Breeding for top quality pork

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Pork is the most widely consumed meat in the world. The FAO estimated world pork consumption to be 100.9 million tonnes in 2004 and this figure to be growing at an estimated 2% annually.

The growth in global meat consumption typically stems from developing countries with growing economies, as the population becomes more affluent and demands greater choice in their diet.

An example is illustrated by figures from the Vietnamese Ministry for Agriculture and Rural Development showing an annual increase in meat consumption of 4.4% starting at 15kg/person in 1990 increasing to 22.4kg/person in 1999.

This pattern is mirrored in many similar economies across south east Asia, Eastern Europe and various areas of Latin America. In these economies, where the increasing demand continues threatening to exceed supply, pork is a commodity product and increasing productivity and subsequently output continues to be the production aim.

Developed economies and meat markets, typical of Western Europe and North America but also including Japan and to some extent Korea, face different pressures.

Typically, demand and supply is relatively balanced and subsequently increasing output leads to oversupply and a reduction in price.

Producers must, therefore, differentiate their product if they are to maintain or add premium to their product income.

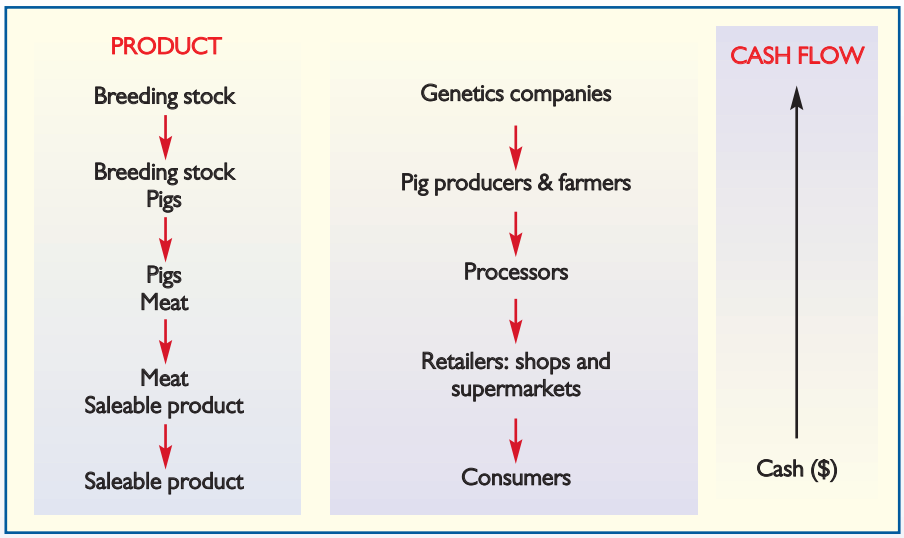

Fig. 1. Passing value down the production chain.

In these decommoditised markets, differentiation of product to add additional value can be achieved through the improvement of meat quality.

Economics

The value pig producers are able to command from their stock is primarily controlled by the values that the processors are able to extract from the retailer and consumer. Producing quality pork allows product of higher value to be passed down the production chain and represents a strategy for increasing financial value ascending the production chain (see Fig. 1).

Increasing the eating quality of pork is, therefore, financially beneficial to producers and genetics houses, who are reliant on greater amounts of money being passed up the pork chain.

Table 1. Diet details (Reproduced from Blanchard et al., 1999b).

	Conventional diet	Quality pork diet
Digestible energy (MJ/kg)	14.2	14.7
Crude protein	205	166
Oil	55.6	57.7
Crude fibre	40.3	24.3
Ash	51.8	44.4
Moisture	115.3	117.5
Lysine	10.5	7.0
Available lysine	9.0	5.9
Available methionine	2.7	2.1
Available methionine + cystine	5.7	4.9
Available threonine	6.1	4.6
Saturated fatty acids	16.8	15.7
Unsaturated fatty acids	30.2	34.0
Unsaturated/saturated fatty acid ratio	1:1.8	1:2.17

Defining quality

Quality covers a range of aspects pertaining to the production and consumption of meat.

Quality primarily covers meat eating quality referring to the taste of pork and bacon. Tenderness, juiciness and flavour are the most important characteristics. Quality can also include the country of origin and rearing system of the animals.

This has lead to successful marketing of 'free-range', 'organic' and 'outdoor reared' produce. Each of these systems have their own set of rules for producers to obey, however such systems do not necessarily improve meat eating quality.

This article will, therefore, concentrate on the production of high meat eating quality

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pork and further references to quality will refer to meat eating quality.

Genetics

Despite numerous claims from many individual breed societies representing their own case, only two breeds have consistently demonstrated independent scientific peer reviewed benefits to meat eating quality.

Meat containing a minimum of 50% Duroc genetics has a lower shear force, reduced cooking loss, is more tender, better pork flavour and higher overall acceptability when analysed by a trained eating panel.

Other studies have also seen increased juiciness from Duroc genetics. The only other breed to enhance meat eating quality is Hampshire. Meat that has inherited the RN-allele at the Rendement Napole gene from a Hampshire parent has lower shear force values and a lower ultimate pH, but also incurs some lesser desirable characteristics such as higher muscle glycolytic potential leading to increased drip and cooking loss, paler meat and lower protein content.

Feeding

High quality pork should be produced from animals fed ad libitum from 30kg liveweight to slaughter. Diets for higher quality pork are higher in energy but lower in protein.

A sample of such a diet compared to a more conventional diet is given in Table 1.

Reducing protein in the latter stages of growth (for example in the last 30 days) from 21 to 17% has a significant improvement on levels of marbling fat without adverse effects on subcutaneous fat levels.

Feeding Vitapork can enhance omega-3 fatty acids and specifically docosahexaenoic acid (DHA), a long chain polyunsaturated fatty acid and the most important fatty acid within the omega-3 group.

DHA is a major constituent of the brain, retina and spermatozoa and hence helps brain structure and function and preserving vision.

Pregnant women, newborn infants, children up to 18 years old and the elderly are the key beneficiaries from consuming DHA.

There are over 350 scientific papers highlighting the benefits of consuming DHA and hence considerable interest in increasing levels in human diets.

Stocking density

Farming methods that minimise animal stress typically maximise the quality of pork. Hence, animals from overstocked facilities produce poorer quality pork.

There is, however, an optimum, past which producers are less likely to increase pork quality but significantly increase cost of production. The optimum is typically a stocking density of 1.4m^2 (15ft^2) per pig.

Animals should be finished on straw rather than concrete slatted accommodation.

Mixing

In line with minimising animal stress levels, pigs should only be mixed at weaning. After this point animals should only be split into smaller groups and not mixed into larger groups.

Transportation

Animals should be withdrawn from feed a minimum of 12 hours prior to slaughter and ideally between 12-18 hours.

This has many benefits including reduced costs to producers due to less feed wastage at slaughter (gut contents), less stress whilst moving animals on and off lorries and reduced waste at processing plants.

Animals should not be mixed on lorries and stocking density on transport should be at least 0.4m^2/100kg.

Vehicles should have non-slip floors, good ventilation and use either raised loading bays or electronically operated lifting decks to load and unload pigs.

Due to the stress caused to pigs during transportation, journey times should not be unduly delayed and should be a maximum of

four hours with a maximum stationary period in hot weather of 30 minutes on any one occasion.

Lairage and slaughtering

Animals should be unloaded promptly on arrival at the abattoir and should not be mixed from the existing groups. Lairage stocking densities should be a minimum of 0.5m^2/100kg.

Animals should be stood in lairage a minimum of one hour but a maximum of three hours and not given feed or held overnight.

Both electrical and CO_2 stunning are conducive to quality pork production but electrical equipment must be appropriately positioned in relation to the brain.

Scalding tank temperatures must be between 59-62°C and scalding time 5-7 minutes.

Carcase and meat processing

All carcases should be from clean pigs and be free from blemishes. Carcases should be split into two sides within one hour of stunning so that the aitch bone is split centrally into two equal parts. Ideally carcases from uncastrated boars should be a maximum of 85kg to minimise the appearance of boar taint although modern genetics have delayed the maturation weight of pigs meaning this to be a lesser issue.

Carcases should be suspended from the hole in the aitch bone (obturator foramen of the os covae) within one hour of slaughter and remain suspended for a minimum of 12 hours. During the first three of these hours the deep muscle temperature must not fall below 10°C and then chilled rapidly to a temperature between 0-4°C.

No further processing should occur prior to the deep muscle temperature reaching this level. All meat should be kept at such temperature until sold. For maximal pork quality meat should be allowed to mature on the bone for a minimum of 10 days, hence retail sale of all pork should always be a minimum of 11 day post slaughter.

Conclusions

Quality pork can only be achieved through integrated production systems. Substantial consumer benefits can be achieved if all links of the pork chain are addressed.

Producing quality pork allows additional revenue to be yielded from the consumer which should be shared amongst the pork chain to compensate for the additional measures that have to be implemented to produce such quality product.

Individual links of the pork chain cannot produce quality pork without the cooperation of other components in the chain. For example changing genetics but continuing to persist with high stress transport systems is unlikely to deliver the desired product.

For those producing high quality pork the rewards can be high. The product offers significant point of difference to commodity pork in the market and allows producers to maintain margins during periods of negative deflationary pressures. ■

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