

Ban on castration of boars in the Netherlands: modeling economic consequences of options

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Abstract

As a result of social criticism on castration, the Netherlands intend to start fattening boars. The great obstacle to a ban on castration is the expected negative effect on international trade because of the fear of boar taint. Consumers' perception of boar taint is investigated, and a summary is presented of the knowledge gained up to the present to reduce boar taint. Advantages and drawbacks of several alternatives are assessed. An economic chain- and import/export model has been developed to estimate economic consequences. The total added value of the pig farmers' chain will significantly reduce, but there is much uncertainty of the estimation of market acceptance and prices. A further elaboration of the model is proposed, with an assessment of the optimal mix of alternatives.

1 Introduction

In the Netherlands young boars (male pigs) that are intended for fattening are nowadays always castrated. This is motivated by the risk that an unpalatable taste of boar meat has an adverse effect on consumption. Non-anaesthetized castration of boars is currently a topical subject. It is no longer found socially acceptable and regarded as an infringement of the well-being and the integrity of the animal. Partly for that reason, pig farmers find it an unpleasant task. And there are also economic disadvantages for the farmer: castrated boars require relatively more feed and have less favorable meat to fat ratio.

As a result of social criticism on castration, the Netherlands intend to start fattening boars. The great obstacle to a ban on castration is the expected negative effect on international trade, especially for the Netherlands as an important exporting country of piglets, slaughtering pigs and pig meat. Because of the fear of boar taint, considerably less is paid for boars' meat and most market parties will accept no boars' meat at all. Therefore castration leads to serious economic losses.

At the request of the Ministry of Agriculture, Nature Management and Food Quality (LNV), research was conducted into the economic consequences of unilaterally stopping the castration of boars in the Netherlands within Europe. This paper describes an economic chain- and import/export model that has been developed to estimate economic consequences. In chapter 2 the issue of boar taint is explained, with emphasis on consumers' perception of boar taint, and a summary of the knowledge gained up to the present to reduce boar taint. Several alternatives are assessed. In chapter 3 one of the options, slaughtering young without castration, is further elaborated for economic consequences for the primary sector and slaughterhouses by means of the results of the economic chain- and import/export model. In chapter 4 discussion and conclusions are presented. This paper is predominantly based on two recent reports on this issue (Backus et al., 2008; Baltussen et al., 2008).

2 Boar taint

Boar taint is a penetrating unpleasant odour (and accompanying taste) in pork. Where it is very strong, it is associated with manure, urine and sweat. When such meat is heated, i.e. in the pan, it is likely that consumers experience unacceptable odour and taste.

Three compounds are generally regarded as responsible for this boar taint and explain two thirds of the variation: androstenone, skatole and, to a lesser extent, indole. Androstenone is a testicular steroid with a strong urine odour. The concentration of androstenone increases with age. Skatole is a non-sex-specific substance but with a three times higher concentration in male pigs. Indole, which is related to skatole, also plays a role. What is clear is only that a marked boar taint is associated with high concentrations of androstenone and skatole.

2.1 Consumer research

The problem concerns not purely the concentration of certain substances, but also how the consumer experiences the odour and flavour associated with these substances. There are differences between countries, due to habituation, but also to the manner in which pork is prepared (e.g. use of herbs). Currently there is very little experience of non-acceptance by consumers because the pork chain almost nowhere brings fresh meat from non-castrated adult boars onto the market. Thus, it is not known what percentage of adult boars actually have boar taint.

In order to discover the extent to which consumers accept boar taint, an investigation was held among 121 Dutch consumers. For this purpose, samples were taken of the bacon from 677 boars of a pure pig breed line. Based on the contents established in a laboratory, 60 were selected and submitted to an experienced expert panel of seven people to assess the extent to which they accepted boar taint. Conclusion from earlier research was confirmed: at low concentrations, the assessment (even by an expert panel) can vary widely from 'no boar taint' to 'distinct boar taint'. At high concentrations, most of the experts noted 'distinct boar taint'. However, for some samples there were very contradictory assessments.

Three kinds of samples were then selected for an investigation among 121 pork consumers: samples which, according to the experts, did or did not have boar taint, and a group of samples which had been labeled by the experts as 'doubtful'. The latter group was also further subdivided into samples with low or enhanced contents of the substances concerned. Each person was given 6 pieces of bacon (with both categories of 'doubtful' being offered twice) and had to award a score of from 1 to 10 for acceptability, unpleasantness and taste. It was striking that only a weak relationship was noted with the assessment of the expert panel. Although there was an observable (but not dramatically) lower appreciation for bacon 'with boar taint', the differences were otherwise not significant. The overall conclusion was that there was no clear preference among these Dutch consumers for samples with low androstenone, skatole and indole contents.

2.2 Prevention of boar taint

To lower or prevent the risk of boar taint, there are alternatives to the current practice of non-anaesthetized castration of boars. Actually all alternatives need further investigation and the tabular summary below (Table 1) expresses the knowledge gained up to the present to reduce boar taint. Table 1 is based on Backus et al. (2008) who give a more detailed description.

In this table eight methods are described very briefly. For each methods advantages and drawbacks, as well as some additional remarks, are summarized. Aspects are the well-being of animals (pain, fear, aggressiveness) and of farmers, the reduction of levels and taint, the efficiency of meat production, costs for farmers and abattoirs, effects on consumer, society, markets and export, and further reliability, accuracy, risks, safety, time. Every method has its own advantages and drawbacks based on these aspects. More research effort is required to gain more insight, also in combinations of two or more methods (e.g. combination of breeding and management measures). After more knowledge has been gained, models are helpful to support decision making regarding methods and how they are to be applied. In chapter 3 the results of a model are presented of the alternative 'slaughtering young'.

There are widely differing views within European countries (EU member states, Norway and Switzerland) on alternatives for the castration of male piglets. All the parties concerned in the European regions have a slight preference for castration under anaesthetic and the sexing of semen.

	Currently: castration, no anaesthetic	Castration under anaesthetic	Slaughtering young (more in Chapter 3)	Breeding	Immuno- neutralisation	Management measures	Sexing of semen	Detection on the slaughter line
Method	Allowed up to 7 days. Performed by the farmer.	Anaesthetic injection or CO2.	No castration, lower weight (80-85 kg)	Reducing levels by breeding.	Two injections. Inhibits testicle growth.	Water supply, hygiene, feed adjustments.	Select female semen before fertilisation.	Removing all boars with taint in the abattoir.
Advantages	No andost., less skatole. Less aggressiveness.	Less pain and stress. CO2: other treatments at same time.	Growth and feed conversion (but should be better at older age!)	Higher weight possible. No other measures.	Less pain and stress. Costs.	Lower skatol content. Hygiene positive other effect.	If possible, no negative effects e.g. pain and stress.	As final check combined with other methods.
Drawbacks	Painful. Society acceptance decreasing.	Injection: painful. CO2: safety.	Market accept. Drop added value. Aggression.	Takes many years. Interaction of genes. Other traits. Invest risk.	Safety risk for injector. Fear consumer.	No 100% guarantee, only skatol lowered. Costs for farmer.	Feasibility for pigs: time and quantity. Related costs.	If frequent, less lucrative alt. use. Must be certain, exact, fast.
Additional remarks	Majority EU countries.	Research started application CO2.	Applied in some EU countries.	Androstenon and skatol are inheritable.	Reliable in Australia. Safe for consumer.	Unclear relations and interactions.	Experience in e.g. cattle.	Balance between guarantee and costs regarding % rejects.

Views of stakeholders

Pig farmers	preferred	preferred	not preferred	1)	not preferred	1)	preferred	1)
Abattoirs	preferred	preferred	not preferred				not preferred	
Processing	preferred	preferred					not preferred	
Consumers	aversion	preferred	not preferred		not preferred		preferred	
NGO	aversion	not preferred	preferred				preferred	
Policymaker	aversion	preferred	preferred		certain prefer.		preferred	

1) Not assessed by Backus et al. (2008)

Table 1 Review of castration and alternatives

3 Modeling economic consequences of young slaughtering

With the aid of available business and chain models and statistical sources, the possible economic consequences of separate fattening and young slaughtering of boars for the meat sector and pig slaughter sector were calculated. Constraints and assumptions for the model and the calculations are: a unilateral ban on castration of boars in the Netherlands; no effect on infrastructure; time and cost for slaughtering do not depend on weight; no export of male piglets and pigs; unchanged Dutch consumption; separate fattening; slaughtered male pigs with a lower weight have no boar taint; no other alternative to detect or reduce taint are included or combined. There were no data available about the market value of exported boar meat or on effects on disposal of manure. Regarding all constraints, the results of this quick scan should be regarded indicative.

3.1 Materials and methods

Two models have been used in combination for this research:

- a model (BAM) for the optimization and simulation of gross margin based on payment schemes (Giessen et al. 1988);
- a model for the simulation of animal and meat flows in order to obtain the input-output balance of the pigmeat chain (Baltussen et al., 2008).

The combined model use makes it possible to estimate the economic consequences of the chain and its segments. For the current situation Good Farming Global is used as payment scheme, and for the situation of fattening boars Good Farming Welfare is used (VION, 2007 and Hooven, 2007). The COMEXT database of Eurostat is used for export data (amount as well as value). For the calculations only the 14 most important markets (countries) for Dutch meat are used. Other countries are combined and not distinguished. A Dutch source is used for domestic consumption (PVV, 2006).

3.2 Added value of the pig chain

For 2005 the added value of the pig farmers (fattening), transport and slaughterhouses is about 920 million euro (Baltussen, et al., 2008). The model has been applied to calculate the effects of a ban on castration combined with separate fattening and other above mentioned assumptions. The calculated results show that the gross added value for the pig sector and slaughterhouses are estimated to decline by around 90 million euro (10%) a year as a result of stopping castration. The revenue in this part of the column will decline by around 200 million euro, while the costs will fall by only 110 million euro. The next section (3.3) gives the causes. The reduction in revenue will be almost solely due to the reduction of meat production in the slaughter business. Since the margins in both primary sector and slaughterhouses are less than 10%, a decrease of added value with the estimated 10% means that no positive gain it to be expected.

3.3 Revenues and costs of separate fattening and slaughtering

Lower revenues that are expected are a result of: less volume of meat due a constant capacity for fattening and slaughtering (same number of animals), lower prices (boar meat and less heavy hams). On the other hand, there will be more export of pigs when the slaughtering capacity is constant while the number of fattened pigs increases (lower weight and thus more rounds). The net decline is expected to be 200 million euro.

The costs decline by around 110 million euro, particularly due to: reduced purchasing costs of slaughter pigs by Dutch slaughterhouses, the reduced feed costs in the primary sector because of lower weight and more efficient feed conversion, and lower costs for disposal of manure. The costs rise due to the extra purchases of young pigs (more pigs are fattened in the Netherlands). Higher costs for transport are caused by export of pigs and piglets and extra domestic transport due separate slaughtering gilts and boars.

The figure below gives a summary of the calculation of the expected consequences for the added value and the revenues and costs for the alternative 'separate fattening and slaughtering'.

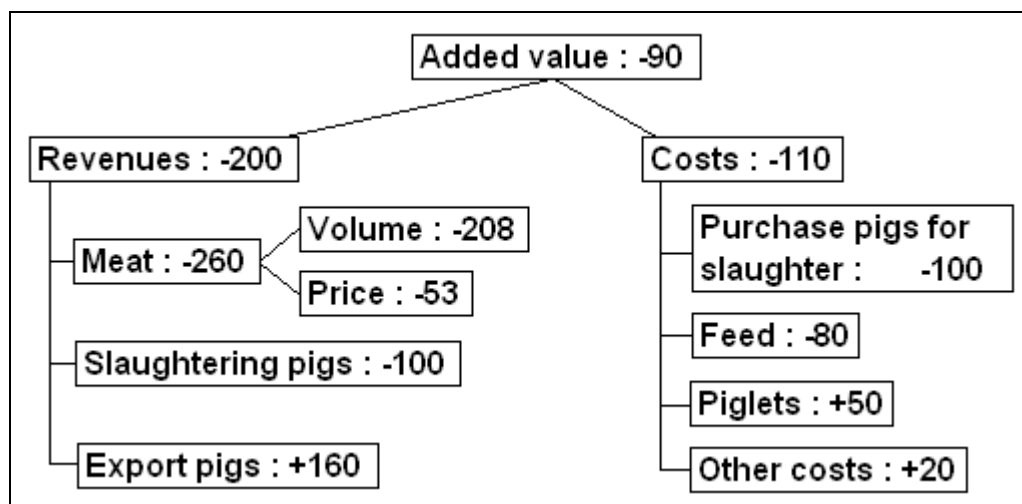


Figure 1 Economic consequences of separate fattening compared to current practice (in million euro per year)

3.4 Economic consequences

The boars will be slaughtered at a lower weight to prevent problems with odour. Because the number of slaughters in slaughterhouses depends more on the number of animals than the weight of the animals, less meat is produced with the same slaughter capacity. A second important reduction in revenue is the price reduction per kg. There are two reasons for this. In the first place, lighter parts of pigs are worth less than heavy parts (a ham of 13 kg is worth more per kg than a ham of 11 kg). Secondly, an expected lower price for meat from boars.

It should be mentioned that the possible decline in piglet feed costs and labour costs of castrating piglets are not calculated in this study. Also the manure disposal price will decline. In this study a static approach is used. If adaptation processes had been included, certain bottlenecks could (partially) be solved. In the allocation of the assets and liabilities, Dutch

sow farmers will probably foot the largest part of the bill, because pig farmers and slaughterhouses have the option of buying young pigs and fattening pigs abroad.

The expected decline in gross added value has a substantial band width in the range of tenths of millions euro as a consequence of several uncertain aspects. The model lacks the relevant knowledge regarding consumer behaviour and market acceptance.

3.5 Market acceptance

Market acceptance and meat with boar taint can lead to a higher decline. It is expected that buyers abroad will pay less for the same quality meat. This will not apply to all countries, but can be expected in important sales countries like Germany, Italy and Greece.

In order to avoid any negative consumer reaction, the international trade does not want any boars' meat. Boars' meat is labelled as 'low quality' and is therefore not accepted or realizes a markedly lower price. That would cause a big problem if the Netherlands - as an exporting country - were to abolish the castration of boars unilaterally. In that sense, it would be in the interest of the Netherlands (and the pigs) if the castration discussion were to be carried on in a European context. However this may be, buyers of pork – both the trade and the final consumer - want to run as little as possible risk of getting smelly pork.

4 Discussion and conclusions

In this paper some alternatives of non-anaesthetized castration of boars are described. Each method has advantages and drawbacks.

A model has evaluated one of these alternatives, slaughtering young boars. The total added value of the pig farmers' chain will significantly reduce, and general estimates suggest a decline in the added value giving only partial compensation for labor and capital. There remains no room for profit (compensation for risk). The added value is expected to decrease with 10%, but there is great uncertainty since the boar taint question is primarily a problem of market acceptance. In answering the question of how one could give guarantees against boar taint, one is faced by the problem that there is no broad definition of boar taint accepted by the market. We actually do not really know what it is. It is significant that - even in the scientific literature - the estimate of the percentage of boars with boar taint varies widely¹. Studies have shown further that the 'experience' of boar taint varies by country, by sex and by individual. This makes it difficult to get a grip on how consumers experience the odour and taste of boars' meat. We are accustomed to assume a relationship between the experience of boar taint and the presence of androstenone, skatole and indole in the boar bacon. In reality, the concentration of these substances has been found to explain only two-thirds of the consumer experience. This applies equally to the judgement by expert panels. Research results show that it is unlikely that there is a simple solution to stopping castration. A search has to be made for a combination of different methods.

It is recommended that directed research be carried out into the essence of boar taint, a complex combination of aromatic substances, in order to discover whether it is possible to

¹ In Welfare aspects of the castration of piglets, ESFA Journal 2004 (91), p. 45 refers to 10 to 75%. John-Erik Haugen of the Noorse Matforsk (LEI Wageningen UR, 5 July 2007) mentions 20 to 80%. Our own consumer research (CCL and Essensor, 2007) did not find more than 1.5%.

give better guarantees for individual submarkets. Directions for solutions must be investigated in relation to the industry and the chain together with stakeholders.

Economic research is important to give insight in technical and economical consequences of a ban of castration by different technical solutions or combination of solutions (alternatives). With a proposed model an optimal mix can be estimated given cost/benefits of alternatives, the available knowledge about “ist und soll” and uncertainty.

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