# CHAPTER III

# THE COMPONENTS OF THE PORK SUPPLY CHAIN IN SOUTH AFRICA

*"The **genetic** quality of pork is fixed at conception or the breeding level, the **value** of pork is created and added by the processor, but the **brandname** is accpeted or rejected at consumer level."*

- Anonymous, 2002

## 3.1 INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

In simplistic terms a supply chain is... *"a series of activities which are concerned with the planning, co-ordination and controlling of materials, and finished goods from the supplier to the customer"* (Ganeshan, Jack, Magazine & Stephens, 1999). An effective supply chain is built upon outstanding supplier relations and supplier networks which could (should) eventually become an alliance. In this regard Kotler & Armstrong (1994) indicated that successful companies manage their supply chain through (i) an effective information system, (ii) strong relations with their partners in the value chain and (iii) a close and loyal relationship with their ultimate customers. According to Shapiro (2001) successful supply chain management is a function of integrated planning. Cespedes (1994) indicates that optimization of the supply chain necessitates a closer relationship with fewer supply sources.

Various definitions have been formulated to best describe **supply chain management**. Chen (1999) defines supply chain management as the management of materials, and information in multi-stage production and distribution networks, whilst Anupind & Bassok (1999) indicate that supply chain management is indeed variety orientated, since aspects such as product design, production, outsourcing (or third party logistics), incentives, performance measures and also multi-location inventory control are involved. According to Tsay, Nahimas & Agrawal (1999), supply chain management will take into consideration the number of suppliers, distributors and retailers - thus the topology of the system. Stevens (1989), as quoted by Ganeshan, Jack, Magazine & Stephens (1999), defined the supply chain as follows: *"A connected series of activities with the strategic co-ordination of materials, products and finished goods from the supplier to the consumer. It is also concerned with two distinct flows (material and information) through the organization or industry".* A general supply chain structure, where the manufacturer produces a typical product and a retailer whose intention it is to serve market demand, is given in Figure 3.1.

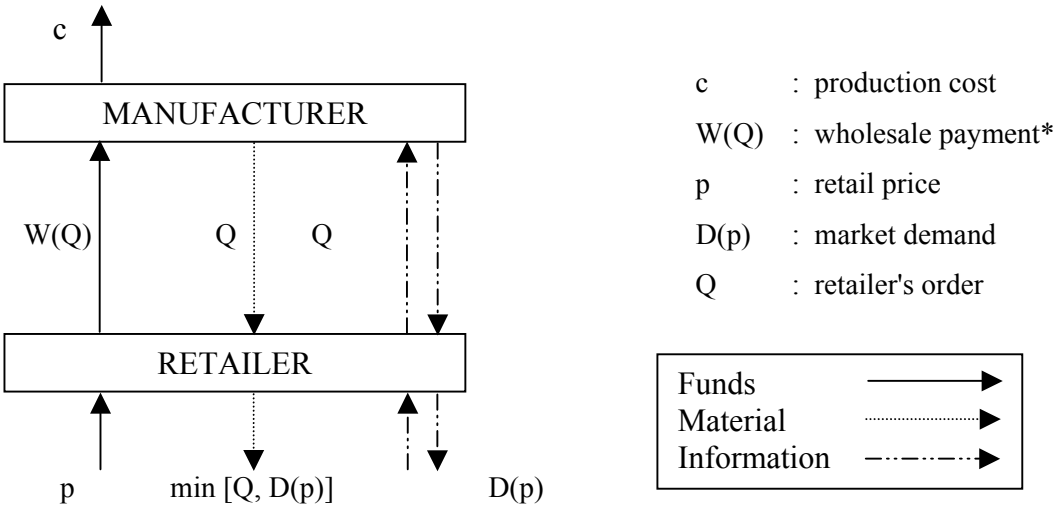


**Fig 3.1 Simplified structure of a general supply chain (Tsay, Nahimas & Agrawal, 1999)**

* The manufacturer manufactures the product at a constant unit cost of c and charges the retailer a wholesale payment [W(Q)] for Q units. WQ can either be exogenous or under control of one of the parties.

Modern supply chains have become primarily dependant upon optimal information sharing between the value chain partners (Kekre, Mukhopadhyay & Srinivasan, 1999). According to Ganeshan *et al,* (1999) a supply chain can be managed either as a single entity or through a system of partnerships. The former is achieved through dominance (a single entity-cum-dominant member) and the latter through co-operation and co-ordination.

The lack of a comprehensive industry supply chain vision (linked with no obsessional drive to improve pork quality) holds serious implications for international competitiveness, consumer confidence and sustained quality assurance. Strategic reorganisation of the South African pig industry should be addressed from a holistic, consumer, safety and product assurance point of view, regarding Fig 3.2 as a realistic departure point.

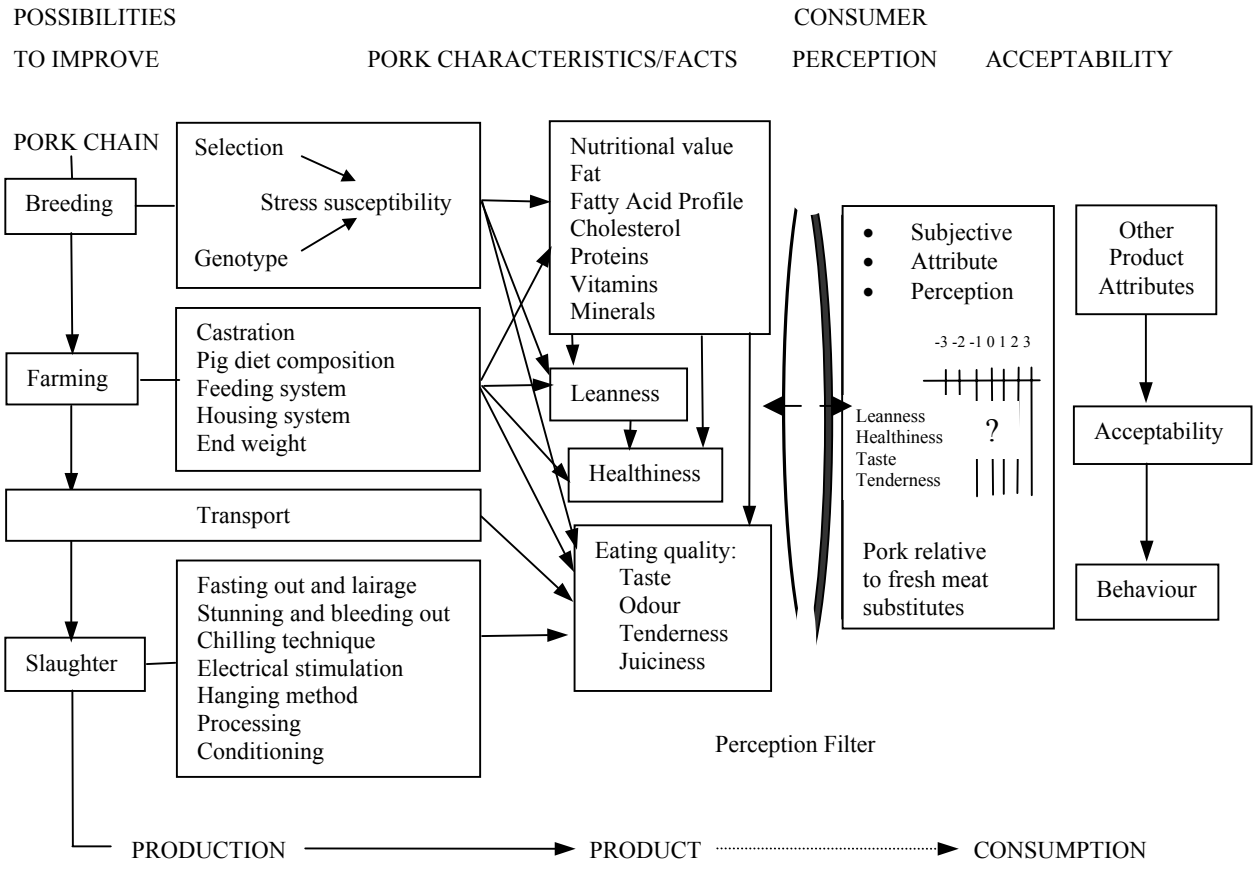


**Fig 3.2 Possibilities to improve production characteristics, consumer perception and acceptability of pork (Verbeke, 2001)**

From Fig 3.2 it is evident that breeding, farming, feeding and slaughtering are four important elements in the supply chain and will be discussed accordingly (Vide 3.3 – 3.5). Pork characteristics (the quest for lean, healthy, safe and tasty pork) and the perception of the consumer through consumer trends (Vide 2.3) were discussed at length in Chapter II. In the remainder of this chapter the inherent structure of the South African pig industry will be discussed with the emphasis on production statistics, the pig feed industry, genetic improvement and pig information systems, slaughter houses and some slaughtering statistics. In the last part of the chapter (section 3.6) the different industry organisations, institutions and computer programmes in support of the South African pork supply chain will be discussed.

## 3.2 SYNOPSYS OF MARKETING RELATIONS AND DIAGRAMMATIC EXPLANATION OF THE SOUTH AFRICAN PORK SUPPLY CHAIN

According to Boehlje & Sonka (2001) **the industrialization of agriculture** and the **formation of tightly alligned supply chains** are **two** of the **most structural dimensions** pertaining to structural change in agriculture. A supply chain approach will... "*increase the interdependence between the various stages in the food chain; it will encourage strategic alliances, networks and other linkages to improve logistics, product flow and information flow*". Fig 3.3 explains the proposed range of marketing relationships and sectors involved and their activity[6] in the South African pig industry. In the agri-food channel, participants as a general rule behave autonomously/individually in the different stages, demonstrating an adversary rather than co-operative behaviour towards each other. Solare (2000) indicated that the variability of prices in the French beef and pork supply chains is a matter of concern, making it very difficult for the two industries to regulate and plan strategically.

ANNEXTURE XII gives a summary of the 14 largest pig farms/companies in South Africa and the extent to which they are vertically integrated. Kanhym Estates (in possession of ± 7 500 sows) are the most advanced since they have their own stud, own AI Station, own feedmill, do their own mixing and their own planting. Until recently they also had their own transport fleet. They hold a production contract with Enterprise abattoir. Not one pig company is listed on the Johannesburg Stock Exchange (JSE) whereas at least two poultry companies, National Chicks and Rainbow Farms, are listed.

[6] Different sectors are involved in the different types of relationships in the South African pork supply chain

| TYPE OF RELATIONSHIP | ACTIVITY | SECTORS INVOLVED AND TYPE OF ACTIVITY[6] |
|---|---|---|
| Intention to sell | • Activate interest of potential buyer | • Breeder investigates potential of a producer or of producers |
| Transaction | • Once off exchange of value between parties | • Breeder sells to producer<br>• Producer sells to abattoir |
| Repeat transactions | • Precursor for a relationship<br>• Trust and credibility are present | • Breeders sell to producer(s)<br>• Producers sell at auctions<br>• Producers sell to abattoirs |
| Long term relationships | • There are normally long term contracts involved<br>• Total commitment is still lacking | • Producers sell weekly (daily) to abattoirs<br>• Abattoirs sell weekly (daily) to wholesalers<br>• Wholesalers sell weekly (daily) to retailers |
| Buyer-seller partnerships | • Focus has moved away from the transaction as an agreement<br>• Need to develop long term mutually supportive relationships | • More structure and discipline in system. Top producers establish long term relationships with breeders/breeding companies, feed companies and abattoirs |
| Strategic alliance | • Partners want to achieve a long term strategic goal | • Consortium of producers owning shares in an abattoir, or breeding company, a feed mill and/or abattoir (DALLAND) |
| Joint venture | • A strategic alliance leads to the establishment of a new firm with it's own capital structure and infrastructure | • Establishment of own AI station between a consortium of stud breeders (PIG GEN (Pty) Ltd) |
| Networks | • Networks encompass larger sets of partners<br>• A kind of confederation guided from a hub where the key functions of the network are performed | • Collectively 10 – 20 producers (share holders) market the majority of pork in a province.<br>• Can own their own abattoir (Winelands Pork Abattoir in the Western Cape)<br>• Want to export |
| Vertical integration | • A single firm owning successive stages of the food production chain | • No real vertical integration on company basis. Producers diversify from own planting, own transport, own feed mixing (feed mills), own abattoirs to own butcheries |
| Vertical co-ordination | • Vertical co-ordination takes on such forms as integration, contracting, alliances, co-operatives, source verification, integrated information - even a complete new supply chain<br>• Different stages of the production process are owned by different (sometimes the same) firms | • Not yet present or fully operational in South Africa |

**Fig 3.3 The range of marketing relationships evolving into the supply chain concept (After Wierenga, 1998)**

## 3.3 THE STRUCTURE OF THE SOUTH AFRICAN PIG INDUSTRY

The origin of the South African pig industry can be traced back to 1652 when Jan van Riebeeck[7] brought some pigs with him to the Cape of Good Hope (Naude and Visser, 1994). This humble beginning of the early South African pig industry at the Cape of Good Hope has developed into a national industry over the last 350 years. The industry applies modern technology, science, a free market approach and has established itself as a dynamic component of the agricultural sector[8]. The pork industry has evolved into a spatial and economic (important) industry with a gross producer value of ± R1 billion and a gross consumer value of more than R2 billion (Matthis, 1999). According to Meulenberg (1998), the marketing channels for agricultural (food) products consist of a number of companies. These include studbreeders, breeding companies, feed mixing companies, pharmaceutical companies, producers, abattoirs, processing plants, traders, wholesalers and retailers.

### 3.3.1 Production Statistics

Pig producers are distributed across all nine provinces of South Africa. According to Davies (2002), 350 producers are in possession of ± 100 000 sows. According to Streicher (2001), 210 pork producers in possession of 71 067 sows, are members of SAPPO (South African Pork Producers Organisation). SAPPO represents approximately 65-70 % of all commercial pig producers. Fig 3.3 gives an indication of the number of commercial pork producers, distributed on a per province basis.

---

[7] The magic wand, which changed pigs' fortunes so radically was a letter from the Lords Seventeen to Commander Jan van Riebeeck. They demanded fresh pork when they called at the Cape. According to the letter, Van Riebeeck had failed to display sufficient zeal in the breeding of pigs. Although more pigs were imported from the island of St Helena at the end of 1658, only 24 pigs were on the livestock inventory list! Suffice to conclude that his Lords and Masters had no idea what it takes to breed pigs in Africa! (Porcinarium, 1996).

[8] The contribution of animal products to the total gross value of agriculture amounts to R 19.4 billion or 40.5 % thereof. The percentage contribution of the pig industry to the animal products gross value, is estimated between 4 % (A.A.S, 2001) and 5.2 % (Streicher, 2001). Streicher (2001) is assuming a producer price of R 7.67 per kg, 2 million pigs slaughtered per annum with an average carcass weight of 65 kg, resulting in a nett producers value of R 997 million per annum. Thus in conservative monetary terms, the pig industry is estimated to be approximately a one billion Rand industry.

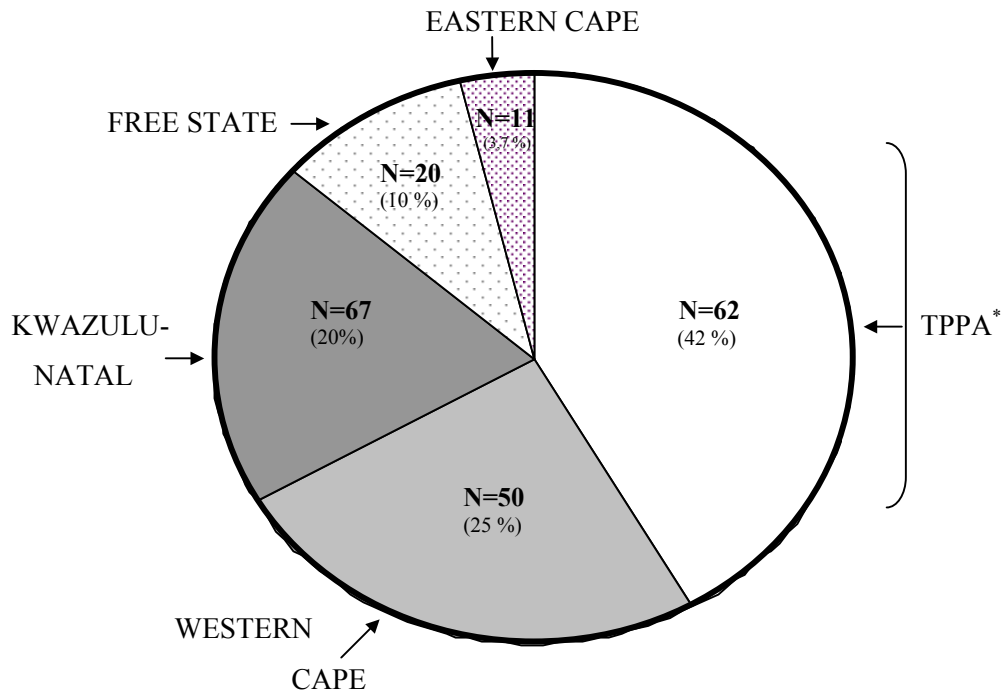


**Fig 3.4 Distribution of commercial pork producers on a per province basis (SAPPO, 2001)**

***(N = Number of producers and % indicates their pro rata contribution)***

* TPPA or Transvaal Pork Producers' Association represents the Northwest Province, Gauteng, the Limpopo Province and Mpumalanga Province. Producers in these four provinces are in possession of 30 321 sows or 42 % of the SAPPO active sows.

.

From Fig 3.4 it is clear that the concentration of pig production is dominated by the province previously known as Transvaal, hence TPPA* (Transvaal Pork Producers' Organisation). More than 42 % of all the pigs in South Africa are concentrated in a 250 km radius around Pretoria or the Gauteng province. The second and third most important production-related provinces are the Western Cape and KwaZulu-Natal, which are in possession of approximately 24 % and 20 % of the country's pigs respectively [Vide Table 3.1].

**Table 3.1 A summary of SAPPO membership, sows registered at SAPPO and average herd size per province (SAPPO, 2001)**

| PROVINCE | Percentage of Pigs per Province | Number of Active Members | Number of Sows Registered at SAPPO | Average Herd Size per Province |
|---|---|---|---|---|
| Eastern Cape | 3.8 | 11 | 2 703 | 246 |
| Free State | 10.1 | 20 | 7 213 | 360 |
| KwaZulu-Natal | 19.05 | 67 | 13 400* | 200* |
| TPPA | 42.6 | 62 | 30 321 | 489 |
| Western Cape | 24.45 | 50 | 17 430 | 348 |
| **TOTAL** | **100** | **210** | **71 067** | **$\bar{x}$ = 338** |

* The figure for Kwazulu-Natal is estimated, since their levy is based on pigs slaughtered at the abattoirs and not the number of active sows in the herd *per se*
[22 127 pigs slaughtered per month x 12 (months) / (9 pigs weaned/sow x 2.2 litters/annum) / 67]

SAPPO (1999) indicated that 79.85 % of the total pig numbers of the RSA is designated to the commercial areas and 20.15 % to the developing areas. On a per province basis the distribution of total pig numbers for the commercial and developing areas are depicted in Fig 3.5 and Fig 3.6.

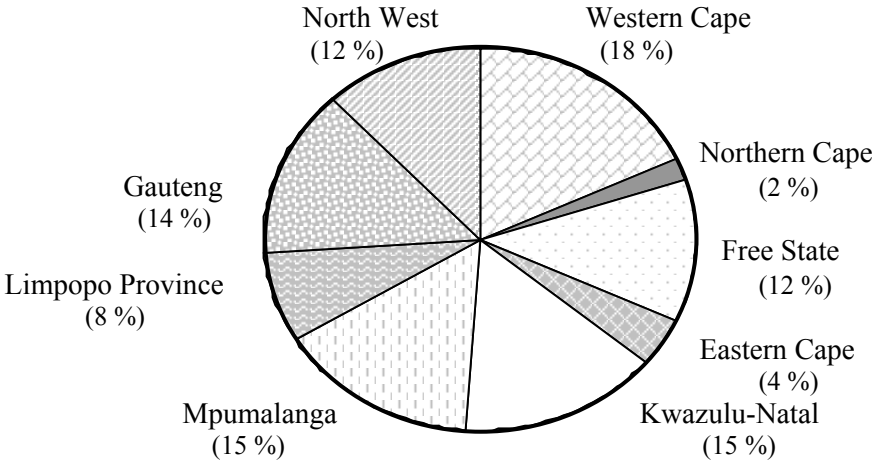


**Fig 3.5 Distribution of total pig numbers in the commercial areas on a per province basis (N = 1 240 487)** *Source: SAPPO (1999)*

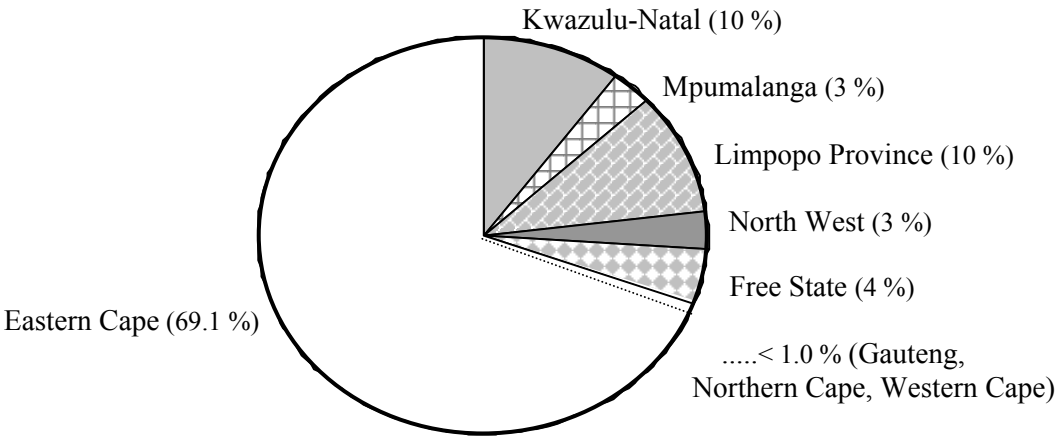


**Fig 3.6 Distribution of total pig numbers in the developing areas on a per province basis (N = 315 513)** *Source: SAPPO (1999)*

Internationally it is a well known trend and fact that pig production is best practiced as close as possible to the maize production areas. It stands to reason that the production areas, most distant from the maize belt (Vide Table 3.7), are likely to be more pressurised in terms of economic efficiency and sustainability. This is exacerbated by the fact that the preponderance of cheaper produced pork (Vide Table 3.7) can be transported, fairly cost effectively, to these most distant areas. In contrast, the cost of transporting maize from the maize belt to the most distant areas is inherently expensive and likely to become more expensive in future.

### 3.3.2 The Pig Feed Industry

#### 3.3.2.1 Introduction

Since the early 1930's, when the South African animal feed industry was established officially, the formal feed industry gradually increased almost every year. At present the national feed production is estimated to be approximately 7.6 million tons (Vide Table 3.2) with a monetary value of R700 000 million per annum (AFMA, 2003).

AFMA (Animal Feed Manufacturers Association) was established in 1988 as an Article 21 company and represents the feed industry on various platforms in order to protect and/or enhance the interests of the feed industry. To this extent AFMA liaises with government organisations, producer organisations, the academic fraternity, research institutions, commodity forums (traders) and also international roleplayers/associations. AFMA is furthermore involved in no less than twelve matters of importance ranging from feed regulations, crop estimates, statistical calculations to agricultural trade agreements.

### 3.3.2.2 The Protein and Animal Feed Dilemma

Historically, the traditional influence of nutrition on animal performance has been considered as a single input-output relationship. However, in modern day pig production, the domain of pig nutrition (based on home mixing and industrialized mixing) has become more complex. Cognizance must now be taken of the effects of nutrition on profitability, performance, animal welfare, environmental pollution, health and meat quality. Improvements in nutritional knowledge and diet formulation linked with sound stockmanship and management acumen are linked to improvements in sow productivity and *vice versa*. Input providers of pig feed however, need to be constantly aware of external and internal threats that can have a negative effect on their enterprises. In this regard cognizance should be taken of the Rand/Dollar exchange rate, cyclical droughts, industrial strikes, labour unrest, internal sabotage and bio-terrorism.

Feed costs contribute to between 70 % to 80 % of the total variable costs in pig production. For instance, a R50 saving per ton in the growth ration of a 500 sow unit (weaning 22 piglets per sow per year and a feed conversion ratio of 2, 4 : 1) will mean an annual saving of approximately R108 000 !

Hence, the South African feed industry will always be subjected to financial scrutiny. The meticulous financial scrutiny of this industry is as a result of (i) *a fluctuation in the annual maize crop* (where maize normally constitute in excess of 65 % of any ration on the typical pig farm) and (ii) *the poor self-sufficiency index* (±40 %) of local protein sources. Subsequently the South African livestock industry is a net importer of fish meal and plant oil cakes. This is aggravated by the inconsistency of quality of these raw materials. Eckermans (2001) indicated that South Africa's total demand for animal feed proteins (oil cakes) is 1,063 million metric tons of which 427 041 metric tons (40,16 %) are locally produced. The bulk of animal feed proteins (636 279 metric tons or 59,84 %) must be imported. These imports are, almost without exception dollar driven, causing further uncalled pressure on input levels, balance of trade, performance and profitability of livestock and pig farmers.

### 3.3.2.3 Feed Production Levels

The calculated national feed production for South Africa during 2 000 on a per specie/industry basis is given in Table 3.2. From this table it is evident that home mixing forms an integral part in the pig industry. In excess of 60 % of all pig rations is home mixed.

**Table 3.2 A summary and percentage allocation of the national animal (across species) feed production (metric tons) during 2000 (AFMA, 2003)**

| FEED TYPE | AFMA FEED* (Including those derived from concentrates) | INFORMAL SECTOR | TOTAL NATIONAL FEED PRODUCTION | AFMA FEED AS % OF NATIONAL PRODUCTION |
|---|---|---|---|---|
| Broilers | 2 133 077 | 59 923 | 2 193 000 | 97.27 % |
| Layers | 767 062 | 86 938 | 854 000 | 89.82 % |
| Dairy | 731 498 | 819 695 | 1 551 193 | 47.16 % |
| Beef & Sheep | 398 334 | 1 154 666 | 1 553 000 | 25.65 % |
| Pigs | 251 201 | 380 030 | 631 231 | 39.79 % |
| Dogs | 106 922 | 105 078 | 212 000 | 50.43 % |
| Horses | 21 179 | 99 868 | 121 047 | 17.50 % |
| Other mixtures | 56 350 | 306442 | 362 792 | 15.53 % |
| Ruminants & other | 8 935 | 122579 | 131 514 | 6.79 % |
| **TOTAL (Metric Tons)** | **4 474 558** | **3 135 219** | **7 609 777** | **58.80 %** |

* AFMA FEED means feed that is produced by those companies that are affiliated with AFMA (Animal Feed Manufacturers Association)

Naudé and Visser (1994) indicated that the annual feed consumption of raw materials in the South African pig industry amounts to approximately 600 000 tons of feed (Vide Table 3.3).

**Table 3.3 Analysis of annual feed consumption on a raw material and percentage basis for the South African pig industry (Naudé & Visser, 1994)**

| Raw Material | Tonnage | Percentage |
|---|---|---|
| • Grain (Maize, Wheat & Sorghum) | 390 000 | 65 |
| • Bran | 96 000 | 16 |
| • Fishmeal | 42 000 | 7 |
| • Oilcakes | 48 000 | 8 |
| • Salt | 6 000 | 1 |
| • Premixes | 12 000 | 2 |
| • Synthetic Lycine & Macro minerals | 6 000 | 1 |
| **TOTAL** | **600 000** | **100** |

#### 3.3.2.3.1 The Mineral and Pre-mix Market

Differences in feed intake is manifested in inequalities and imbalances in the intake of, in particular, proteins and amino acids (Close & Cole, 2000). A decline in dietary protein and certain essential amino acids, especially lycine, will impair the onset of puberty in gilts and sows. The amino acid requirement of the lactating sow is furthermore closely correlated to the composition of her milk. The comprehensive work on sow and boar nutrition (Close & Cole, 2000) deals with many topics including minerals, vitamins, amino acids, etc., as well as that of Viljoen (1998).

The total premix market in South Africa is estimated to be in the region of 7,6 million tons per annum (Fisher, 2002) of which the pig industry represents approximately 7 % or 500 000 tons per annum. This represents a gross product value of ± R22,5 million per annum, based on an average premix cost of R45 per ton of feed for the pig industry.

It is to the detriment of the livestock industry that all the vitamins that are used in livestock rations, including pig rations, are imported (Fisher, 2002). Furthermore, for each of the thirteen vitamins, a technologically advanced and specialised processing plant is required. Manufacturing of vitamins is predominantly confined to the United States, Europe, Japan and China.

The manufacturing of pre-mixes[9] in South Africa is dominated by three major internationally renowned companies, namely ROCHE, BASF and NUTEC. Smaller local distributors such as Feedmix and Coprex are also active in the South African market, but also have international links.

#### 3.3.2.3.2 The Pharmaceutical Industry

The pharmaceutical industry represents an important part of agriculture, the livestock industry and especially the intensive industries (Vide Table 3.4). Nearly all companies involved in crop protection and the manufacturing of animal health products are represented by AVCASA. Some 14 animal health companies, all situated in Gauteng, are affiliated to AVCASA. The functions and responsibilities of these companies are regulated by Act No 36 of 1947 (The Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act - Vide 3.6.5). In this regard AVCASA endeavours to promote the image of the crop protection and animal product industries with due consideration to human health, animal health and the environment. This is accomplished through its structure, working groups and committees (Vide Fig 3.7).

[9] A pre-mix pack (normally weighing 3-5 kg) is added to one ton of feed and contains vitamins, trace elements (of which the bulk is manufactured in South Africa) and/or medication. A pre-mix macro pack (normally weighing 10

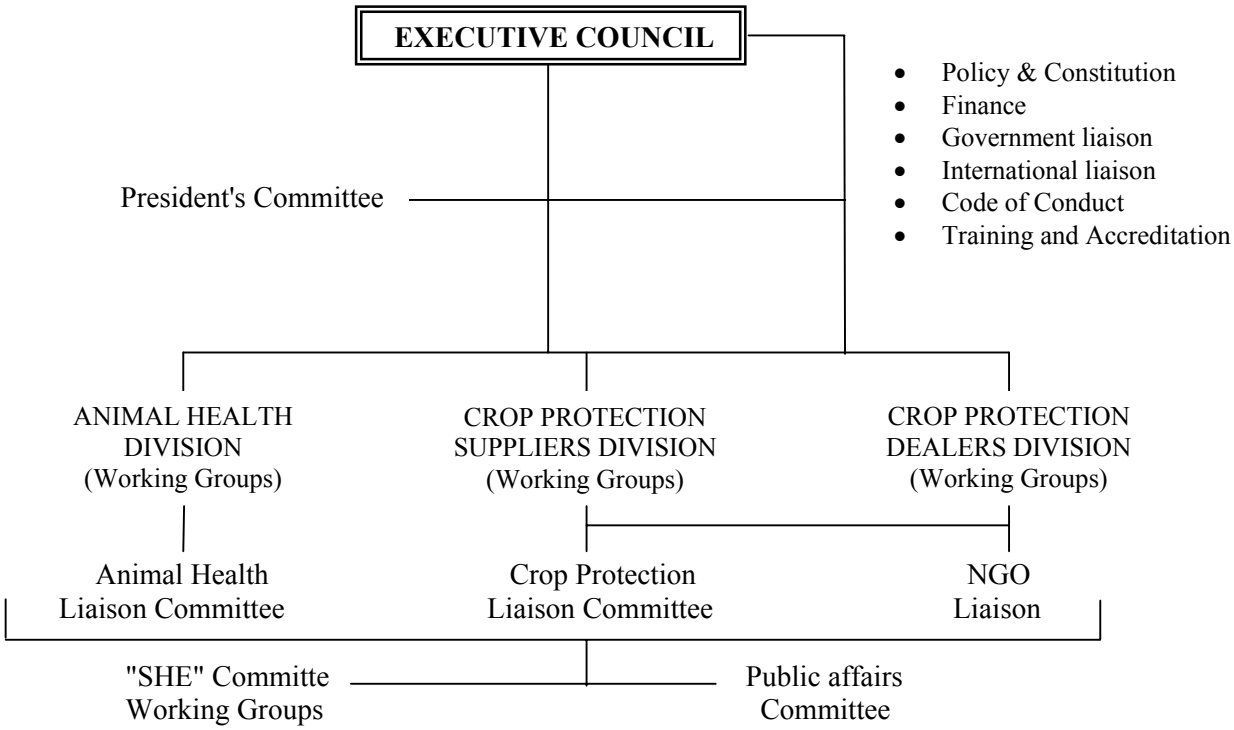


**Fig 3.7** **Organogram explaining the functionality of AVCASA and the role of the various committees (AVCASA, 2003*)**

* http://www.avcasa.com/about.html.

**Table 3.4** **A summary of the animal health product sales during 1999 (AVCASA, 2003)**

| ITEM | PERCENTAGE | RAND VALUE |
|---|---|---|
| 1. Antimicrobials | 26 | R 175 million |
| 2. Ectoparaciticides | 22 | R 148.1 million |
| 3. Vaccines | 18 | R 121.2 million |
| 4. Anthelmintics | 9 | R 60.5 million |
| 5. Endectocodes | 8 | R 53.8 million |
| 6. Growth Promoters | 7 | R 47.1 million |
| 7. Other | 10 | R 67.3 million |
| **TOTAL** | **100** | **R 673 million** |

or 20 kg) is added per ton of feed but contains a range of nutrients ranging from vitamins, trace elements, feed lime,

### 3.3.3 Vulnerabilities Pertaining to the South African Pig Industry

(i) **Local pig production** in comparison to global production norms and global trends **can be regarded as minute/fractional**, accounting for approximately 0.2 % of world production and 0.1 % of world exports in 1996 (LMC International Ltd, 1999). Equally important is the fact that South Africa has never been a pork exporter of any substantial magnitude (Matthis, 1999). SAMIC (2000) indicated that 10 427 tons of pork were imported during the year 2000. China (by virtue of numbers) dominates world pork production, accounting for approximately 50 % of world production, followed by the European Union (18 %) and the USA (10 %). Given the inherent small size, structure and limitations of the South African pig industry, preliminary competitiveness comparisons (Vide 3.4) are reflected in sub-optimal and impaired performance when compared to the Danish, American and Taiwanese pork industries. This is exacerbated by export subsidies and the inherent vulnerability of the Rands intrinsic exchange rate against the Dollar and Euro.

Matthis (1999) indicated that the biggest single threat to the South African pork industry is the massive influx of poultry meat into the country (mainly from the USA). In excess of 50 % of all imported meat is still poultry meat. The ripple effect of imported poultry meat is manifested as follows:

- The local import levy on imported poultry meat, albeit 17 % at present, is not convincingly effective, since turkey meat is duty free
- Imported poultry and turkey meat, along with the mechanically deboned meat (MDM), competes in direct opposition with local (processed and fresh) pork and poultry products
- The low import product prices (which are substantially subsidized) are not passed on to the consumer, thus not contributing to food security, whilst simultaneously pressuring local pig and poultry producers in a disguised manner with serious financial and unemployment implications.

(ii) The **establishment/creation of a responsive production environment** conducive to sustainable and profitable pig farming calls for, *inter alia*, stringent monitoring and application of health measures, welfare and environmental codes of conduct, biosecurity programmes, transparent import and export protocols and most importantly the furthering of a sound technology development and research strategy. The latter should be regarded

---

Mono Calcium Phosphate, salt, amino acids and sometimes medication.

as fundamentally related to the above-mentioned critical production factors. However, the commercial and stud industry must take drastic actions to mobilize financial support to further the cause of agricultural research, since agricultural research is not regarded at present as a high government priority. State owned/subsidized industries (previously protected from international competition), where funds were abundantly directed to the private sector, are being replaced by actions, activities and programmes where competition is stimulated and subsidies to the private sector are limited substantially (Matthis, 1999). Grulke (2000) stated that companies can no longer rely on regulations to protect them or their market positions. During the past five years the Parliamentary Grant of the Agricultural Research Council declined from R 350 million in 1998 to R 264 million in 2002 (Carstens, 2002). Simultaneously, the funds earmarked for research through the RMRDT of SAMIC were subjected to the inherent risks and fluctuations of the money markets and the causal relationship with regard to money being effectively available for research in the livestock production chain and more specifically the pork chain. In 1999 an amount of R 2 158 643 was allocated for meat industry related research to partly finance 29 research projects incorporating the National Performance Testing Schemes (R 240 559) and INTERGIS (R 275 457). This figure has substantially/ significantly decreased to a preliminary amount of R 972 699 budgeted by the RMRDT for the year 2002 to partly finance 22 research projects, excluding the National Performance Testing Schemes and INTERGIS (Klingbiel, 2002). During the 2001 SAPPO Annual Congress in Warmbaths in the Limpopo Province, a heartening motion[10] was tabled, submitted and accepted by the congress.

(iii) **Marketing and promotion.** Van Rooyen (1999) indicated the importance of promoting pork within a generic consumer focussed strategy. Pork promotion and advertising had been a highly debated subject for decades within the South African pig industry. The reality is that SAPPO has orchestrated advertising and marketing campaigns in the post Meat Board era, but these had no sustainable zeal and limited financial impact [Vide Table 3.5 and Table 3.9 where it is indicated that the *per capita* consumption of pork declined substantially after the closure of the Meat Board (3.4kg in 1996 to 3kg in the year 1999/2000) when only half a million Rand was spent on advertising].

[10] *"In order to avoid a breakdown in pork industry research and to establish ownership of relevant research, the Transvaal Pork Producers' Association proposes that SAPPO, as a matter of urgency, budget for this purpose.*

*It is recognised across the globe that returns on agricultural research, result to a figure of ±65 %. Research is furthermore required to become competitive in the international market".*

**Table 3.5 A summary of the amounts of money spent on advertising by the former Meat Board and SAPPO from 1994 - 2003 (Streicher, 2003)**

| YEAR | AMOUNT | INSTITUTION |
|---|---|---|
| 1994 | R 7 500 000 | Meat Board |
| 1995 | R 7 000 000 | Meat Board |
| 1996 | R 5 400 000 | Meat Board |
| 1997 | - | (Closure of Meat Board) |
| 1998 | R 653 421 | SAPPO |
| 1999 | R 389 055 | SAPPO |
| 2000 | R 161 566 | SAPPO |
| 2001 | R 857 628 | SAPPO |
| 2002 | R 1 010 206 | SAPPO |
| 2003* | R 1 100 000 | SAPPO |

Remarks: The Meat Board amounts were obtained from agricultural leaders and former SAPPO and Meat Board employees. The amounts from 1998 - 2002 were spent by SAPPO on a national basis. The actual amount is higher, since the provincial branches of SAPPO manage and budget for their own promotions.

* Budgeted figure for 2003

During the SAPPO strategic planning session (4 May, 1999) participants overwhelmingly identified marketing related issues (featuring as a weakness *per se*) no less than 19 times out of a total of 55 perceived weaknesses. SAPPO is faced with an unenviable challenge, where the issue of funds is pivotal and fundamental to future and sustainable marketing success. The challenge, embedded in a dualistic nature implies, *on the one hand*, a request to the already cash stripped members of SAPPO to further increase their voluntary contribution. *On the other hand* SAPPO must convince/persuade meat processors, wholesalers, retailers and butchers to invest and get intimately involved in a comprehensive long term, strategic marketing campaign for the pig industry. Suffice to conclude that pork promotion and advertising is regarded as crucial, but practised fragmented with limited financial leverage, resulting ultimately in low awareness levels of pork.

(iv) **Protein in pig feed and the maize dilemma.** The high input costs of pig production, especially on the nutritional level (representing in excess of 75 % of total costs), is manifested

twofold. *Firstly in excessively high protein costs* (of which in excess of 40 % is imported) *and secondly the maize factor* (dilemma) with its inherent cyclical nature, complexity, regular supply inconsistencies, recent record price levels, extreme vulnerability to climatic conditions and it's exploitational value on SAFEX based on US Dollars. The maize price is probably the biggest psychological, emotional and financial trigger in the pork supply chain. In short: *Pig farmers have become too reliant on maize.* Venter (2003) stated that the three factors which will always have a significant impact on the South African maize price are: (1) the international maize supply and demand (reflected in the Chicago Board of Trade prices), (2) the exchange value of the Rand and (3) the domestic supply and demand of maize. The uninterrupted domestic protein shortage in all the intensive livestock industries (linked to import disparity/dependency based on dollar terms) and the unavoidable energy dilemma, manifested in the impetuosity of the maize price (mentioned above) has proven indisputably to be two of the major triggers in the pork supply chain with detrimental effects along the chain on profitability and on survival.

## 3.4 GENETIC IMPROVEMENT AND PIG INFORMATION SYSTEMS

### 3.4.1 Introduction

The philosophy of genetic improvement of livestock pivots on the principle that the entire South African population benefits eventually from the genetic improvement which is being generated in the nucleus (seedstock-producing) herds. Improved genes are distributed to all the layers of the breeding pyramid through effective gene flow principles over an extended period of time. Mokoena (1998) studied the payoffs to investments in livestock improvement programmes from 1970 – 1996 in South Africa. Financial investments in the Dairy-, Beef-, Small Stock- and Pig Testing Schemes generated internal rate of returns of 51 %, 44 %, 54 % and 14 % for the different Schemes respectively. These 'rate of returns' indicated very clearly that the investments in the National Livestock Improvement Schemes represent a high return on public funds, during the mentioned period. In terms of welfare gains (to what extent the benefits from investments in livestock production research programmes are distributed amongst consumers and producers) Mokoena (1998) indicated, through applying the Akino – Hayami model, that consumers gain more than producers in all the schemes.

The database component of any animal recording scheme is pivotal to continued genetic improvement (Visser, 1996). For this reason, pig information systems and genetic improvement systems should be regarded as interwoven and be based fundamentally on the utmost accuracy. The process should be continuous. According to Campher, Hunlun & Van Zyl (1998), substantial

genetic progress, achieved over the past decades by South African livestock producers, has resulted in enviable food and fibre production levels. This achievement, however, resulted through dedicated efforts from several institutions, committees and organisations renowned within the South African livestock improvement fraternity. These institutions and organisations include S.A. Studbook, INTERGIS, breed societies, livestock improvement schemes, the artificial insemination (AI) industry, the involvement of some one thousand scientists, consultants and veterinary surgeons in the livestock industry, the Registrar of Livestock Improvement **and also** the Livestock Improvement Act (No. 25 of 1977 which is being administered by the Registrar).

### 3.4.2 Genetic Improvement of Pigs

Genetic improvement of pigs in South Africa (on a national level) can be traced back to the 1st of April 1956. Official performance testing commenced with three testing centres (Pretoria, Cedara and Elsenburg) in South Africa and one in the former Rhodesia (Hofmeyr, 1996). The centres were designed to mirror similar conditions in commercial piggeries and to ensure standardised management and animal environments. Regular changes were introduced during the last forty six years to keep abreast with modern performance testing. *"In fact the golden thread of successful breeding in the South African pig stud industry has been it's intimate involvement in and collaboration with performance testing at a national level"* [Webber (1996) as quoted by Campher, Hunlun & Van Zyl (1998)].

#### 3.4.2.1 Central Testing

The central testing phase of pigs (conducted at the three pig testing centres at Irene, Cedara and Elsenburg) has been inherently part of the genetic improvement of pigs on a national level since 1956 (Hofmeyr, 1996). From each breeder a random sample of at least 22 young boars and 22 young gilts (which represent the offspring of at least 50 % of the herd boars) per breed or line are tested centrally during a test year. At the end of the test (before slaughtering) all animals are judged and scored for functional efficiency based on 14 visual traits. Fig 3.8 gives an overview of the central test statistics since 1991.

A detailed carcass evaluation is conducted on the slaughtered animals. Carcass traits such as % lean, % fat, % bone, % drip free lean and efficiency of lean meat production are determined. The breeding values (EBV's) of centrally tested animals are estimated once a week, using the PEST-computer programme. The genetic evaluation of pigs is discussed in further detail in CHAPTER IV.

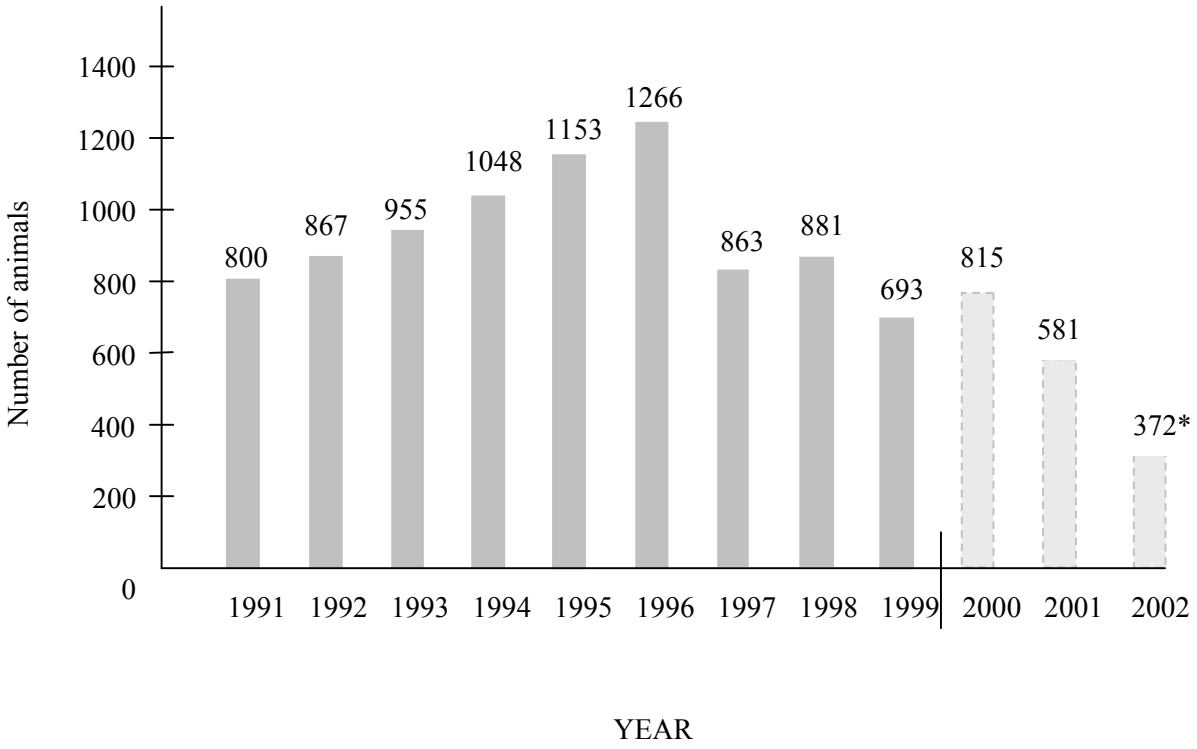


**Fig 3.8 A summary of the total number of pigs tested centrally (Phase B) in the National Pig Performance Testing Scheme from 1991 - 2001 (AII, 2001)**

( Since January 2000 the national database is continuously subjected to the retrieval of rejected data. This figure will fluctuate as long as more records are recaptured.)

* Estimated figure

### 3.4.2.2 On-farm Testing

The official phase D (on-farm testing) of pigs forms an integral part of genetic improvement within the National Pig Performance Testing Scheme (Vide Fig 3.9). On-farm testing involves the testing of boars and gilts, measuring growth rate, ultrasonic back fat measurement, and in certain herds, feed intake and feed conversion. On-farm performance data and reproduction data are submitted to INTERGIS (Integrated Registration and Genetic Information System). This enables scientists at the ARC - Animal Improvement Institute to summarize, verify and prepare the data for the execution of PIG BLUP.

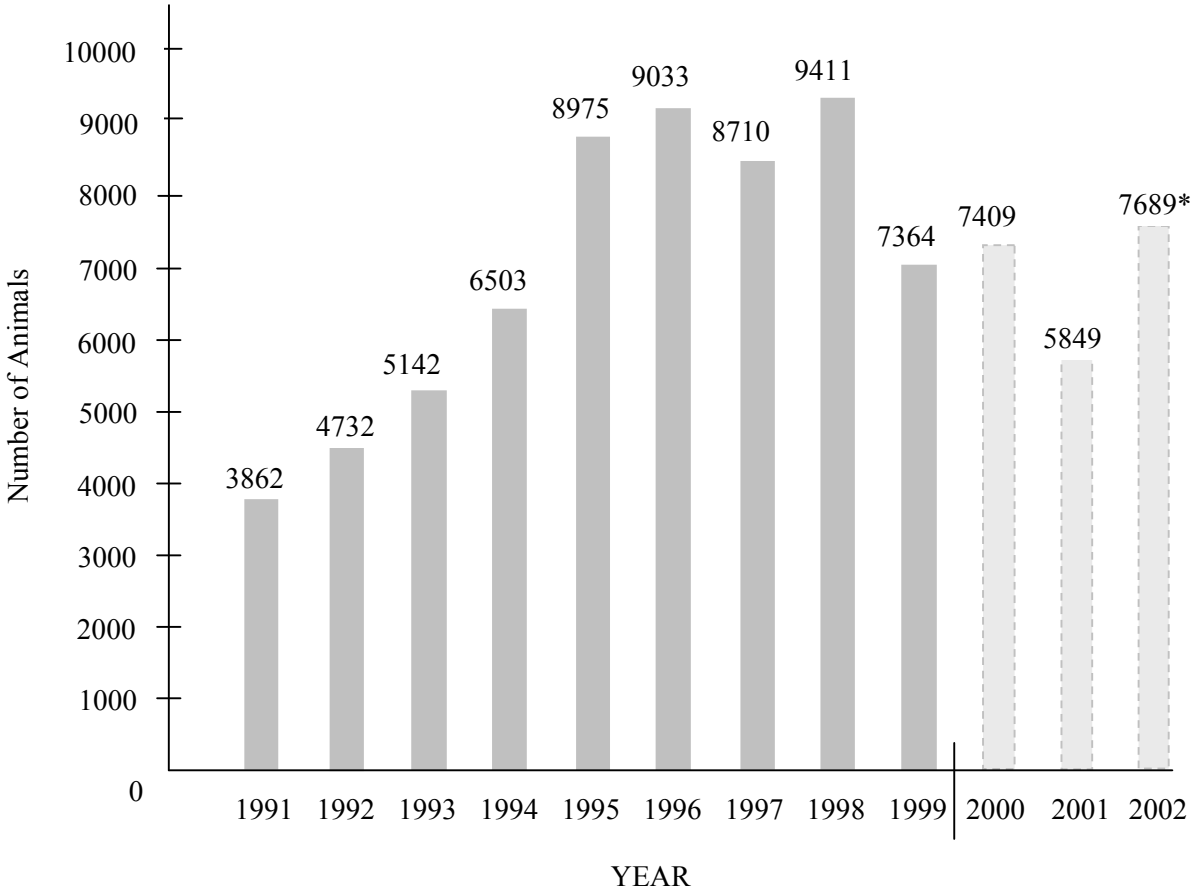


**Fig 3.9 A summary of the total number of pigs tested on-farm (Phase D) from 1991-2001 (AII, 2001)**

Since January 2000 the national database is continuously subjected to the retrieval of rejected data. This figure will fluctuate as long as more records are recaptured.

* Estimated figure

### 3.4.2.3 PIG BLUP

PIG BLUP, a comprehensive genetic evaluation computer programme was developed during the late 1980's by scientists of the Animal Genetics and Breeding Unit at the University of New England, Armidale, New South Wales in Australia. The **power of** PIG BLUP is based particularly on using information from **all** measurements and **all** relatives (normally over a period of ten years) as well as other animals in the breeding herd simultaneously. PIG BLUP is a scientific tool to calculate Estimated Breeding Values (EBV's). The Estimated Breeding Value (EBV) is the genetic

value of an animal as a parent. PIG BLUP is a within herd genetic evaluation programme and divides phenotypic performance into genetic effects, environmental effects and other effects, thus calculating trends within each herd.

During 1993 the ARC - Animal Improvement Institute obtained the (first) licence for the execution of PIG BLUP in the South African pig stud industry. PIG BLUP was implemented in the South African pig stud industry during 1993/94. Almost all participating Scheme members apply this programme in their herds with advantageous benefits.

#### 3.4.2.4 Independent Selection Panel

Ascertaining genetic merit through genetic comparisons between pig stud herds calls for encompassing (total) procedural, scientific and judicial responsibility (Heydenrych, 1996). This is paramount since wrong findings could have deleterious genetic and economic implications for the pig industry at large. Subsequently the Independent Selection Panel was formed to ensure scientific interpretation and total impartiality of the test results and the official classification of stud herds as Super Nucleus, Nucleus or On-farm Testing. The Independent Selection Panel (who meets anually during the month of March) consists of the Programme Manager of the National Pig Performance Testing Scheme, an independent animal geneticist and the President of the Pig Breeders Association (PBS) who also acts as chairman.

Test results are presented by using anonymous code letters to distinguish between the different herds, thus rendering further objectivity to the panel. Compliance to the rules of the scheme is strictly adhered to and scrutinized by no less than seventeen herd parameters. The final decision regarding the genetic merit of participating stud herds, is based on the genetic Rand Value Index (RVI) which is determined by the PEST programme. The RVI has significant practical value, since it expresses the average genetic superiority of pigs (based on the three most important production traits) in a specific herd compared to the genetic value of the national average of all participating herds in monetary terms.

#### 3.4.2.5 Progress Through Consolidation: PIG GEN (Pty) Ltd

The new millenium has brought with it some of the most exciting challenges and opportunities to date in the history of pig breeding in this country. A private company PIG GEN (Pty) Ltd (a consortium of individual studbreeders with the intention to co-operate on a national and international basis and to breed and sell the best genetic material to the South African pig market)

was already formed in 1996. The establishment and approval of the PIG GEN AI station on September 11, 2001 at the premises of the ARC-AII has paved the way for accelerated genetic improvement. The most superior (official performance tested) stud boars in the country will be identified through a national BLUP-programme. Dissemination of elite genes to the shareholders (Vide Fig 3.10) of PIG GEN, followed by careful identification through across-herd genetic evaluation procedures, will ensure a continuous supply of proven progeny tested boars to the AI-system. The biggest impact of this co-operative/consolidated breeding programme will ultimately be on the commercial industry.

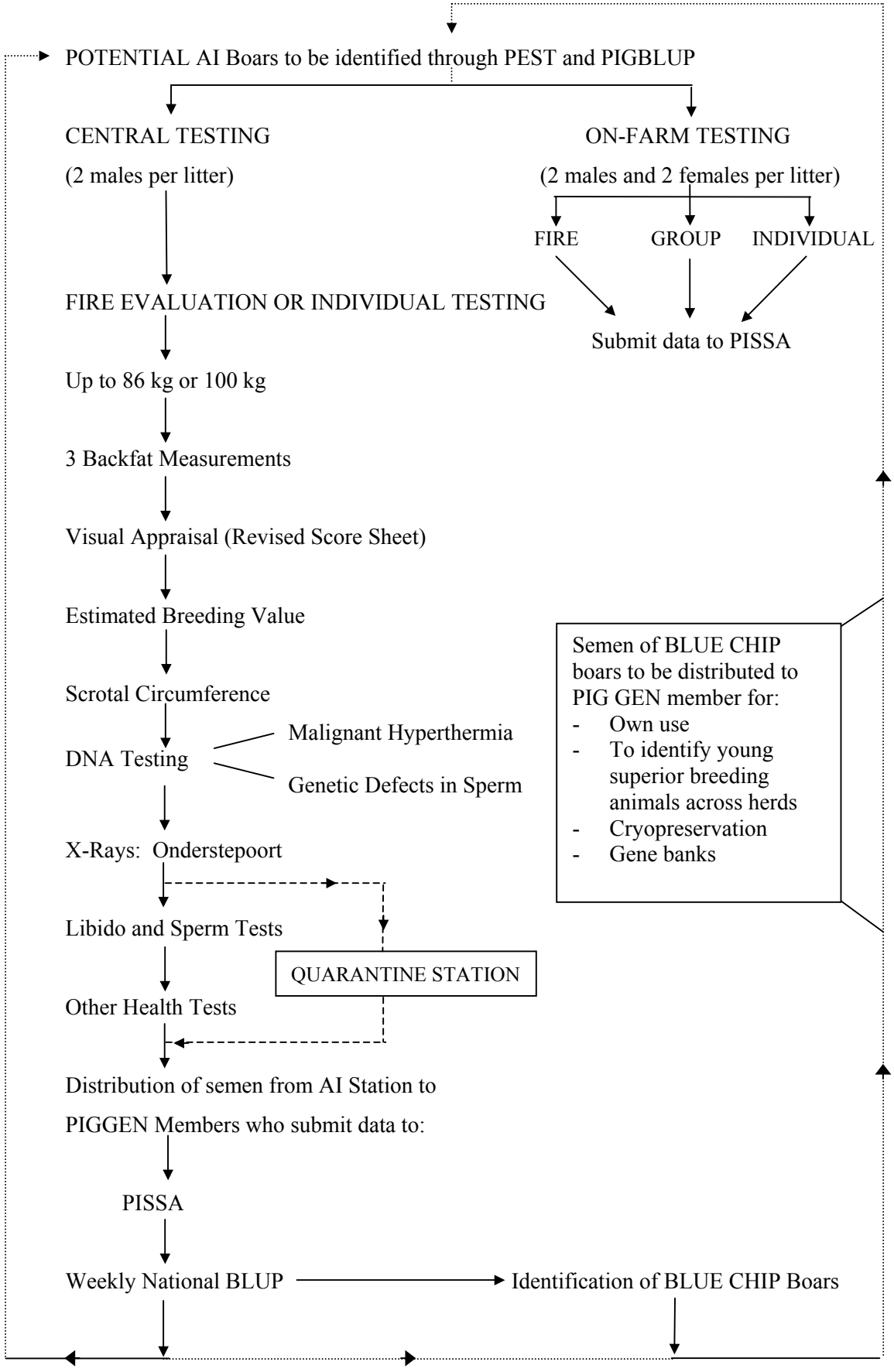


**Fig 3.10 The proposed PIG GEN gene flow diagram (Visser & Van Zyl, 2000)**

### 3.4.3 The Implementation of an "Adapted Platform Independent Information System" for Pig Recording in South Africa

Management and genetic improvement activities at population level require complete and updated data on individual animals in breeding and production herds. The investigation into the possibility of creating a complete[11] pig information system (with international application) was initiated by Prof Eildert Groeneveld at the Institute of Animal Science and Behaviour, Mariensee, Germany. Subsequently six countries, including South Africa, became involved in developing such a system which progressed to, what is currently known as, the Adaptable Platform Independent Information System (APIIS), since the core database structure can be adapted to different species and populations. No additional programming of validation rules is required, irrespective of how the data enter the database. Different languages and different countries' requirements are supported. Either commercial or public domain databases can be used. Current development of the system takes place from a LINUX platform. The PERL programming language is used with PostgreSQL as the relational database. Development of APIIS is done over the Internet, using the open source model approach.

The development of APIIS has paved the way for utilising this system as an aggregate industry information system. The system is locally known as Pig Information System South Africa (PISSA). It is intended to produce a generic pig information system that is compatible to any pig breeding programme, covering all the data collection areas from central to on-farm systems, accommodating intermediate genetic improvement locations like test and AI stations (Voordewind & Kanfer, 1999). In future, aspects like on-farm financial and production management (including matings, farrowings and weanings), marketing models and abattoir information will also be included. PISSA could in future also enhance traceability in the following spheres of recording and production:

- The birth data, parents and a five lineage history of any animal across the herds of different stud breeders.
- Movement of animals across herds.
- Unique animal identification which will ensure backward traceability from abattoirs to stud breeders.

[11] A reference database that makes provision for herdbook data, field test data, station test data, reproduction data and carcass evaluation.

### 3.4.4 Vulnerabilities Pertaining to Breeding and Genetic Improvement

(i) **Summer Infertility**. Reproductive inefficiency in pigs during the summer period, known as the Summer Infertility Syndrome (SIS) has been recognised in different parts of the world. According to Douglas & Mackinon (1992), seasonal reproductive inefficiency was the biggest source of financial loss to the British pig industry as well as to the individual British farmer. (During the year 2001, the single biggest source of financial loss to the British pig industry was unmistakably the outbreak and the catastrophic effects of FMD). The existence of the Summer Infertility Syndrome (SIS) was proved to the Pig Research Planning Committee of SAPPO at a meeting on the 6th of December 1995 at the former Meat Board. Information obtained from the former Meat Boards Health Scheme database indicated a net loss of approximately 4000 pregnancies per annum. Janyk & Visser (2001) indicated that during the peak summer infertility duration of approximately three months in South Africa, reproductive factors such as poor conception rates, "not in pig", multiple returns to service, anoestrus, abortions (exacerbated by the presence and influences of mycotoxins) low boar libido (and reduced feromone activity), poor semen quality, etc. all inhibit the reproductive efficiency of pigs significantly. A decline of 10 % in reproductive efficiency during the hottest period (summer) of the year, is implicated in a gross loss of approximately R 19 million per annum to the South African pig industry. This phenomenon has culminated in a research project[12] at the ARC - Animal Improvement Institute, Irene and is co-funded by the RMRDT, which commenced in January 1999. The nature of the SIS is multi-factorial, complex and directly linked to climatic conditions (especially daylight length and high maximum temperatures) within the ambit of differentiated bio-climatic regions, the presence of mycotoxins and environmental extremes. It can be stated that solving this problem is no easy task. A time span of a decade, international collaboration and various research teams with access to sufficient funds, materials and equipment are required to partly solve this problem.

(ii) A sincere question that all pig producers must answer is: What **impact does AI and Biotechnology** have on the South African pig industry? The application of Artificial Insemination (AI) is exceptionally low in South Africa when compared to the European and Scandinavian countries (Visser, 1996). During the year 2000 it was questionable whether more than 30 % of all pig litters born in the country originated from AI. The database of the National Pig Performance Testing Scheme revealed that 23 % (N = 18 596) of all registered stud litters born during the period 1990-2000, were from AI. Data

[12] DVN 21 09: An investigation into the Summer Infertility Syndrome in South African pig herds

submitted to the most recent (2001) sitting of the Independent Selection Panel (ISP) indicated that 29 % (N = 1 014 litters) of all progeny born in stud herds originated from AI. AI has been around for more than thirty years in the pig industry. The logistics of distance, technological aptitude of pig producers (reflecting the typical normal distribution - ranging from full acceptance to robust rejection), intrinsic sensitivity of porcine semen, ex post factors as well as other impediments will continue to impair the rightful acceptance and real financial benefits of AI as being manifested in compounded/additive genetic acceleration.

The real application of biotechnology is synonymous with enormous financial budgets (inputs), advanced and extremely expensive laboratory equipment, skilled scientists, an environment conducive to quality research and effective international collaboration. The inability of South African biotechnology laboratories (like the AII's DNA Laboratory at Irene) to comply with and/or adapt to international trends and demands, further renders the SA pig industry to serious vulnerability as well as on the biotechnology-cum-genetic level. Aggravating factors contributing to this situation are the international patenting (intellectual property rights) of methods and genome search/DNA probes. This is further aggravated by the immediate financial dilemma of the ARC, linked with irreversible trends in transformation and employment equity.

(iii) The **implications of the MH-gene for the South African pig industry** (although already discussed under 2.4.2 to 2.4.3.2.1) warrant some further discussion. Given the detrimental effect of the MH-gene on meat quality and carcass traits, the licence to detect the MH-gene [through DNA-testing and polymerase chain reaction (PCR)] was initiated by SAPPO and purchased by the former Meat Board during 1992/93.

Table 3.6 and Fig 3.11 give an overview of the frequency of the MH-gene during the period 1992-1999 (when 10 213 pigs in South Africa were tested for the MH-gene) as obtained from the DNA Laboratory at the ARC-AII, Irene.

From Table 3.6 and Fig 3.11 it is evident that the frequency of the NN homozygous alleles have increased from 0.62 to 0.77 in 1998/99. The Nn heterozygous alleles have decreased from 0.29 in 1992/93 to 0.19 in 1998/99. Finally the frequency of the nn homozygous recessive allele (inherently associated with in transit deaths and poor meat quality) has decreased from 0.08 in 1992/93 to 0.03 in 1998/99. This figure is even more remarkable, if one considers a more than five fold increase (350 in 1992/93 versus 1 852 in 1998/99) in the number of pigs tested for the MH-gene at the DNA Laboratory at the ARC, Irene.

**Table 3.6** **An overview of the trend of the MH-gene in the South African pig population from 1992 to 1999 (Rhode & Harris, 1999)**

| MH Status | 1992/93 | 1993/94 | 1994/95 | 1995/96 | 1996/97 | 1997/98 | 1998/99 |
|---|---|---|---|---|---|---|---|
| **NN** | 217 (0.62) | 690 (0.62) | 1 049 (0.63) | 1 147 (0.64) | 1 237 (0.66) | 1 009 (0.65) | 1 441 (0.77) |
| **Nn** | 103 (0.29) | 328 (0.29) | 489 (0.29) | 563 (0.32) | 574 (0.30) | 497 (0.32) | 354 (0.19) |
| **nn** | 30 (0.08) | 99 (0.09) | 120 (0.07) | 80 (0.04) | 71 (0.04) | 58 (0.04) | 57 (0.03) |
| **TOTAL** | 350 | 1 117 | 1 658 | 1 790 | 1 882 | 1 564 | 1 852 |

( ) The brackets indicate the allele frequency ratios of the MH-gene

From 1992 to 1999 a total of 10 213 pigs were tested for the MH-gene

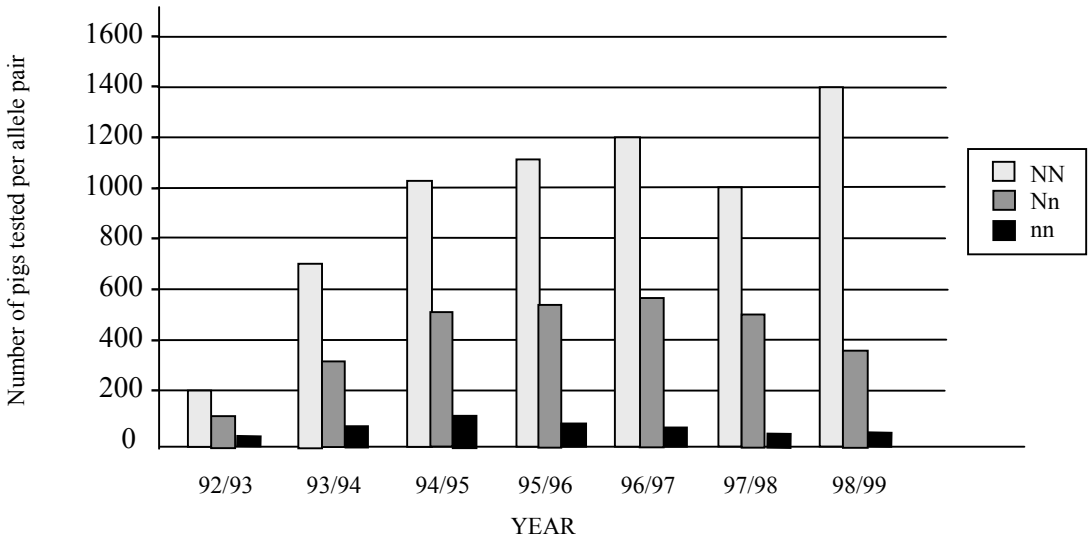


**Fig 3.11** **A histogram of the trend of the allele pair frequency of the MH-gene in the South African pig population from 1992 to 1999 (Rhode & Harris, 1999)**

These trends are not indicative, nor representative of the entire pig industry. However, progressive pig producers would use DNA-testing to reject or limit the presence of the MH-gene in their herds or intentionally test those animals that could potentially carry the MH-gene. The recent revival of the Pietrain pig breed, which is renowned for its ultra stress susceptibility (either as a purebred or

composite) and the surprisingly limited number of offspring of this breed that are DNA-tested for the MH-gene, is a matter of concern.

Hoffman (2000) indicated that if 50 % of all the pigs being slaughtered per annum were to be classified as PSE, the estimated financial losses for the South African pork processing industry could amount to R 9.45 million per annum. Patterson (2001) indicated a conservative figure of 25 % PSE for Enterprise (slaughtering and processing some 220 000 pigs per annum), amounting to an estimated loss of R 5 million per annum. During the 2001 PBS Bosberaad, studbreeders indicated that the MH-gene in the stud herds is approximately 80 % under control (Schoeman & Visser, 2001). The viewpoint of PBS on the MH-gene is clear: *"PBS recommends that extreme caution be applied to homozygous stress susceptible (nn) animals. PBS does not approve the importation of nn animals. PBS encourages the use of homozygous normal (NN) breeding animals and strongly recommends to use heterozygous animals (Nn) with caution and diligence."*

In contrast, certain individual stud breeders and the breeding companies like Kanhym/PIC and Dalland/Topigs SA are of the opinion that the MH-gene can play an important role in the pig industry and are using stress homozygous (nn) and heterozygous (Nn) animals accordingly in their breeding programmes.

## 3.5 SLAUGHTERHOUSES AND SLAUGHTERING STATISTICS

### 3.5.1 Introduction

According to SAMIC (2000), 86 registered abattoirs in South Africa are responsible for the slaughtering of ± 85 % of the 2.095 million pigs that are slaughtered annually (Vide Tables 3.7 & 3.9). To facilitate the marketing of pork products, pig carcasses are classified according to the PORCUS classification system (Vide ANNEXURE IV). This system equips the consumer to identify and select the ultimate pork - based on back fat thickness (mm) and percentage lean meat.

**Table 3.7 A summary of the weekly slaughtering capacity of the SAMIC registered abattoirs in the various provinces (SAPPO, 2001)**

| PROVINCE | Weekly Slaughtering Capacity | Number of Abattoirs per Province | Number of Pig Abattoirs with export status to the EU |
|---|---|---|---|
| Gauteng* | 13 170 | 10 | 1 |
| Limpopo Province | 1 660 | 6 | |
| North West* | 1 760 | 9 | |
| Mpumalanga* | 3 855 | 16 | |
| Free State* | 2 661 | 11 | |
| Kwazulu-Natal* | 5 335 | 10 | 1 |
| Northern Cape | 459 | 4 | |
| Eastern Cape** | 1 661 | 14 | |
| Western Cape** | 5 610 | 6 | 1 |
| **TOTAL** | **36 171** | **86** | **3** |

* Provinces where maize are produced cheaper than the other provinces
** Production areas most distant from the maize belt.

The main pork processors are Eskort, Enterprise, Renown, Roelcor and Spekenham. Niche market processing is conducted by RTV, Seemans, German butcheries and some other butcheries. All the pork carcasses destined for the retail market are purchased directly from the abattoirs. No wholesaler that sells fresh meat and pork to the retail trade exists. In Gauteng 875 butcheries are associated to the Industrial Council for the Retail Meat Industry (Deacon, 2003). According to Louwrens (2003) approximately 45 – 50 % of fresh pork is sold through the traditional butcheries. The majority of the remaining pork is sold through the following retail chains:

Pick ‘n Pay [14 Hypermarkets; 114 Supermarkets; 106 Family Stores; 46 Mini Markets; 127 Score Supermarkets and 39 Boxer Superstores. (Summers, 2003)]

SPAR [98 Superstores; 471 Ordinary Spars and 179 Quickspars]

CHECKERS HYPER [19 Checkers Hyper Stores; 84 Checkers Stores; 245 Shoprite Stores; 28 OK Mini Markets; 29 OK Foods and 32 OK Grocer Stores. This retail chain also incorporates other stores/retail shops such as Hungry Lion, Sentra and Megashare. (http://www.shoprite.co.za)]

WOOLWORTHS [110 Woolworths Food Markets, De Bruyn (2003)]

**Table 3.8 A summary of the pig abattoirs per slaughtering category, number and range within slaughtering category (SAPPO, 2001).**

| SYMBOL | Slaughtering category* | Number of abattoirs per category | RANGE |
|---|---|---|---|
| **A** | 1 - 49 | **25** | (5 - 40) |
| **B** | 50 - 99 | **11** | (50 - 80) |
| **C** | 100 - 199 | **12** | (100 - 150) |
| **D** | 200 - 499 | **19** | (200 - 400) |
| **E** | 500 - 999 | **6** | (500 - 900) |
| **F** | 1000 - 1999 | **9** | (1000 - 1800) |
| **G** | 2000 - 4000 | **3** | (2000 - 2500) |
| **H** | > 4000 | **1** | ± 4500 |
| | **TOTAL** | **86** | |

* Slaughtering category refers to the number of pigs slaughtered per week within that category linked to a specific symbol.

From Table 3.8 it is evident that 56 % of the abattoirs (N=48) are responsible for only 7,38 % of all slaughterings (2 671 pigs per week). The majority of all slaughterings (23 700 per week) or 65 % of all slaughterings are conducted by only 15 % (N=13) of the abattoirs. All registered abattoirs are subjected to a minimum of four surprise (unscheduled) quality control visits per year. These visits ensure that classification standards are continuously adhered to (SAMIC, 2000).

It is almost impossible to ascertain precisely the magnitude of on-farm slaughterings and purchases linked to that. Only one weaner producer (a 250 sow unit) in Gauteng was identified. Adult sows are also sold, on certain farms, to township meat traders. Table 3.9 gives a general overview of pig slaughterings, production and *per capita* consumption of pork since 1985.

**Table 3.9 An overview of pig numbers, slaughterings (at registered auction and non-auction markets), auction prices on the hook, production and per capita consumption of pork in South Africa since 1985/86 (A.A.S., 2001)**

| Year | Pig numbers | Slaughterings | Auction* price on the hook (all auction markets) | Production | Consumption | |
|---|---|---|---|---|---|---|
| | | | | | Total | *Per capita*** |
| | 1 000 | | c per kg | 1 000 tons | 1 000 tons | kg per annum |
| 1985/86 | 1 361 | 1 899 | 222.4 | 107.4 | 105 | 3.1 |
| 1986/87 | 1 366 | 1 880 | 284.7 | 104.3 | 102 | 2.9 |
| 1987/88 | 1 360 | 1 941 | 324.4 | 107.5 | 106 | 3.0 |
| 1988/89 | 1 427 | 2 075 | 362.2 | 114.9 | 113 | 3.1 |
| 1989/90 | 1 524 | 2 275 | 340.2 | 126.2 | 126 | 3.4 |
| 1990/91 | 1 532 | 2 360 | 338.1 | 130.8 | 130 | 3.5 |
| 1991/92 | 1 539 | 2 189 | 399.0 | 112.7 | 113 | 3.0 |
| 1992/93 | 1 529 | 2 267 | 448.3 | 129.6 | 128 | 3.3 |
| 1993/94 | 1 493 | 2 101 | 483.1 | 119.6 | 124 | 3.2 |
| 1994/95 | 1 511 | 1 973 | 623.2 | 119.0 | 139 | 3.5 |
| 1995/96 | 1 628 | 2 194 | 523.0 | 126.5 | 136 | 3.4 |
| 1996/97 | 1 603 | 2 172 | 632.2 | 127.9 | 138 | 3.3 |
| 1997/98 | 1 617 | 2 061 | 752.1 | 125.0 | 132 | 3.1 |
| 1998/99 | 1 641 | 2 064 | 672.8 | 122.6 | 133 | 3.1 |
| 1999/00 | 1 531 | 2 095 | 777.7 | 120.1 | 134 | 3.0 |
| 2000/01 | 1 556 | - | - | - | - | - |

* Auction prices are nominal prices and are not comparable over time

** The per capita consumption of pork during the last fifteen years ranged between 2.9 and 3.5 kg. The lowest consumption of all meat types consumed in South Africa is pork. From all animal protein sources, only fish has lower consumption levels

### 3.5.2 Incidence of PSE Pork in South African Abattoirs

Heinze and Klingbiel (1991) conducted a survey during 1990/91 across fifteen large abattoirs in South Africa, incorporating 6 984 pig carcasses of 170 producers. The ultimate objective of this study was to ascertain the incidence of $pH_1$ values < 6.00, one hour post mortem of slaughtered pigs. This was done to estimate the incidence of PSE pork in South Africa. This study emphasised the following important aspects:

- The incidence of $pH_1$ values < 6.00 (thus indicative of sub-optimal carcass and meat quality) was 21.5 %
- Slaughter day could have a significant effect on the incidence of $pH_1$ values < 6.00
- Pre mortem handling methods and the conditions and technique related to electrical stunning are two human related factors, which could have a profound effect on the incidence of $pH_1$ values < 6.00. According to Van der Wal, Engel & Reimert (1999), the effect of stress applied immediately before stunning (thus a non-genetic factor) caused a reduction in meat quality traits (especially a reduction in water holding capacity) in males and females 45 minutes post mortem.

### 3.5.3 Vulnerabilities Pertaining to Slaughterhouses and Pork Supply

(i) Pieterse (2003) reported an incidence of 46 % PSE ($pH_1$ <6.00) in 450 pig carcasses that were slaughtered at the RTV Abattoir in Gauteng during the course of 2002.

(ii) **Trade liberalisation** (which has not been addressed in this study) has a direct and indirect effect on the pork supply chain and should be quantified within the broader red meat sector ascertaining the impact thereof on a national, regional and global context. For instance, due to it's tremendous economies of scale, vision and economic power, the USA has the ability to penetrate and secure major proportions of any country's pork market (Stein, 2000). According to Jooste (2001), South Africa's position in terms of international trade liberalization should be evaluated from:

- A SADC perspective (the economic status and openness of these countries towards the free market and trade relations internationally)
- The Lomé Convention
- The WTO and GATT
- The Common Agricultural Policy of the EU.

It should be noted that special attention needs to be given to the European Union (EU), since they are South Africa's largest agricultural trading partner. In fact, during the year 2000, approximately 85 % of total pork imports into South Africa originated from the EU and Hungary (SAMIC, 2000).

(iii) SAMIC (2000) indicated that official **pork imports** (from outside the Southern African Customs Union) amounted to 10 427 tons during the year 2000. Although pork imports represent the smallest fraction (6.45 %) of imported meat the implications are far reaching.

When converted to baconer carcasses (at an average weight of 62 kg/carcass) this tonnage represents some 168 177 carcasses or 8.85 % of total slaughterings.

Illegal imports of various agricultural commodities, including meat, are taking place continuously and if not controlled/policed thoroughly, these imports could have a profound impact on the supply and demand of agricultural products. Due recognition must be given to AGRI INSPECT[13] (an independent investigation unit), commissioned by the MPO (Milk Producers Organisation), SAPA (South African Poultry Association), SAMIC (South African Meat Industry Corporation) and SAPPO (South African Pork Producers' Organisation) to investigate illegal imports of agricultural products at all the ports of entry. Remarkable success has been achieved by this unit over the last six years.

## 3.6 INDUSTRY ORGANIZATIONS, INSTITUTIONS AND PROGRAMMES IN SUPPORT OF THE PORK SUPPLY CHAIN

### 3.6.1 Introduction

The South African pig industry is composed by means of various well-organised structures that evolved over many decades. (Unfortunately many of these structures have come and gone as history has marched on). The main objective of these organised structures is (was) to represent, unite, protect and promote the pig producers' interest. These structures are in support of and interwoven with those of other livestock industries, agricultural industries and agriculture in general.

### 3.6.2 The South African Pork Producers' Organisation

The South African Pork Producers' Organisation (SAPPO) started functioning (in it's present format) in 1993 and serves the interest of the commercial pork producer. This is achieved through co-operation, collective bargaining and liaison[14] with private, statal, para-statal and/organised agricultural organisations. SAPPO as a national organisation (Vide Fig 3.12) is funded through voluntary membership fees, based on the number of active sows in the members' herds.

[13] According to AGRI INSPECT, the South African meat industry experiences the following major problems pertaining to (illegal) meat imports: (i) wrong invoicing (ii) faulty (deliberate?) classification of meat and (iii) lack of infrastructure and inspectors leading to inefficient import inspections or policing.

[14] SAPPO liaises extensively (often daily) with a substantial number of role players in the agricultural fraternity such as: Agri SA, the Meat Industry Forum, SAMIC, the RPO, NERPO, the Abattoir Association, SAMPA, the ARC, the NDA, Federation of Meat Traders, AFMA, the Pig Vet Society, the five Pig Study Groups, Grain SA, Department of Trade and Industry, the PBS, CSIR, the SPCA, LWCC, Universities, consumer bodies, the media, pharmaceutical companies, research houses, consultants, individual abattoirs, etc.

At present 210 pork producers, in possession of 71 067 sows, are paid-up members of SAPPO (Vide Table 3.1).

A key function of SAPPO is to assist members towards efficient and profitable production and orderly marketing of pork to enable producers to obtain the best prices, advantages and stability.

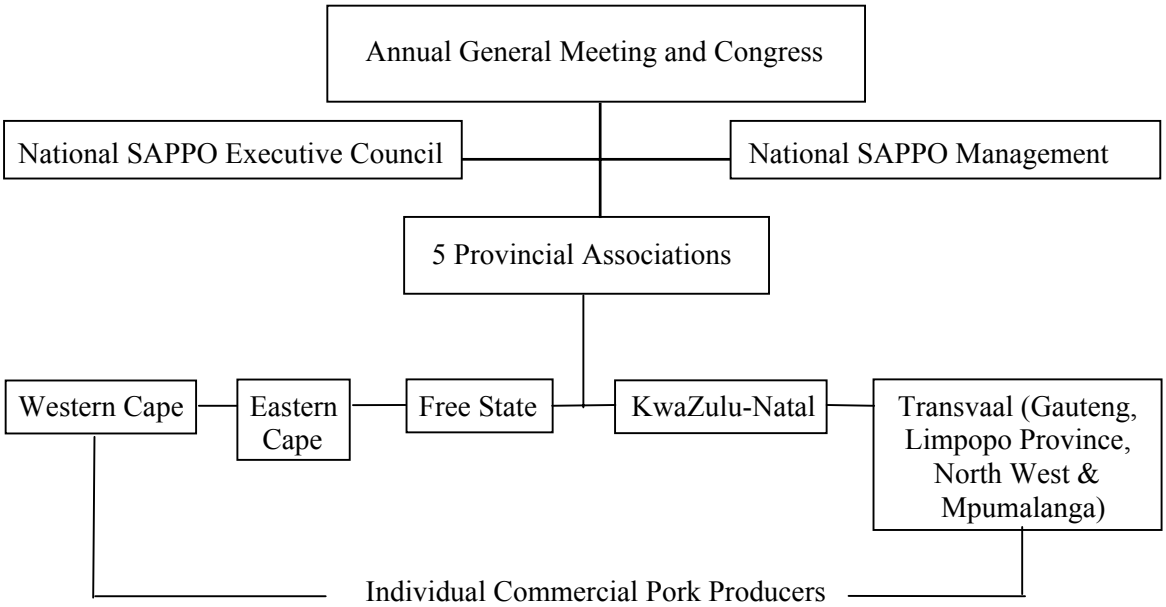


**Fig 3.12 Organogram of the structure of SAPPO as a national organisation (Porcinarium, 1996)**

Under the auspices of SAPPO, five study groups are also functional. The objectives of the study groups are:

- To stimulate the interest and interaction between fellow pig producers
- To co-operate and act as a mouthpiece for pig producers in a geographical region
- To be pro-active and continuously informed as to developments in the local and international pig arena.

The five study groups are: The Limpopo Province Study Group, Magaliesburg Study Group, Gauteng Study Group, Western Transvaal Study Group and Free State Study Group.

#### 3.6.2.1 The South African Meat Industry Company

The South African Meat Industry Company (SAMIC) is represented by virtually all denominations/sectors of the South African red meat industry (Vide Fig 3.13). This representation (on the Board of the Company) has culminated to the effect that SAMIC per definition is a national representative structure. SAMIC was established after the need for an umbrella organisation (within the red meat industry) in a deregulated environment was realised.

Consequently one of the key internal imperatives[15] of SAMIC is to *"unify the strategic initiatives of all industry role players by promoting effective communication and co-ordination of their efforts"* (SAMIC, 2000).

[15] SAMIC personnel act in an advisory capacity to the industry on a regular basis. Aspects such as best meat hygiene practices, abattoir practices, HACCP implementation at abattoirs, offal management and processing are being addressed continuously. SAMIC is also providing a comprehensive and centralised co-ordination point of entry through which trustworthy information pertaining to the industry can be obtained (www.samic.co.za).

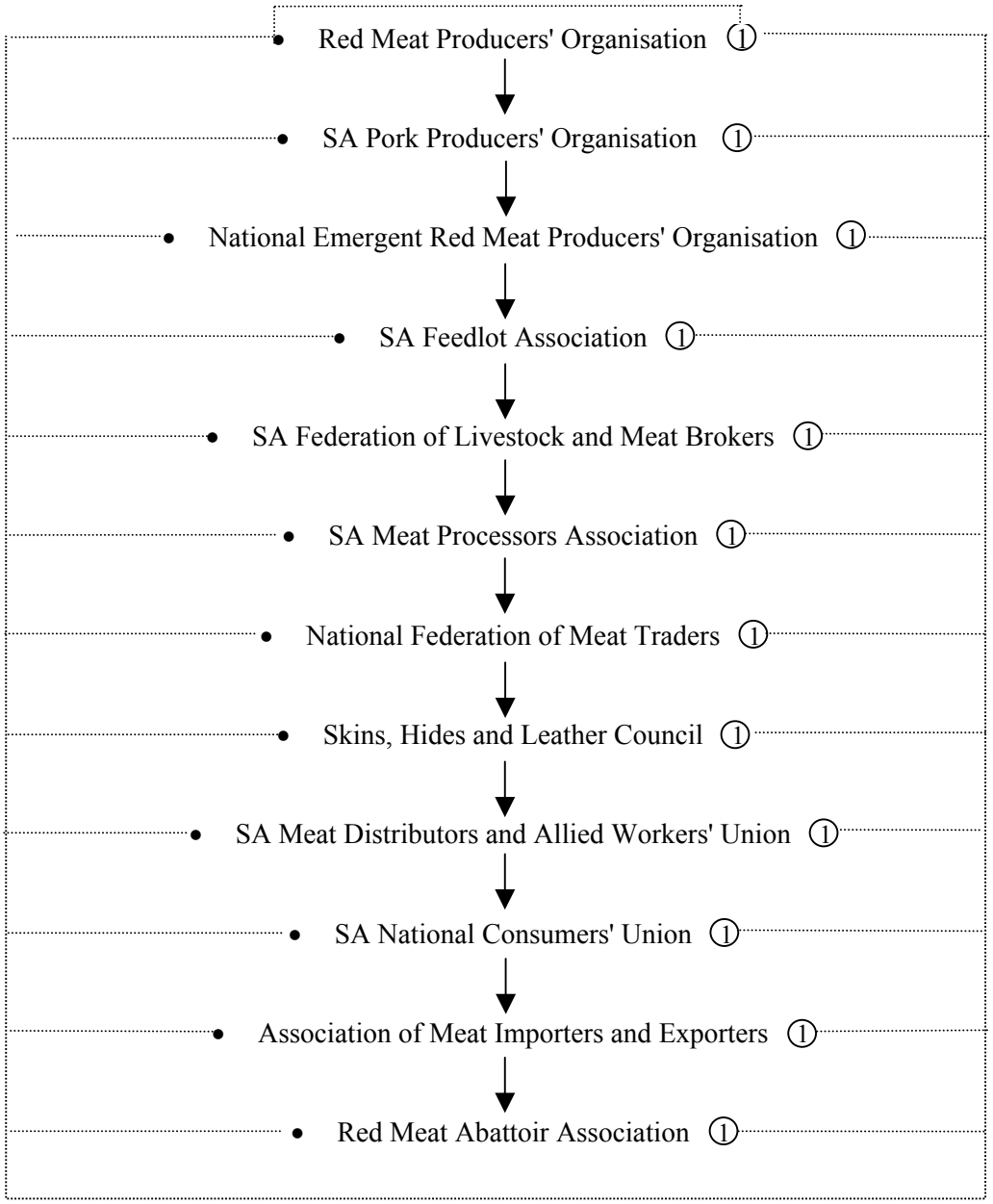


**Fig 3.13 Diagrammatic representation of the various sectors of the red meat industry on the Board of SAMIC (SAMIC, 2000)**

• The twelve sectors that are represented ① Member representation per sector

### 3.6.2.2 The Red Meat Research and Development Trust

The Red Meat Research and Development Trust (RMRDT) of South Africa was established in 1997 to promote, finance and sustain research into:

- red meat production processes (including agro-economical factors)
- red meat products
- products that are derived from cattle, small stock and pigs to eventually support and benefit the Red Meat Industry of South Africa.

The RMRDT is driven by an interrelated structure of committees (Vide Fig 3.14), who professionally oversee, allocate and invest funds whilst also monitoring progress of research projects from initiation to publication.

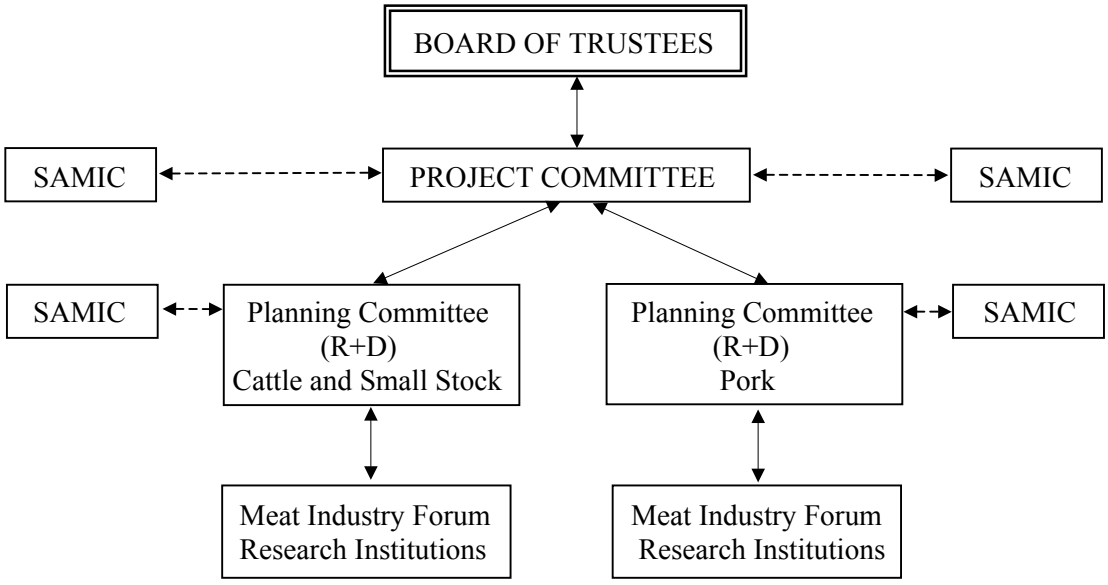


**Fig 3.14 The inter relationship between the structures of the Red Meat Research and Development Trust (RMRDT, 2000)**

The research and development portfolio of the RMRDT is the responsibility of SAMIC's Manager: Research and Development, which means that SAMIC and the RMRDT are very closely linked. It is furthermore the responsibility of the Board of Trustees to... *"ensure that funds for research and development are thoughtfully considered, judiciously allocated and effectively utilised (through the Project Committee). They also have the unenviable task to ensure that research funds are judiciously invested to obtain maximum yields. The RMRDT allocates funds to a broad spectrum of fields ranging from: genetics, animal improvement, nutrition, production systems, meat and food safety, emerging sectors, natural resources, animal health and welfare, marketing and economic surveys to consumers and technology transfer"* (RMRDT, 2000).

### 3.6.3 The South African Stud Book and Livestock Improvement Association (SASBLIA)

The South African Stud Book (S.A. Stud Book) is an independent, non-governmental organisation. In terms of the Livestock Improvement Act (Act No. 25 of 1977), S.A. Stud Book represents all breeders of registered dairy cattle, beef cattle, horses, goats, sheep, ostriches and pigs. In this regard, S.A. Stud Book represents the interests of almost 8 000 stud breeders who endeavour to improve the genetic attributes of the South African livestock industry. However, other less popular livestock breeders' societies are also represented and/or affiliated (Campher, Hunlun & Van Zyl, 1998). S.A. Stud Book is therefore known as an association of registered livestock breeders' societies. One of the unique features of S.A. Stud Book is the fact that the integrated registration as well as performance data of most cattle, small stock and pig breeds is found within a single organisation.

The administration and management of the S.A. Stud Book and Livestock Association is constituted by the Annual General Meeting, the President and his council, a General Manager, two Assistant General Managers, technical and administrative personnel, an Executive Committee and the INTERGIS Management Committee.

### 3.6.4 The Pig Breeders' Society of South Africa

The Pig Breeders' Society of South Africa (PBS) was formed on the 20$^{th}$ of September 1919 and has been affiliated since it's inception to the South African Stud Book and Livestock Improvement Association.

The objectives of the PBS are to:

- keep registration and performance records of the pedigrees of purebred boars and sows registered by the PBS
- encourage improvement in the general standard of all recognised pig breeds in South Africa through breed standards, judges and shows
- advise the registrar: Livestock Improvement on the merits, advantages and disadvantages of imported animals, semen and embryos
- enhance the functional production performance and economic merit of stud animals. This is achieved through active participation (Vide Table 3.10) in the National Pig Performance and Progeny Testing Scheme (NPPPTS) of the Agricultural Research Council's Animal Improvement Institute (ARC-AII).

**Table 3.10 Breed - Breeder Activity in The National Pig Performance and Progeny Testing Scheme (NPPPTS) during 1999/2000 (AII, 2001)**

| Breed | Number of Registered Stud Animals | | Number Involved in the NPPPTS | | % Involvement in Scheme | |
|---|---|---|---|---|---|---|
| | 1999 | 2000 | 1999 | 2000 | 1999 | 2000 |
| **S.A. Landrace** | | | | | | |
| Female | 1 508 | 1 434 | 1 166 | 912 | 77.3 | 63.6 |
| Male | 268 | 314 | 213 | 270 | 79.5 | 86 |
| Active Breeders | 22 | 20 | 14 | 14 | 63.6 | 70 |
| **Duroc** | | | | | | |
| Female | 889 | 888 | 878 | 699 | 99 | 81 |
| Male | 206 | 198 | 188 | 169 | 91 | 85 |
| Active Breeders | 14 | 13 | 10 | 9 | 71 | 69 |
| **Large White** | | | | | | |
| Female | 3 030 | 2 926 | 2 434 | 2 054 | 80 | 70 |
| Male | 503 | 523 | 400 | 403 | 80 | 77 |
| Active Breeders | 23 | 23 | 15 | 14 | 65 | 61 |
| **TOTAL** | | | | | | |
| Female | 5 427 | 5 248 | 4 478 | 3 665 | 82.5 | 69.8 |
| Male | 977 | 1 035 | 801 | 842 | 82.0 | 81.3 |

Only the three most important registered pure breeds in South Africa are portrayed in Table 3.10, although breeds such as the Chester White, Hampshire, Large Black, Pietrain, QM Hamline and the Robuster are also eligible for registering with PBS. Approximately 75 % of all registered pigs in South Africa are involved in the activities (either on-farm, or central or both) of the NPPPTS. In reality, this figure is actually higher, since the three breeding companies (Kanhym - PIC, Dalland-Topigs and JSR) are also practising vigorous performance testing. These companies, however, are not involved in any of the phases of the NPPPTS. A total of 35 individual studs (including three breeding companies) are at present full members of PBS. These studs are at present (in the year 2002) in possession of 4 145 registered female and 1 545 registered male pigs (PISSA, 2002).

The PBS's daily activities are conducted through its secretariat. An annual general meeting is held, which normally coincides with SAPPO's annual congress. The council of PBS (duly elected annually) consists of ten members in total of which two are co-opted (Vide Fig 3.15). Representation of the PBS Council is based on provincial proportionality.

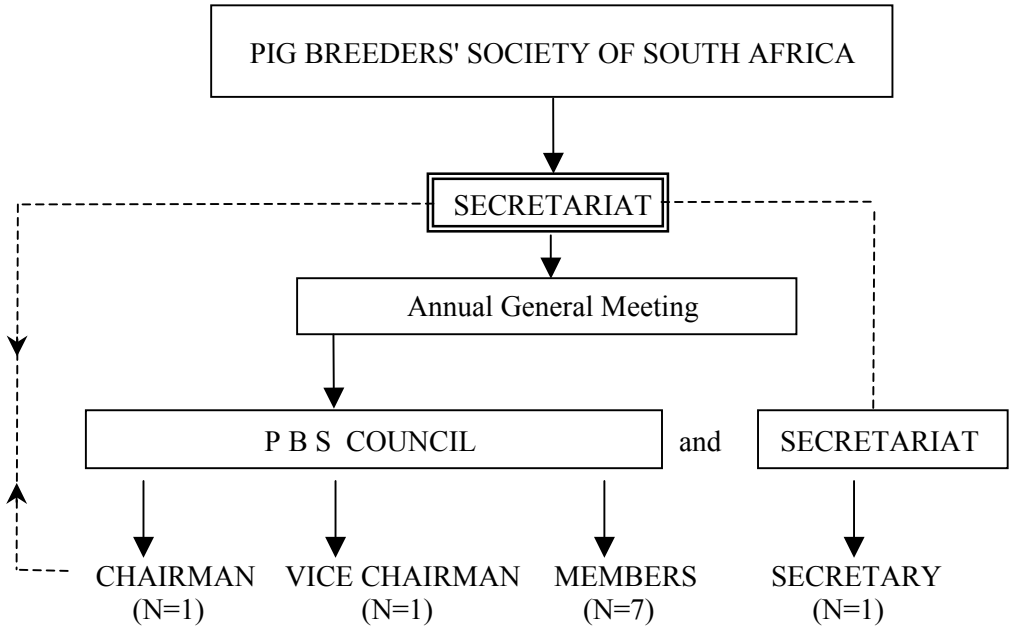


**Fig 3.15 Organogram of the structure of the PBS (Kruger, 2001)**

Value added scientific tools have been developed and/or implemented over the last decade. These developments have complimented pig stud breeding in practice to a further extent (Campher, Hunlun & Van Zyl, 1998). The most important of these developments have been the implementation of the Independent Selection Panel in 1993, the integrated registration and genetic information system (INTERGIS) managed by SASBLIA (South African Stud Book and Livestock Improvement Association) and the ARC-AII, PIG GEN (a consortium of individual stud breeders was established in 1996 with the aim of co-operating through consolidation) and finally, the application of PIG BLUP (an invaluable genetic computer programme) as from 1994 in all the herds linked to the National Pig Performance Testing Scheme.

### 3.6.5 Animal Health, Product Safety and Welfare Organisations

Governments, across the world, are expected to protect their people against health hazards. Governments *per se* cannot guarantee the safety of all foods. On the contrary there is an ever-increasing consumer awareness[16] concerning food quality and safety. Any Government plays an important role in developing a framework (the laws that regulate the activities in the food industry)

[16] This awareness is further accentuated by aspects such as: biotechnology, genetic engineering, residues of heavy metals, antimicrobes, hormones, pesticides, mycotoxins and veterinary drugs (especially antibiotics, dioxins, chloramphenicols and anabolic agents).

that encourages the deliverance of safe and healthy food by the food industry. No less than six Acts are being harnessed in South Africa to regulate food safety, namely:

(i) Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947)
(ii) Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act No. 54 of 1972)
(iii) Hazardous Substances Act, 1973 (Act No. 15 of 1973)
(iv) Liquor Products Act, 1989 (Act No. 60 of 1989)
(v) Agricultural Product Standards Act, 1990 (Act No. 119 of 1990)
(vi) Meat Safety Act, 2000 (Act No. 40 of 2000)

According to Strydom (2001) bodies such as the Government, SAMIC, the Red Meat Abattoir Association, the Directorate of Veterinary Services and South African Bureau of Standards (SABS) are involved in quality assurance of agricultural products and meat in this regard.

#### 3.6.5.1 Directorate of Veterinary Services

The aim of the Directorate: Animal Health of the National Department of Agriculture (NDA) is to reduce the sanitary risks involved in animals and animal products (Meyer, 2003). The functions of the Directorate: Animal Health are:

(i) To develop and promulgate policy, norms, standards and legislation for the prevention and control of animal diseases
(ii) To promote animal health (supported by 18 regional veterinary laboratories)
(iii) To reduce sanitary risks involved in the import and export of animals and animal products
(iv) To establish and maintain a veterinary epidemiology unit
(v) To audit the enforcement of policies
(vi) To render management and support services.

The South African Veterinary Semen and Embryo Group (SAVSEG) is advising the Registrar: Livestock Improvement and the Directorate of Veterinary Services on all the relevant health aspects of AI and Embryo Stations.

South Africa is an official member country of the OIE[17] (World Organisation of Animal Health). During 2002, the total number of OIE member countries amounted to 162. The OIE is thus an

[17] http://www.oie.int

inter-continental and inter-governmental organization, which was established by the International Agreement of 25 January 1924 and signed by 28 countries. The mission of the OIE is: "*To guarantee the transparency of animal diseases worldwide*". This is achieved by the commitment of each member country to report the animal diseases that a country detects on its territory. This information is disseminated by the OIE to other countries to enable them to take preventative action.

Animal health in South Africa is conducted by some 2 341 veterinarians and 6 849 technical personnel, structured as follows: (Meyer, 2003).

| **Capacity** | **Activity** | **Number** |
|---|---|---|
| Veterinarians | Government officials (central and local) | 253 |
| | In universities, training Institutions and laboratories | 162 |
| | Private practitioners | 932 |
| | Other | 994 |
| | **TOTAL** | **2 341** |

| **Capacity** | **Activity** | **Number** |
|---|---|---|
| Technical Personnel | Animal health assistants (with formal training) | 1 999 |
| | Animal health auxiliaries | 3 650 |
| | Meat inspectors and those involved in food hygiene | 1 200 |
| | **TOTAL** | **6 849** |

### 3.6.5.2 The Pig Veterinary Society of South Africa

In the mid 1980's a small group of dedicated pig veterinarians got together and decided to establish a formal association, which ultimately evolved in the PVS (Pig Veterinary Society). At present 55

veterinarians, representing all denominations of the South African pig industry (namely consultants, state veterinarians, lecturers, researchers, pharmaceutical company veterinarians and veterinarians actively involved in pig farming), are registered with the PVS (Spencer, 2002). Only 13 veterinarians are actively consulting in the pig industry (Spencer, 2003). The Pig Veterinary Society endeavours to take a pro-active and leading role when health and disease problems arise in order to either solve or alert others to the problems.

#### 3.6.5.3 The Livestock Welfare Co-ordinating Committee

The Livestock Welfare Co-ordinating Committee (LWCC) is administered by SAMIC. The LWCC in turn is responsible for ensuring that all potential slaughter/production animals (across species) are treated humanely along the supply chain - from the loading process on farm, through transportation to the pre-slaughtering and physical slaughtering process at the abattoir (SAMIC, 2000).

**The South African Code for the welfare of pigs**[18] was compiled during the 1990's (under the auspices of the LWCC) by the following representatives:

- South African Pork Producers Organisation
- Pig Breeders' Society
- Pig Veterinary Society
- National Council of SPCA's
- Livestock Animal Welfare Association
- The former Meat Board
- The former ABAKOR.

[18] "The South African Code for the welfare of pigs" can be obtained from SAPPO and is available in English and Afrikaans.

**The code** which is *inter alia* based on the five freedoms of Webster, incorporates the following spheres:

- Stockmanship, husbandry and health
- Housing (ranging from tethers, crates, outdoor pigs to boars and sick/injured pigs)
- Nutrition
- Transportation (based on the Code of Practice for the Handling and Transporting of Livestock)
- Abattoirs (making provision for lairage, personnel in the holding pens, access to water, veterinary inspection, stunning and sticking).

### 3.6.6 Academic and Tertiary Institutions Actively Involved in the Promotion of Pig Development in South Africa

According to Klingbiel & Matthis (1993), the pig research and training infrastructure (which was established over many decades in this country) is sufficient to address present and future research and training needs. The infrastructure incorporates agricultural schools, agricultural colleges, training institutions, universities and research institutions. Table 3.11 presents an overview of the institutions that are involved in the enhancement of pig development.

**Table 3.11 Institutions that are involved in pig development in South Africa through training and/or research (After Klingbiel & Matthis, 1993)**

| Primary Research Institutions | Research Facilities | Sow Unit | Personnel in Research | | Specialized Field |
|---|---|---|---|---|---|
| | | | Researchers | Technicians | |
| ARC - ANPI | YES | 140 | 2 | 3 | Pig nutrition |
| ARC - AII* | YES | 35 | 3 | 4 | Pig Breeding and Repr. Physiology |
| ARC - OVI | YES | 25 | 2 - 4 | 2 | Pig Diseases |
| Elsenburg -ADI | YES | 25 | 2 | 2 | Pig Production and Pig Nutrition |

* The ARC-AII also presents an introductory course in pig production during the months of June and November each year.

| Universities | Research Facilities | Sow Unit | Pig Production as subject | | Students enrolled since 1995 | |
|---|---|---|---|---|---|---|
| | | | Under graduate | Post Graduate | MSc | Phd |
| University of Pretoria | YES | 25 | YES | YES | YES | YES |
| University of Stellenbosch | YES | 75 - has financial constraints | YES | YES | YES | YES |
| University of the Free State | YES | 150 but rented out | YES | YES | YES | YES |
| University of Natal (Pietermaritzburg) | YES | - | YES | YES | YES | YES |
| University of the North | YES | - | YES | ? | ? | ? |
| University of Venda | NO | - | YES | YES | ? | ? |
| Pretoria Technicon** | NO | - | YES | YES | YES | ? |

** The Pretoria Technicon, although not a University, is presenting an advanced diploma course in pig production as well as a higher diploma in pig production. Students can also pursue the B.Tech, M.Tech or D.Tech degrees in various fields, including animal science and pig production.

? Uncertain

| AGRICULTURAL COLLEGES | Training Facilities | Sow Unit | PIG PRODUCTION AS SUBJECT |
|---|---|---|---|
| CEDARA | YES | 10 | YES |
| LOWVELD | - | - | ? |
| POTCHEFSTROOM | - | - | YES |
| GLEN | - | - | YES |
| GROOTFONTEIN | - | - | YES |
| ELSENBURG (Vide Elsenburg ADI) | YES | (25) | YES |
| TOMPE SELEKI | YES | 10 | YES |
| FORT COX COLLEGE | YES | 25 | YES |
| MDZIVANDILE COLLEGE | YES | 10 | YES |
| MANGOSOTHU BUTHELEZI | - | - | YES |
| SAASVELD | - | - | YES |

### 3.6.7 Application of Computer Programmes/Models in the South African Pig Industry to enhance it's Competitiveness

#### 3.6.7.1 Introduction

Since the process of deregulation (which started in the mid 1990's) and the demise of the Meat Board in 1997, comprehensive statistics on the meat industry (which were in the past directly

linked to abattoir data) are extremely difficult to obtain (if not non-existent). The lack of a central meat statistics or information centre for all meat products (fresh, processed, locally produced, imported, exported, dumped, imports, theft, etc) must be seen as an Achilles heel, not only for the pig industry but the entire livestock industry. The lack of a market intelligence system has been identified as an inherent weakness of the SA pig industry (Van Rooyen, 1999). The lack of a comprehensive traceability and quality assurance scheme for the pig industry warrants a concerted and dedicated effort to enhance consumer satisfaction and global competitiveness in these two spheres of pig production.

#### 3.6.7.2 International Competitiveness of the South African Pig Industry

Beyond the African continent, the competitiveness of the S.A. pig industry is limited (Mathis, 1999). In a recent study (LMC International Ltd, 1999) conducted for the National Department of Agriculture (Directorate: Economic and Policy Analysis) an international cost comparison between four pig producing countries - South Africa, Denmark, Taiwan and the USA - was done. In this study South Africa had the highest field costs (specified as labour, feed and other), some 15 % more than the USA. Labour costs (based on hourly wage rates) in South Africa were only 25 % of that in Taiwan, 16,5 % of that in the USA and 10 % of that in Denmark. Comparing the key indicators of the four countries and expressing them by means of a *technical performance index** (TPI), portrays indexes of 58,6; 72,0; 79,0 and 79,2 for South Africa, Denmark, the USA and Taiwan respectively (Vide Table 3.5).

**Table 3.12 Technical pork production and performance parameters for Denmark, South Africa, Taiwan and the USA (LMC International Ltd, 1999)**

| KEY INDICATORS | DENMARK | SOUTH AFRICA | TAIWAN | USA |
|---|---|---|---|---|
| Feed Conversion Ratio | 4.20 | 4.20 | 4.15 | 4.31 |
| Average Carcass Weight (lbs) | 166.30 | 135.30 | 197.10 | 187.0 |
| Age at Slaughter (months) | 5.50 | 5.50 | 6.0 | 5.5 |
| **TECHNICAL PERFORMANCE INDEX* (TPI)** | **72.0** | **58.60** | **79.2** | **79.0** |

* The technical performance index (TPI) is defined as: [carcass weight (in lbs) x 10] / feed conversion ratio x age at slaughter (months).

This technical performance index, according to the author, should be viewed with caution, since:

(i) The lean meat percentage, grading and price obtained for the carcass are not expressed in this index.
(ii) Nutritional aspects such as type of ration and type of feeding (dry or wet) were omitted.
(iii) Reproductive efficiency, genetic composition and advent of Artificial Insemination (AI) and the impact of biotechnology were omitted.
(iv) The Technical Performance Index is based on an index, which is used by the USA broiler industry.
(v) The inherent nature, level of technological advancement and competitiveness of the countries and more specifically the pork industry in each of the countries were not taken into consideration.
(vi) Government incentives/subsidies on import tariffs pertaining to pork producers in the various countries were not accounted for.

The marked difference between South Africa and for instance its closest rival, Denmark (a 13 point difference in the TPI), is indeed a matter of concern and warrants further in-depth evaluation/research. According to Baker (1999), Denmark is the leading exporter of pork in the world, whilst the US pork sector is the lowest cost producer in the world. Ideally, the efficiency of our local industry should also be compared to that of Australia, Brazil and Argentina.

Booysen (2001) has implicated five key success factors for the South African red meat industry to be competitive in the international arena:

(i) *Establish a generic industry image* - through quality products, food safety regulation, optimized logistics and reliability (our industry must entice international trust and confidence)
(ii) *Establish joint ventures with strategic partners* (Vide Fig 3.3)
(iii) *Training of Role-Players* through the total value chain from the small emerging sector to the well established commercial sector
(iv) *Government support* mainly through the National Department of Agriculture and Department of Trade and Industry manifested in sound Veterinary and Animal Health and Safety programmes, as well as support programmes and export incentives
(v) *Support for IMQAS* (International Meat Quality Assurance Service) as an industry one-stop quality service provider.

### 3.6.7.3 Overview of Different Computer Programmes and their Application

During the last twenty years various computer programmes and models have been developed locally (on private and government initiatives) and overseas to equip the South African pig industry with computerised technology to further the efficiency and inherent competitiveness of the South African pig industry. Table 3.13 provides an overview/summary of these programmes/models. For the purpose of this study no detailed explanation or in depth discussions of these programmes/models will be conducted.

**Table 3.13 An overview of different computer programmes/models and their application in the South African pig industry**

| NAME OF PROGRAMME | INSTITUTION | FIELD OF APPLICATION | LEVEL OF IMPACT | |
|---|---|---|---|---|
| | | | PRESENT | FUTURE |
| INTERGIS 2000** | S.A. Studbook | Livestock Registration and Recording | H | H |
| FERGUSON GROWTH MODEL** | University of Natal | Growth Simulation Academic Institutions | L + I | M + I |
| APR MODEL* (Animal Product Requirements) | University of Natal | Future demand for animal products, feed & raw materials | L | M |
| WINFEED | University of Natal / Business Partner | Optimal Ration Formulation | L + I | M + I |
| PISSA (Pig Information System ) South Africa | ARC-Animal Improvement Institute & Institute for Animal Behaviour, Mariensee, Germany | Generic Pig Information System (Registration, Performance, Breeding, Management, Traceability and QA) | H + I | H + I |
| PIG BLUP | University of New England Armidale, NSW, Australia (Licenced to ARC - AII) | Pig Breeding | H + I | H + I |
| CEDARA PIG ECONOMICS** | Department of Agriculture - KwaZulu-Natal. Cedara College of Agriculture | Economics of Pig Production | M | M |
| PIG PRO** | EBM COMPUTERS (Private) | Record Keeping, Management, Economics, Breeding | H + I | H + I |
| EASICARE** | Developed in the UK. Sub-licenced to KANHYM (Private) | Recording, Management Economics, Production | L + I | M + I |
| SPESFEED** | SPESFEED CC (Private) | Pig Nutrition. Least cost pig diet formulation | H + (I) | H + (I) |
| TRADE LIBERALISATION* | CIAMD/SAMIC | Supply, demand, consumption of red meat. Urbanisation and global trends | L | M + (I) |

| | | | | |
|---|---|---|---|---|
| SENSITIVITY ANALYSIS** | AGRI SA/SAPPO | Price sensitivity of various input and output variables to profitability | L | L |
| OPTI SLAUGHTER* | ARC-ANPI, SAPPO & University of Stellenbosch | Optimal slaughter (carcass) weight and Economics | L | M |
| IMQUAS* (Not a true computer programme: Vide 3.5) | SAMIC | Quality Assurance and Traceability System | L | (?) |
| PIGCHAMP | Developed in the USA | Record Keeping Management, Economics, Breeding | L + I | L + I |

* In progress, still being developed

** Computer programmes, developed over the last 2 decades

L = Limited: < 10 % application

M = Moderate: 10 - 40 % application

H = High: 41 - 75 % application

I = Has impact in other countries (Internationalized)

(I) = Has possible impact in other countries

(?) = Uncertain

## 3.7 CONCLUSIONS TO CHAPTER III

The South African pork supply chain (viewed from an aggregate industry perspective) is fragmented, individualistic, price inconsistent (sometimes manipulative) with elements of dominance and also partnership systems - in essence unco-ordinated. On the contrary agri-food companies in Europe (such as France, Germany, Denmark, Sweden, Holland and England) have realized that overall performance (efficiency and profit) of the agri-food channel can improve drastically by means of thorough co-ordination and relationships between the participants. Through the utilization of modern information technology, these companies have linked the different stages of the chain to control production and processing or value adding throughout the entire chain thus from conception to consumption. (Vide 2.4.1 where the example of the company EGO-Schlacnthof Gmbh Co-operative at Georgmarienshütte in Germany is given.)

Given the preceding discussion and the conceptualization of Fig 1.1 indicating the abattoirs/ slaughterhouses as one of the pressure valves in the pork supply chain, all efforts should be made to guarantee or ensure continuous pork product excellence. This can only successfully be achieved through slaughterhouses of excellence [(Vide 2.5.1.6.2) applying the blueprint for Pork Abattoirs] and through international supply chain management standards.

The world price of a specific product and the exchange rate are regarded as the two major factors that will affect the domestic competitiveness of South African producers. Although it is envisaged that the world price of red meat (including pork) will increase (±3 %) in the medium term, the exchange rate of the Rand is likely to decrease consistently against the major international money units, thus gradually inhibiting potential and progress within the pig industry. To pursue the export drive, albeit small and seemingly troubled, should enable local pork producers to ensure their (and the industry's) survival and competitiveness.

It is encouraging to note that the pork processing company Enterprise has embarked on a protocol: **Blueprint for producing quality pork**. Implementation of this protocol/agreement between producer and processor has surpassed the infancy stage and could become reality for all producers producing pigs for Enterprise by December 2002. A cumbersome problem that needs to be addressed and solved urgently is - *"the fact that no real co-ordination, communication, co-operation and a long term strategic vision between scientists, the abattoirs and producers exist"* - of course to the detriment of the industry!

The strategic vision between scientists, the abattoirs and producers/breeders can only be achieved if the desired breeding objectives are formulated accordingly. Structuring of these breeding objectives is done in CHAPTER V. In the next chapter (CHAPTER IV), genetic parameters will be estimated for certain production and carcass traits in the South African Large White, Landrace and Duroc pig breeds. Genetic parameters, variances and co-variances form the basis for the estimation of breeding values, which in turn is applied in the breeding objective.