent red meat producers (completed)

Electrical stunning of pigs

2.2.10 RU (Rhodes University)

Training and consulting grant (LIRI) (Terminated)

Hides and skins quality link (LIRI) (Terminated)

Wet-blue surface quality (LIRI) (Terminated)

Feedlot versus farm hides (LIRI) (Terminated)

Economic input of stock-theft in the Eastern Cape (Department of Economics) (Completed)

2.2.11 SASBLIA (South African Studbook and Livestock Improvement Association)

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

INTERGIS 2000 : Development: Beef PTS Extended programs (Completed)