CHAPTER I

INTRODUCTION AND PROBLEM STATEMENT

" The gulf between the highly effective, but socially stigmatized vertical integrators on the one hand and the (in)efficient but familiar <u>family firms</u> on the other hand is widening and the ability of the independent farmer to remain competitive is diminishing."

- Thomas Blaha, 2001

1.1 INTRODUCTION

The turn of the previous millenium witnessed the agricultural product market changing from a predominantly **producer dominated** market approach to a demanding, well informed, **consumer dominated** market. The agricultural industry in general had become **more industrialized** and **more specialized** - thus imposing more pressure on management and business acumen. Irreversible trends in market changes, biotechnology, information technology, globalization and advanced consumerism (well-informed and extremely sensitive consumers) have contributed to this phenomenon. Consumers are now demanding more transparency, trust and traceability along the food supply chain. These trends will increasingly play a more important role in the future of agriculture. Food production (including pork) needs to become more holistic to satisfy market demands (Andersen, 1999; Van Oeckel, 1999). Consequently more emphasis should be placed on the optimization of the food supply chain from genetics to the consumer.

Changes in the Agri-Business (Vide Fig 1.1) sector are caused by changes in distribution channels, the environment (political, economical and global), agricultural producers and the consumer (Wierenga, 1998). The discrepancy between consumer acceptance and consumer rejection, especially of agricultural products (including meat), can be regarded as a very thin edge between prejudice and perception. In a consumer driven market approach the foremost question to answer is: **"Who is the consumer and how does he or she perceive quality?"**

1.2 PROBLEM STATEMENT

Pig production is a techno-scientific internationalized business, continuously exposed to change and risk. **Pig production** *per se* is normally influenced by the following factors: the efficiency of animal performance, efficiency of production units, import of animal products/protein, health

aspects, size of the national herd and number of slaughterings. **Demand for pork** on the other hand is influenced by: *per capita* consumption, population income, population growth rate (cognizance must be taken of HIV AIDS[1] in South Africa), the import and export of animal products and income elasticity/demand elasticity. Studies in Denmark by Tangermann (1986) quoted by Steenkamp (1998) indicate that the income elasticity of demand at the farm gate for raw products is significantly lower than the income elasticity for marketing activities. According to Liebenberg & Groenewald (1997) the income elasticity of South African pork is relatively low (0.73) when compared to other meat products. Thus, as the real per capita disposable income increases, consumers are likely to purchase more other types of red meat, relative to pork.
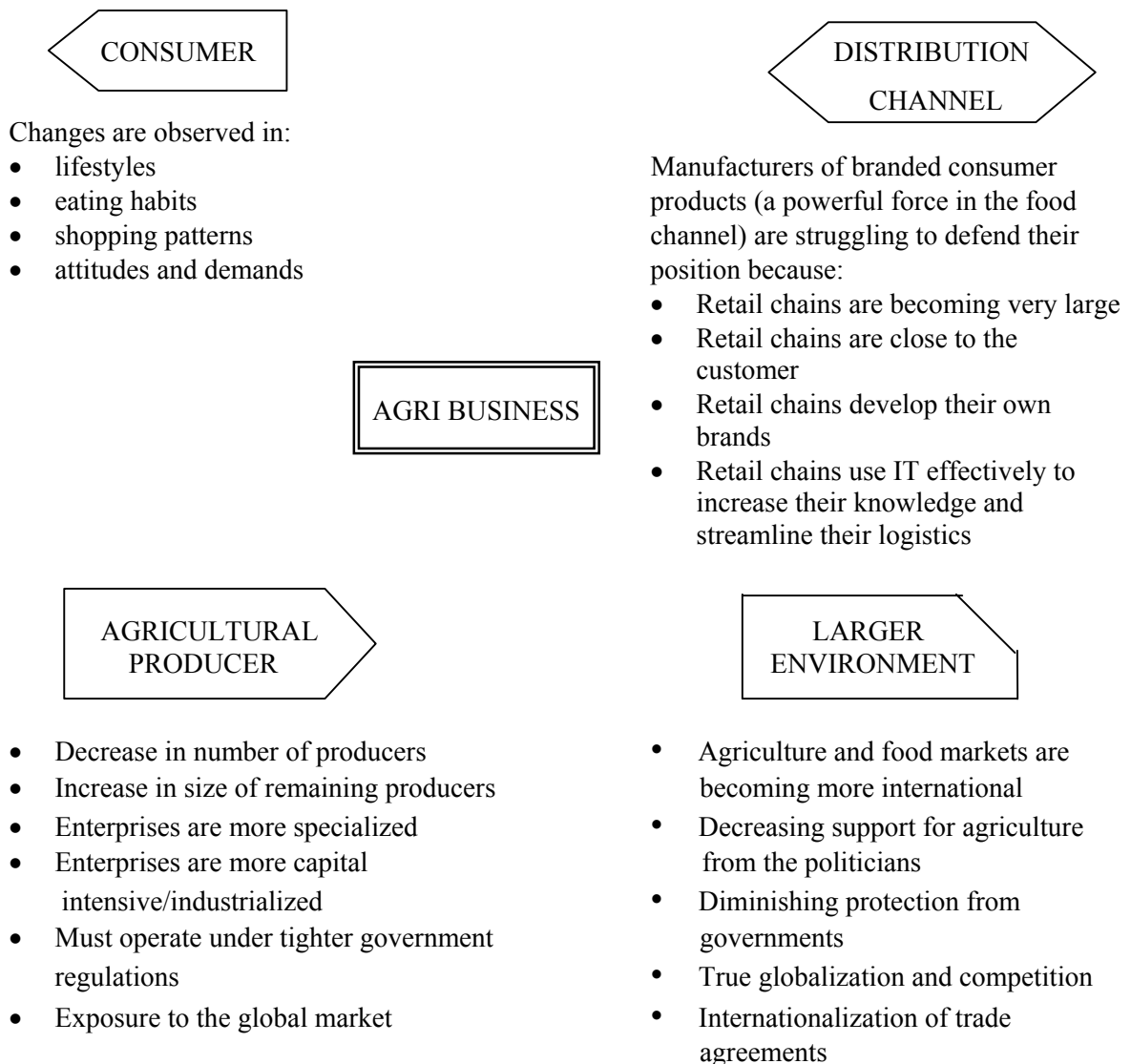
CONSUMER

Changes are observed in:
- lifestyles
- eating habits
- shopping patterns
- attitudes and demands

DISTRIBUTION CHANNEL

Manufacturers of branded consumer products (a powerful force in the food channel) are struggling to defend their position because:
- Retail chains are becoming very large
- Retail chains are close to the customer
- Retail chains develop their own brands
- Retail chains use IT effectively to increase their knowledge and streamline their logistics

AGRI BUSINESS

AGRICULTURAL PRODUCER

- Decrease in number of producers
- Increase in size of remaining producers
- Enterprises are more specialized
- Enterprises are more capital intensive/industrialized
- Must operate under tighter government regulations
- Exposure to the global market

LARGER ENVIRONMENT

- Agriculture and food markets are becoming more international
- Decreasing support for agriculture from the politicians
- Diminishing protection from governments
- True globalization and competition
- Internationalization of trade agreements

Fig 1.1   Changes in the Agri-Business Environment (Wierenga, 1998)

---

[1] *The impact of HIV AIDS, tuberculosis and malaria holds serious social and economic implications for society, the labour force and the country*

The inherent risk of pig production and its relationship to **competitiveness** is a summation of divergent factors. These factors range *from* increased international competition, access to improved technology or limitation of technology, fluctuation in producer prices, environmental conditions (often ranging from one extreme to the other), fluctuating rainfall and production norms, susceptibility to ordinary and extraordinary diseases, effective size of the national gene pool, deregulated agricultural markets (especially in South Africa), *to* extremely high input costs (which in turn are accentuated by **expensive** housing, feed, medicine, labour and venture capital).

The foremost **answer to competitiveness** is to be as efficient as possible, both in the production and in the chain from farm gate and ultimately to the consumer. Invariably the inter-continental levelling of the playing field is largely a fundamental, political and international trade issue, beyond the basic framework of this study, but should be recognised/regarded with diligence. The deregulation of the South African meat sector in the post apartheid era, which coincided with international trade liberalisation, compelled this sector to reorganise itself. South African pork production, at farm gate level, is competitive with production norms of the European Union, the USA and Canada.   The top ten percent of pig producers in South Africa realise a dead weight feed conversion ratio of less than 3,6:1, in excess of 90% of all slaughtered pigs are graded P and O (Vide Annexure II) and they wean in excess of 25 piglets per sow per annum (Streicher, 2003). However, South African pork cannot compete with the European Union and the USA, as they are subsidised directly and indirectly (Matthis, 1999). According to Hofmeyr (1997), the challenge of future agricultural research in South Africa is to focus on competitiveness and bio-economic efficiency. This challenge may be theoretically possible, but it is impaired by the effective size and impact of the pig industry linked to inherent financial constraints and the forces of globalization.

Van Rooyen, Esterhuizen and Doyer (2000) calculated the competitiveness of sixteen selected food commodity chains in South Africa. The pig meat chain, as with most other chains, showed marginal international competitiveness as the RTA (The Relative Revealed Comparative Trade Advantage) index is close to zero. In terms of competitiveness, cognizance should be taken of Brazil. Scholtz (2003) indicates that during the period 1997 – 2002 Brazil has increased their pig production by 53 % from 1.5 million tons to 2.3 million tons. During the same period, exports of pork have accelerated from 0.1 million tons in 1997 to 0.4 million tons in 2002 – an increase of no less than 300 %. According to Streicher (2003) 11 584 tons of pork were imported during the period 1 Jan 2003 – 30 Nov 2003 into South Africa. Of these imports no less than 44 % (5 054 tons) were from Brazil. The balance of the other imports came from Belgium, France and the United Kingdom. The Brazilian competitive advantage (as far as pork is concerned) can be attributed to vertically integrated production systems, a competitive market, top quality research

and development, access to advanced genetic programmes and world class companies and brands. Brazil is at present the fourth largest exporter of pork after America, Canada and Denmark.

Addressing **competitiveness** from another, but extremely important dimension, namely positioning, calls for a thorough understanding and analysis of the product, the market and the consumer, niched within the ambit of the supply chain. Value adding of pork products is directly linked to competitiveness. Positioning commences with a concrete differentiation that a specific product will give consumers more value than a rivalry product (Kotler & Armstrong, 1994).

Quality assurance schemes in many parts of the world, especially the Scandinavian and some European Union countries are adding value, guarantee traceability, comply with stringent welfare standards thereby enhancing consumerism and international acceptance of pork. Application of such schemes in the South African pig industry and livestock industry is limited or has not convincingly surpassed the infancy stage. According to Van Oeckel (1999), meat quality is affected at the following levels in the production chain: at genetic level through breeding objectives; at farm level through the production system; during transport and handling and finally at slaughterhouse and processing levels. Furthermore a substantial part of the variation in meat quality is attributed to genetics   (Vide 2.4.2). Many factors affect the ultimate quality of pork (Vide Fig 5.5). The foremost one, that guarantees good quality, is through an integrated approach (Van Oeckel, 1999; Booysen 2001). To really achieve quality, high quality partners are required (Kotler & Armstrong, 1994). Hence, proactive companies or industries, according to Kotler & Armstrong (1994), have fundamentally a dualistic role to play:

(i)   they must build strong relations with their partners in the supply chain

(ii)   they must work hard to develop a close and loyal relationship with their ultimate customers

Increasing health concerns of consumers in many pig producing countries of the world, including South Africa, have culminated in focused breeding and the selection of leaner and more efficient pigs, accelerated through meticulous breeding techniques (such as the selection index and breeding value estimation referred to as BLUP[2]), better management and improved nutrition.
These endeavours were rewarded by a lean meat-cum-fat discrimination classification system. Thus, enormous advances have been achieved in the field of animal breeding and genetics during the last five decades (Ollivier, 1999). Extremes in animal breeding should be avoided. In this

---

[2] BLUP stands for BEST LINEAR UNBIASED PREDICTION BLUP is regarded as the undisputed international tool for breeding value estimation and is thé method which is being used the most widely for the genetic evaluation of domestic livestock.

regard Hovenier (1993) refers to the **genetic antagonism** between the production and meat quality traits in animal breeding. Commercial pig producers (across continents) are compensated according to low backfat and high lean meat percentage levels. However, thicker backfat levels are related to better meat quality and improved reproductive efficiency, thus leading to a consumer-cum-producer paradox.

Hypothesis of the study:

To test the relationship between pork genetics and consumer preferences

Given the preceding discussion, the following questions are pertinent:

i)   How will the pig industry move from the present (production driven) to the future (consumer orientated, information competitive and quality driven)?

ii)   How to structure future breeding objectives for the stud industry taking cognizance of input, production, output (bio-economic) and acceptance (consumer) criteria?

The latter (thus a supply chain approach) is fundamental to the rational of this study, namely: *How to reconcile meat quality, genetics and the consumer against the background of bio-economic pig production?* In South Africa the breeding emphasis has been too long on input efficiency and too short on output efficiency, whilst carcass quality and meat quality are becoming much more important in modern day pig production. A further question for the South African pig industry (within a changing environment) is how pork (the ultimate product) should be positioned to distinguish it's uniqueness and/or competitive advantage, whilst simultaneously increasing it's market share of *per capita* consumption? Will it be through lower costs or quality differentiation?

Genetics forms the core layer of pork as the product. This core layer is fixed at conception. If meat quality (a consumer demand) is fixed at conception or the genetic level, would future efforts, to add value further down the supply chain, simplify the quest for pork quality?

According to Boehlje & Sonka (2001), optimizing the food supply chain (thus from genetics to the consumer) will have the following advantages:

- better resource utilization
- improved quality control throughout the chain
- reduction in the risks associated with food safety and contamination
- increased responsiveness of the agricultural industries to respond hastily to changes in consumer demand for food attributes (thus efficient consumer responses)

Optimizing the supply chain is a concept, which is often absorbed in academic rhetoric. It should however be noted that the reality of the supply chain is that the flow of products and information in the supply chain is subjected to "three pressure valves" (Vide Fig 1.2).
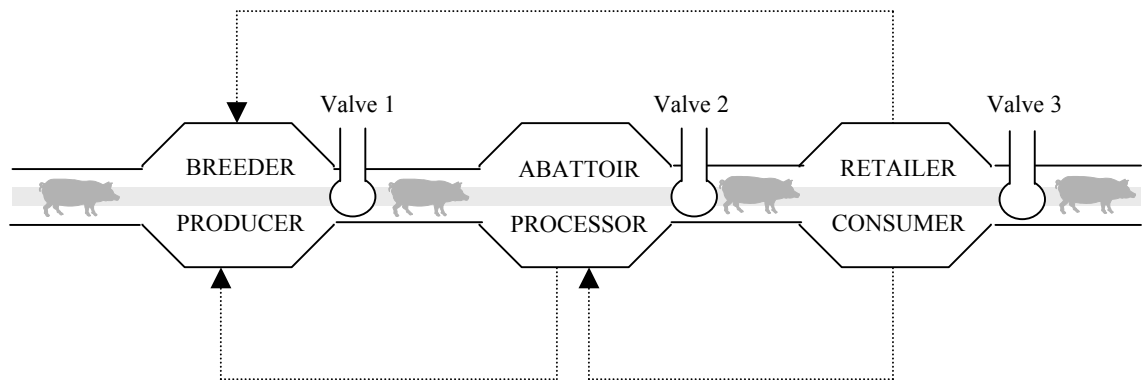

Fig 1.2 The "three pressure valves" in the pork supply chain (arrows indicate the feedback loops in the supply chain)

The effective flow of pigs through the supply chain is dependent upon these three pressure valves. Pig producers (who are the first link in the pork production chain) must understand and know their markets very well. They must have assurance, preferably guarantees of their existing market and be informed on the long term potential of the aggregate pork market. Producers should also be aware of consumer and other trends in the pig industry. They should know which producers expand or scale down and the impact of this on supply and demand and importantly the impact of the strength of the Rand on imports and exports. The abbatoirs – cum – processors are in fact the true regulators of supply and demand of pork. On the one hand they must have a continuous inflow of slaughter pigs from producers to ensure throughput and cover their costs and still make a profit.   On the other hand they must implement and adhere to good slaughtering and manufacturing practices and deliver the required amounts of fresh pork and value added products to a diversified consumer market. They must continuously be aware of consumer trends and consumer preferences and intimately know their wholesalers and retailers. Retailers are becoming more quality driven and modern consumers are better informed, more inquisitive, more health conscious and safety concerned. They are therefore the ultimate regulator in the supply chain.

The feedback loop is indicative of open, effective and rapid communication upstream. Effective flow can only be achieved if these pressure valves are synchronized, in mutual agreement, and honest business partners pursue profitable pork business.

1.3 OBJECTIVES OF THIS STUDY

1.3.1 Overall Objective

Following the preceding discussion of the problem statement, the subjacent objective of this study is to structure aggregate breeding objectives for the South African pig industry, based on relevant information obtained from the changing environment, the pork supply chain and the consumer specifically. This necessitates a producer to consumer, stable to table, field to pork, gate to plate or conception to consumption approach.

1.3.2 Specific Objectives

Specific objectives, resulting from the subjacent objective are the following:

- To determine which market trends/changes are experienced at consumer level with reference to the consumption of pork.

- To investigate (describe and analyze) the structure and extent of the pork supply chain in South Africa.

- To estimate (co-)variance components and genetic parameters for the most important performance and carcass traits in the genetic (input) link of the supply chain.

- To structure the desired breeding objective for the pig industry taking cognizance of the market, consumer, supply chain and genetic components.

- To establish appropriate recommendations to the South African pig industry (stud in particular) on the positioning, competitiveness and the way to progress from a general supply chain to a value (mature) supply chain.

1.4 ANALYTICAL FRAMEWORK AND METHODOLOGY

Primary and secondary data as well as information from comprehensive literature surveys were used in this study. Market research projects/surveys conducted to ascertain consumer perceptions, trends and preferences covered the period from 1970 - 2000.

Investigating the structure and extent of the pork supply chain (for the first time) in South Africa necessitated a thorough literature survey, backed up by information (obtained direct and indirect) from individuals, institutions and/organisations to best describe the present pork supply chain.

The estimation of variance components and genetic parameters for traits of economic importance require a high degree of accuracy in order to optimize the estimation of breeding values *per se* and that of breeding objectives and breeding schemes (Tribout & Bidanel, 1999). Furthermore, large data sets, non-interruptive and non-selective recording of primary data, stretching over a period of at least ten years, are required. The three most important pig breeds, namely the S.A. Large White, S.A. Landrace and Duroc were involved. Production data and carcass data of 5 631 registered Large White pigs, 3 239 Landrace pigs and 1 515 Duroc pigs (originating from the INTERGIS database of SA Studbook during the period 1989-2002) were used to estimate (co-)variance components and genetic parameters for nine economic traits - four production and five carcass traits. An animal model, which made provision for fixed, random and additive effects as well as genetic groups, was fitted to the data by using the VCE computer programme of Groeneveld & Kovac as described by Groeneveld (1998).

Structuring of future breeding objectives for the pig industry were addressed **through an integrated approach** - preceded by the changing marketing environment; establishing and ascertaining consumer dynamics; analysis of the South African pig supply chain and estimation of variance components and genetic parameters for applicable production and carcass traits.

1.5   THE OUTLINE OF THIS STUDY

The marketing environment is researched and evaluated in CHAPTER II, whereby the traditional genotype (**production driven**) is extended to take cognizance of the aspirations and perceptions of the consumer and consumer trends (**consumer orientated prodution**). CHAPTER III describes the contents and components of the pork supply chain, with special emphasis on the vulnerabilities in the chain. In CHAPTER IV, (co-)variance components and genetic parameters of economically important production and carcass traits are estimated for the S.A. Large White; S.A. Landrace and Duroc pig breeds, applying mixed model methodology. CHAPTER V has been constructed by virtue of insight into the domains (which contributed stepwise) of the market and the consumer (Chapter II), the present supply chain (Chapter III) and the genetic components of the live animal pertaining to bio-economic production and carcass traits (Chapter IV). CHAPTER VI culminates in the final conclusions, future perspectives, future research directives and final recommendations.