FOOD PRODUCTION AND HUMAN NUTRITION: THE IMPACT OF HEALTH MESSAGES PRIMARY PRODUCTION PERSPECTIVE - THE PIG INDUSTRY EXPERIENCE

M.R. TAVERNER* and R.M. RANSLEY**

Summary

For pig farmers, as with most other farmers, the consumer's consideration of the healthiness of his product, pork, is but one of several considerations influencing its success in the butcher's shop or in the supermarket. As a whole the pig industry is responsive to all these factors but it is messages relating to consumer health issues that are most strongly and clearly signalled to pig farmers in Australia. All pigs are graded for carcase fat content at slaughter and traded on the basis of their fat cover. There are strong price incentives to reduce carcase fat; price discounts for fat pigs can severely impact on a farm's profitability. Such incentives have reduced carcase fat from 31 to 20% during the past 15 years. The industry will become increasingly sensitive to messages from consumers and changing industry structure and improved technology will enable the Australian pig industry to respond more effectively to consumer demands.

I. INTRODUCTION

Like any other producer, the primary producer or farmer is keenly aware of the need to deliver to his customers the product they seek. Although for most farmers, the person to whom they sell their product is not the consumer, farmers of meat producing animals know that their business success and practices are very much influenced by the food buying patterns of consumers.

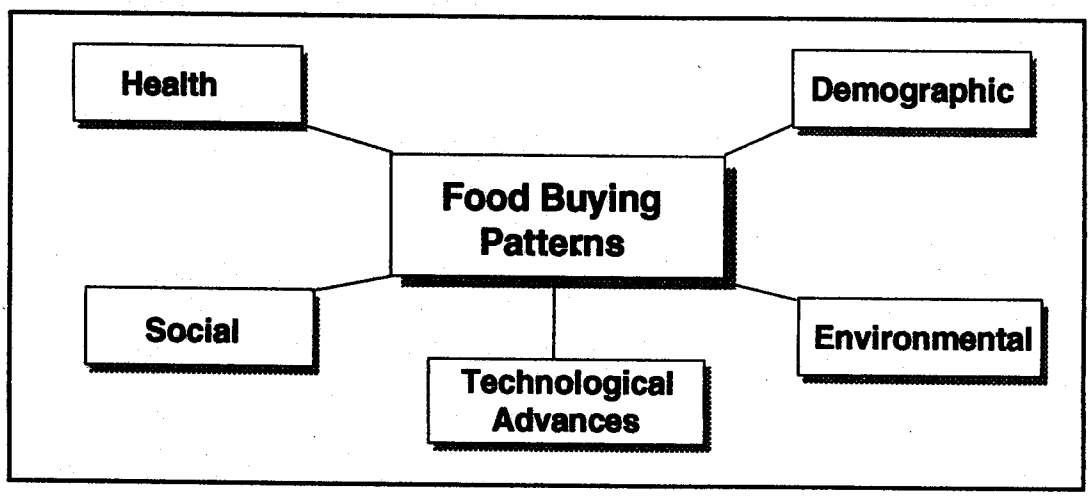
For pig farmers, as with most other farmers, the consumer's consideration of the healthiness of his product, pork, is but one of several considerations influencing it's success in the butcher's shop or in the supermarket. Other considerations (shown in figure 1), include social factors, environmental factors, demographic factors and technological advances.

As a whole the pig industry is responsive to all these factors. The Australian Pork Corporation (APC) for example, has responded to changing social conditions such as Australia's emerging 'time famine' by promoting pork products - Take Away Pork, that require minimal preparation. Similarly APC produces appropriate pork recipes to address technological advances such as microwave cooking. Pig farmers have responded to environmental issues affecting the consumer's image of pork. They are aware of the association that some consumers make between the conditions of pig rearing and the pork they see at retail level.

* Pig Research and Development Corporation, PO Box 4804, Kingston ACT 2604
** Australian Pork Corporation, PO Box 307, St Leonards NSW 2065

Recent consumer research in the USA, has shown that 46% of shoppers refuse to purchase products because of the potential for unethical treatment of animals (Trends 92).

Figure 1. Factors influencing consumer food buying patterns (Mitchell 1993)



During the past decade, the pig industry has invested several million dollars into research to develop more welfare-friendly production systems. As a result, Australian pig farms no longer tether their animals; new facilities have been designed for farrowing sows that account for the needs of the sow and her piglets; and the industry has codes of practice for the welfare of pigs. In most cases, the changes to production systems have not resulted in improved productivity, but have been implemented largely to address apparent consumer concerns for the pig's environment.

In the UK, this approach resulted in several major retail outlets specifically promoting 'green pork' produced from less intensively reared pigs.

II. FACTORS FOR FOOD SELECTION

The most important consideration when shopping for food is taste (Trends 92). As quoted by Mr Jim Seiple of ConAgra Frozen Foods in his paper to a recent meeting on clean foods, 'consumer preferences are driven by taste, not nutrition - a concept based solely on nutritional parameters is unlikely to generate much widespread interest with consumers.'

Pig farmers can and do respond to consumer messages regarding taste. Flavour of the meat is partly dependent on the amount of fat present. Importantly however, flavour can be influenced by diet and is also a feature of the gender of the pig. In Denmark, producers are licensed by their local abattoir to deliver entire male pigs only when the abattoir can be assured that the breeding and management of those pigs will reduce the incidence of a boar-related flavour. The presence of the boar-related flavour is measured in each pig carcase whilst it is on

the slaughter line; financial penalties are incurred by those farmers who continue to produce bad tasting meat.

Nutrition is next to taste as a factor in food selection. For US shoppers, nutrition (77%) outweighs price (75%) and product safety (71%) as considerations in food selection (Trends 92).

III. HEALTH FACTORS

The health factors of primary concern to consumers appear to be related to the safety of food and its nutrient status. Through various mechanisms, messages relating to these consumer health factors are received and do impact on pig farmers.

As shown in Table 1, messages relating to consumer health issues (fat content and safety) are those most clearly signalled to pig farmers in Australia. The strongest signals to the farmer about his pigs are to reduce fat content (and increase lean meat yield of carcases), and to conform to meat safety standards.

Table 1. Signals currently received by pig farmers about their product, how these signals are relayed, and a subjective assessment of the clarity or strength of the signals

Market signal	**Mechanism for relaying the signal**	**Strength / clarity of signal**
Carcass fat	price	***
Carcass weight	price	***
Food safety		
- parasites and zoonotic diseases	meat inspection	***
- microbiological safety	meat inspection	*
- chemical residues	NRS+ / State Authorities	**
Meat quality		
- gender (taste)	price or market access	*
- processing yield	negotiated on subjective assessment	(*)
- rearing methods		(*)
- fat quality (taste, stability)		(*)
Carcass conformation	price or market access	*
	negotiated on subjective assessment	

*Strength and clarity rated from (*) - weak and obscure , to *** - strong and clear.*

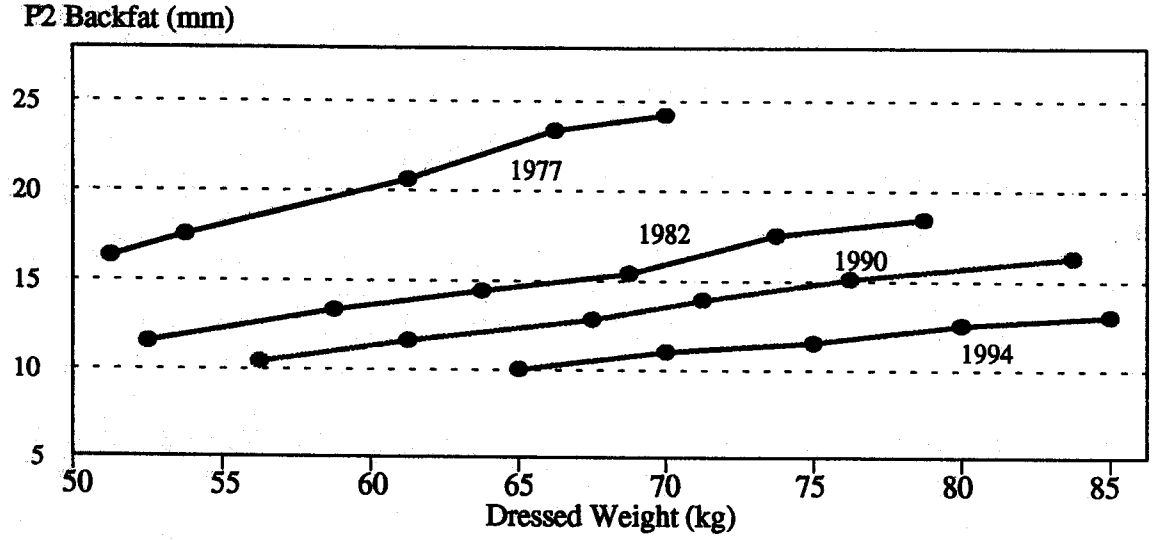
NRS+ - National Residues Survey, Bureau of Rural Sciences, DPIE

(a) The FAT response

In the past, the pig has been valued as a farm animal as much for its propensity to store fat as for its contribution of lean meat to the human diet. However, pigmeat has been well placed to respond to a message that consumers want less fat.

In a pig the subcutaneous fat constitutes a much higher proportion (70%) of total separable fat than in cattle (36%) or sheep (46%) (Kempster et al. 1982). This facilitates the removal of surplus fat during butchering. Also, because the amount of subcutaneous fat is easily estimated from simple linear measurements, genetic selection against fatness is facilitated and carcases can be more accurately classified according to fat content.

Figure 2. Changes in backfat in commercial pig production in Australia (Cleary 1991 and J. Vercoe personal communication)



There have been similar changes to pigmeat composition in the UK. As shown in Table 2, Wood (1993) has recorded a decline in carcase fat from 31% to 20% during the past 15 years.

Table 2. Changes in the chemical composition of the average UK pig carcase (63kg)

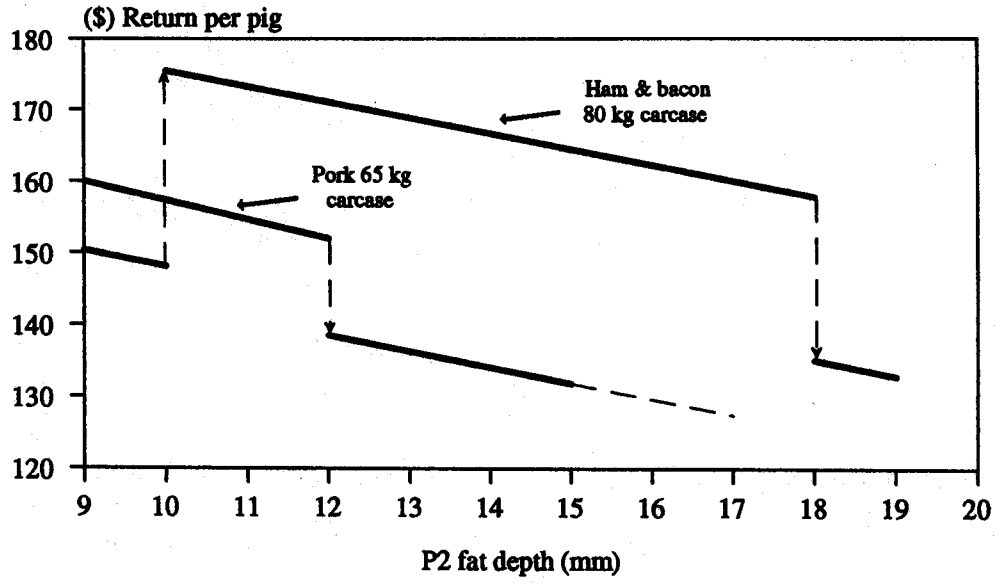
	1975	1990
P2 fat thickness (mm)	18	12
Separable fat (%)	31	20
Lipid in defatted lean (%)	5.5	3.7
Lipid in backfat (%)	85.4	77.2
Marbling fat (%)	1.1	0.8
Fatty acids, saturated (%)	42.6	40.7
Fatty acids, unsaturated (%)	9.7	13.2

Source: Wood (1993) based on estimates from several sources mainly MLC

For nearly 30 years, the Australian pig industry has used a national carcase classification system which has allowed farmers to monitor the fat content of their animals and encouraged adoption of new technology and management practices to reduce carcase fat content. Producers have responded to consistent market pressure to reduce fat content of pig carcases.

All Australian pigs are graded for carcase fat content at slaughter and traded on the basis of their fat cover. Carcase fat has been assessed as the thickness of backfat at a standard site on the carcase over the eye muscle; the site is termed P2. An indication of current price incentives for carcase fat content is shown in Figure 3.

Figure 3. Price incentives for carcase fat content in Australian pigs
(I. Whan personal communication)



The market signals an optimum fat cover for each weight of pig and top prices are paid for pigs within these specifications. Prices are reduced for greater fat cover and the price discounts can severely impact on a farm's profitability.

As shown in Table 2, Wood (1993) also found the fatty acids making up the lipid have changed - meat from leaner carcases contains higher concentrations of polyunsaturated fatty acids and lower levels of saturated fatty acids. This is a desirable move from a nutritional view point.

But there are some trade-offs between health, taste and quality traits. These changes in fatty acid composition affect the firmness and stability of the fat. Furthermore, eating quality of pork can be reduced with too little fat; this message is also clearly signalled to farmers as a price reduction for very low backfat cover (Figure 3).

(b) The SAFETY response

The safety of Australian pigmeat is closely monitored by state and national meat inspection services and mechanisms exist to ensure farmers comply with appropriate standards.

Though the consumer might be largely unaware of inspection procedures for meat he is confident that there are enough checks and balances between the farm and the butcher shop to ensure that the meat he buys is safe to eat. He can afford to be confident because incidents of sickness or death from consuming contaminated meat are rare, if not non-existent in Australia today.

Consumers should appreciate however that meat is a highly perishable food carrying microbiological flora which may include pathogens in addition to spoilage organisms. This was graphically illustrated recently by the *E. coli* food poisoning outbreak in the US associated with the consumption of hamburger meat and the death of four children (Biddle and Matthews 1994).

There are many agencies working to achieve and maintain consumer confidence in meat safety. Departments of Health, food authorities, registration authorities and quarantine inspectors as well as the growers themselves, combine their efforts.

The animals are first inspected to determine their fitness for slaughter. All cattle and pigs must be identifiable to the last holding where they were kept for a period of more than seven days. This is to enable the traceback of an animal or its carcase to the property of origin should disease or other problems be discovered which require investigation (Biddle and Matthews 1994).

On the day of slaughter animals receive an inspection by a veterinary officer to determine whether or not they are fit for the production of food for human consumption. Animals classified as 'suspect' are held separately from all healthy animals, slaughtered then given a complete post mortem examination. Some conditions warrant immediate condemnation.

In 1991, only 0.7% of slaughter pigs were rejected from slaughter, 0.6% of cattle and 0.1% of sheep.

The post-mortem examination of the carcase is undertaken by a food standards officer under the supervision of a veterinary officer. At this time visual inspection together with palpation and incision is carried out. 'Suspects' are again isolated for further analytical tests and possible condemnation. The rate of rejection at post mortem examination, as with ante mortem examination, was very low. Only 0.1% of pigs, 0.2% of cattle and 0.5% of sheep were rejected.

The use of chemicals, growth promotants or antibiotics on livestock is regulated by animal nutritionists or veterinarians and tested randomly through the National Residues Survey. Farmers comply with withholding periods or risk being closed down if their produce is found to have excessive levels of antibiotic residue. Violations of maximum residue levels (MRL) are minimal. On top of this, health authorities build in a safety net of many times the allowable MRL for maximum confidence. This is something that causes great concern amongst those farmers penalised for infringing the MRL by a small amount.

As the carcase is broken down at meat processing plants, additional microbiological assessment is undertaken. It is here that the emergence and spread of spoilage organisms such as *Salmonella*, *Listeria* or *Yersinia* might occur. Detailed attention is given to sanitary procedures and refrigeration to control spoilage and micro-organisms.

The meat inspection program carried out by Australian Quarantine and Inspection Service (AQIS) aims to protect public and animal health and at the same time improve market access for all meat-based products. AQIS reasons that by promoting the development and adoption of a common international veterinary meat inspection standard, trade is facilitated. The growing

international acceptance of QA schemes in meat processing is reflected in recent changes to the 'Code of Hygienic Practice for Fresh Meat' adopted by the Codex Alimentarius Commission.

The Food Safety Management Committee within the Department of Primary Industries and Energy (DPIE) coordinates food safety issues across the Department and advises accordingly. It aims to anticipate and investigate issues which could undermine Australia's image as a producer of clean, safe and wholesome food. Working with all sectors of the food chain it endeavours to develop preventive measures, and conduct monitoring, research, communication and education activities.

The common denominator to all this for the farmer is money. To stay in business and to be successful in business depends on his ability to continue to provide the clean, safe, wholesome food that consumers expect and demand.

(c) The QUALITY response

The pig farmer has had little direction, opportunity or incentive to respond to consumer or the manufacturer's requirements for pigmeat quality. The financial imperative has been to respond to health messages related to fat content and to meat safety messages. The opportunity to manipulate pork quality has been under the control of the manufacturer or retailer.

However, the sophistication in the market is increasing and retailers are beginning to provide signals down the production chain relating to the customer's requirements for traits such as taste, tenderness, colour and juiciness.

IV. FUTURE DEVELOPMENTS

As with most other agricultural industries, the Australian pig industry is increasingly operating in the world market. Canadian pigmeat is imported to Australia and it seems likely that imports from Denmark will follow. This competition will encourage Australian farmers to be more responsive to consumer requirements for pigmeat.

The structure of the Australian pig industry is rapidly changing; whereas there were 50,000 producers in 1960, 20,000 in 1980, and 7,000 in 1990, in 1994 there are less than 4,800 pig farmers in Australia. More than 30% of our pigs are produced on less than 1% of our pig farms (PigStats 93).

We are seeing the rapid emergence of Quality Assurance schemes throughout the Australian pig industry in an effort to provide consumers with greater confidence in pigmeat. The QA issues incorporate the messages of reduced fat and high standards of meat safety, but extend the assurance of pigmeat quality to issues of colour, water holding capacity and of environmentally-sound and welfare-friendly production systems. Pig farmers will be faced with the prospect of adopting QA systems to maintain their access to markets.

Campbell (1994) believes that the future Australian pig industry '.. will be made up of fewer but larger units ..... characterised by the fact that they can produce pigmeat at the same cost or lower than their global competitors; competitiveness in the future will be increasingly dependent on technology ... the most successful units will be those with the largest number of technologies at their fingertips.' New and emerging technologies will enable farmers to better respond to market requirements.

Technology has developed to enable farmers to respond more effectively to consumer demands. Some good examples are:

- the development of recombinantly derived porcine somatotropin, pST. Treatment with pST during a period of 35 days prior to slaughter has been found to reduce carcase fat by 10 - 20% in addition to benefits to feed efficiency and growth rate;
- commercialisation of a gene probe (HAL - 1843 DNA probe) to enable pig breeders to accurately identify and effectively utilise those pigs carrying major genes influencing meat quality in pig breeding programs;
- vaccines to control endemic pig diseases without the use of antibiotics;
- vaccines to suppress male hormones prior to slaughter and thus reduce boar-related flavours in pigmeat;

Campbell (1994) believes that the pig industry of the future will be more responsive to consumer demands - there will be an advantage to those farms integrated with processing, manufacturing and even with retail outlets.

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