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RECENT MARKET REQUIREMENTS FOR PORK QUALITY IN GERMANY

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Review paper

SUMMARY

Meat market is changing continuously. The amount of meat sold in butcher shops is decreasing while pre packed meat in grocery stores and discounters is growing up to more than 50 % of the total consumption in 2007 (forecast). This has an impact on carcass evaluation concerning weight, proportion of cuts and homogeneity. New evaluation systems were developed and applied. Consumer's demand to meat quality is, besides the well known characteristics for contents of nutrients, vitamins, minerals, trace elements, minimal residues, tenderness, water holding capacity etc., i.e. where objective measurements can be applied, also ethic considerations. These are sustainable production systems, animal welfare and enjoyment of meat consumption. The first group of traits mentioned has been improved substantially by selection against the MHS gene. But heterozygous products are still on the market and even in homozygous MHS negative populations a wide variation in meat quality remains. To gain further genetic progress additional characteristics of pork quality were introduced into progeny testing schemes, and, occasionally, in the slaughter line, i.e. drip loss and intramuscular fat. Due to heritability parameters and genetic correlations these efforts are promising. Ethic aspects are taken care of by integrated production schemes where the main steps of production (genetics, housing, handling, transport, slaughter etc.) are guaranteed by contract.

Key-words: pork quality, market, consumer, integrated production

INTRODUCTION

Marketing of food in general and meat in particular has changed during the last decades considerably. Since quality became more important while the quantity was saturated, marketing of carcasses dominated over live stock market, because the evaluation of carcasses is more accurate than in live animals, especially in pigs.

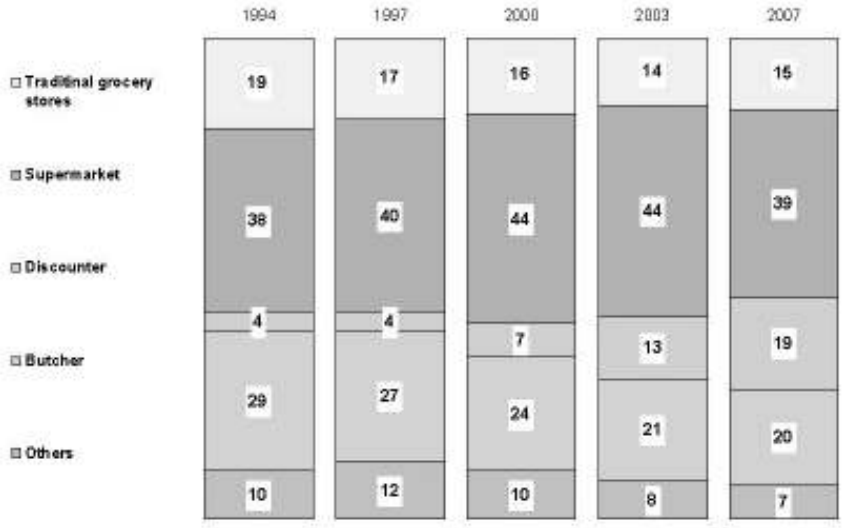

Figure1. Development of meat retail market (Schweer, 2007)

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Traditional markets and butcher shops have been continuously losing market shares in favour of large grocery stores and discounters which offer packed meat for self service. This has an impact on carcass characteristics in terms of weight, lean:fat ratio, and proportion of valuable cuts. In addition this practice allows the customer to visualise meat quality by colour and drip loss if the packages are transparent and have been stored in the counter for some time.
As shown in Fig. 2 consumers, however, have further requirements to pork, exceeding the quality traits that can be measured objectively.
How some of these requirements can be fulfilled will be discussed in this presentation.

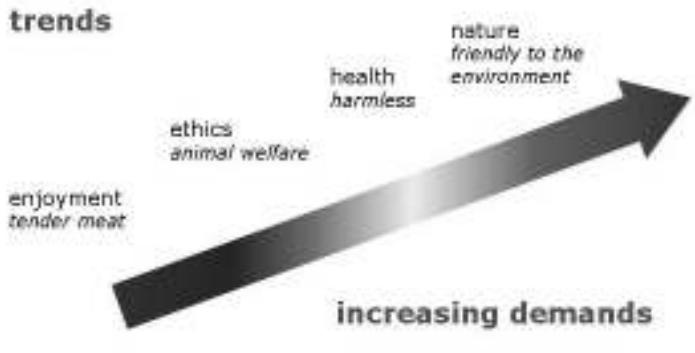

Figure 2. Consumer's demands (Schweer, 2007)

CARCASS COMPOSITION

For trading carcass cuts and/or packed meat and processed products it is necessary to dissect the pig carcasses. In large enterprises this is partly performed by machines. The borderlines between cuts are located with the assistance of laser technique. Thus fairly homogenous carcasses in weight and proportion (conformation) are necessary. Since the different parts of the carcass are sold at different prices, their proportion, and their composition is also of economic interest.
The amount of valuable cuts should be as high as possible, and the lean content can be of significance for the utilisation of a cut. This is true for instance for belly and neck. Fat parts can only be used for processing at a low price, whereas lean ones may be a high price cut, utilised as bacon or barbecue (Fig. 3).

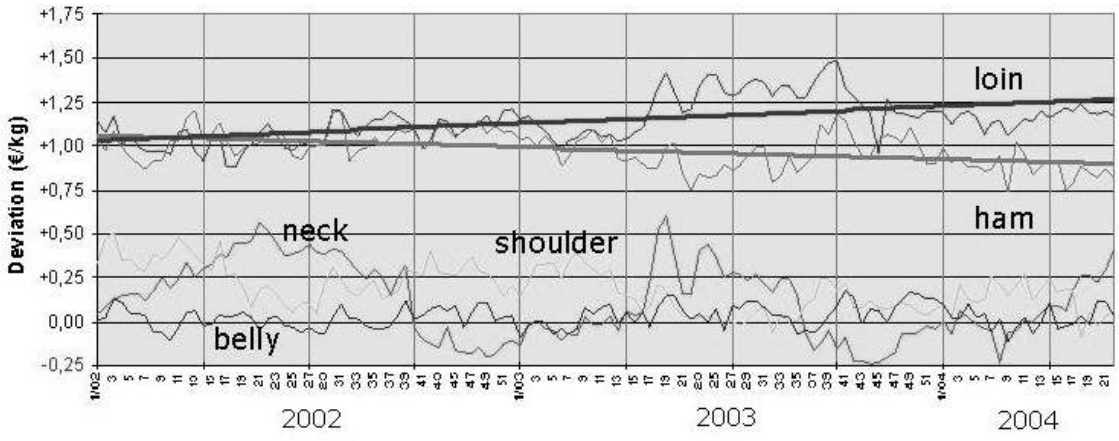

Figure 3. Deviation of prices of various cuts related to average carcass price during 2002 to 2004

Four actions are essential to fulfill these aims:

1. Breeding schemes must emphasise these characteristics in their selection work properly. This has been done for a long time (Tab. 1).
2. Instrumental evaluation systems must be available at reasonable cost and practicability to accurately measure these traits (Fig. 4).
3. Price differentiation between cuts must be reasonable to stimulate these activities (Tab. 2 and 3).
4. The management system has to take care for an adequate genetic basis in order to produce homogeneous groups of slaughter hogs and at the right marketing weight.

Table 1. Influence of sire lines on carcass composition traits (LS means and standard errors in brackets) and their economic relevance (Paulus et al., 2000; modified)

	Sire line and MHS genotype						
	Pi NN	Pi nn	Pi*Ha NN	Pi*Ha Nn	Du NN	Du*Ha NN	F - test
FOM (%)	55.72 (0.13)	56.09 (0.18)	54.63 (0.12)	54.89 (0.22)	53.91 (0.17)	54.38 (0.16)	***
Eye muscle area (cm^2)	52.3 (0.25)	50.8 (0.35)	50.9 (0.23)	51.5 (0.43)	47.2 (0.33)	48.4 (0.30)	***
Valuable cuts (%)	47.91 (0.15)	48.45 (0.18)	46.76 (0.16)	47.10 (0.29)	46.52 (0.20)	47.00 (0.25)	***
Price (€/pig)	91.44	92.40	88.67	89.26	86.51	88.12	***
Deviation (€/pig)	+ 2.18	+ 3.16	-0 .59	0	- 2.75	- 1.14	

F-test: *** ($p < 0.001$)

From Tab. 1 slight breed differences in carcass composition at a high average level can be seen. It has to be realised that a maximum of lean is not desirable, due to negative genetic correlation between percentage of lean and meat quality characteristics.
Fig. 4 shows the AutoFOM grading system which delivers not only the proportion of lean and fat tissue, but also information about weights of various cuts.
Tab. 2 demonstrates the current price system in Germany which supports – or initiates – the breeding aims and management. Price additions are only allowed up to 58% of lean meat. More leanness is not paid for. Price reductions are due for weights above and underneath the optimum range of 84.0 to102.0 kg carcass weight.
In Tab. 3 prices for different cuts are listed, where the importance of belly leanness is obvious.
The economic consequence of the new AutoFOM grading and pricing system is demonstrated in Tab. 1 where the highest proportion of valuable cuts results in the highest price per kg carcass weight if meat quality is not regarded.

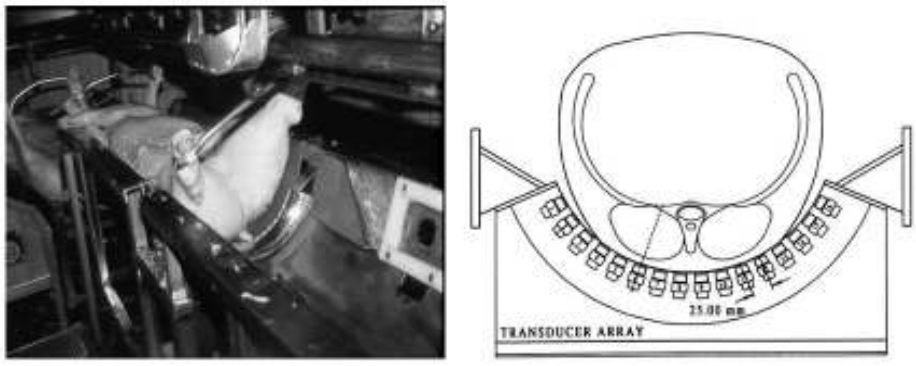

Figure 4. Automatic carcass grading system AutoFom (SFK Technology A/S)

Table 2. Former and current price mask in Germany – example (Schweer, 2007)

Range	until 6/2004	since 7/2004
% lean	**45** – 58 %	**47** – 58 %
Carcass weight	84 – **100** kg	84 – **102** kg
Basic price	56 %	56 %
Addition per % lean		
56.1 – 58.0 %	**+ 0.02 €**	**+ 0.01 €**
Deduction per % lean		
52.0 – 55.9 %	- 0.03 €	- 0.03 €
47.0 – 51.9 %		- 0.04 €
45.0 – 51.9 %	- 0.04 €	
Ded. due to overweight per kg		
102.1 – 120.0 kg		- 0.02 €
100.1 – 120.0 kg	- 0.02 €	
Ded. due to under weight per kg		
73.0 – 83.9 kg	- 0.01 €	- 0.01 €
50.0 – 72.9 kg	- 0.03 €	- 0.03 €

Table 3. Price of cuts based on AutoFOM evaluation – example (Schweer, 2007)

Cut	Limits (kg)	Points/kg
Ham, boneless	15.00 – 19.50	2.30
	14.99 – 14.50	2.20
	< 14.50	2.10
	19.51 – 20.00	2.20
	20.01 – 20.50	2.10
	> 20.50	1.80
Loin	≥ 6.20	3.50
	< 6.20	2.80
Shoulder, boneless		1.90
Belly, max. 16 kg	> 51% lean	1.00
	45.00% – 50.99 %	0.80
	< 45% lean	0.60
Weight limit	84.0 – 110.0	- 1

MEAT QUALITY

Meat quality failures have been diminished in past mainly by eradicating the MHS gene. As can be seen from Tab. 4, breed differences in general are rather low with the exception of Piétrain breed where the three genotypes differ significantly. This clearly demonstrates the importance of the MHS gene for meat quality characteristics. However, even in homozygous MHS negative populations a certain variance in meat quality traits is left, even though in progeny testing schemes the measurements of colour brightness and pH have been included since many years. This fact asks for additional or other characteristics which are of significance for meat quality. The main ones in this respect are marbling and water holding capacity. In the past they were only determined indirectly by pH, conductivity, and colour brightness, because it was difficult to measure them directly. For some time more practicable and standardised methods have been developed and are in the process of being applied.

Table 4. Influence of sire lines on meat quality traits and their impact on meat quality defects (LS means and standard errors in brackets) - Laube et al. (2000; modified)

	Sire line and MHS genotype						
	Pi NN	Pi nn	Pi*Ha NN	Pi*Ha Nn	Du NN	Du*Ha NN	F-test
pH 45 min	6.18 (0.01)	5.76 (0.02)	6.19 (0.01)	5.97 (0.02)	6.26 (0.01)	6.26 (0.01)	***
pH 24 h	5.51 (0.01)	5.49 (0.01)	5.49 (0.01)	5.48 (0.01)	5.59 (0.01)	5.52 (0.01)	***
Electrical conduct. 24 h	3.37 (0.04)	4.49 (0.05)	3.31 (0.04)	4.00 (0.07)	3.52 (0.05)	3.48 (0.05)	***
PSE (%)	2.1	21.8	1.4	10.2	1.9	1.5	
DFD (%)	0.77	0.25	1.15	1.11	2.93	0.94	

F-test: *** ($p < 0.001$)

Mörlein (2007) published a promising attempt to determine intramuscular fat (IMF) by a specific ultra sound device on the intact carcass. He admits, however, that still some effort is needed to improve it for practical application. Differences in IMF by breed can be seen in Table 5.

Table 5. Influence of sire line on intramuscular fat content (IMF) and payment (Laube et al., 2000; modified)

	Sire line and MHS genotype						
	Pi	Pi	Pi*Ha	Pi*Ha	Du	Du*Ha	F-test
	NN	nn	Nn	NN	NN	NN	
IMF (%)	1.32	1.24	1.47	1.33	2.05	1.72	***
Price and surplus (€/pig)	+ 3.15	+ 4.15	- 0.42	± 0	- 4.10	- 1.90	***

F-test: *** ($p < 0.001$)

This table shows, however, that only one of the populations reaches the generally recommended value of 2.0 % IMF. Due to the positive correlation between IMF and fatness in general these carcasses obtain a lower price on the market. For the future, a pricing system is needed that allows an additional surplus for meat quality, if this trait shall be of more importance.
From Tab. 6 it is evident that drip loss also varies remarkably between breeds and within breed. That gives the opportunity for selection in the actually most important meat quality trait.

Table 6. Drip loss in different breeds and crosses (Otto, 2005)

	DE	DL	Pi	(DL*DE) * (DE*DL)	Pi * (DE*DL)	(Ha*Pi) * (DE*DL)
No. of obs.	35	69	394	180	62	34
Drip loss 24 h p. m. (%)	1.06	2.10	2.63	1.83	2.18	2.69
Standard dev. (%)	1.18	1.89	2.11	1.68	2.06	1.96
Minimum (%)	0.06	0	0	0	0	0.17
Maximum (%)	6.01	7.17	13.27	8.01	10.09	6.22

From the practical point of view Otto (2005) states that the EZ drip loss method is the most suitable one, but requires samples and laboratory application and at least a time period of 24 hrs. Therefore it is not possible to be applied on the slaughter line but can well be utilized in progeny testing schemes. The phenotypic correlations between drip loss and carcass traits are detrimental, but at a low level or not significant. Thus improvement of drip loss without disadvantage for carcass composition seems to be possible.
In scientific studies the significance of some genetic markers also has been investigated by Otto (2005) and shows promising results. For final recommendations more research is needed.

MANAGEMENT

To be successful with the aims defined, in addition, a high degree of integration between the numerous steps in production and marketing are essential. In meat production this is only realised in poultry production to the full extend, as demonstrated in Fig. 5. There is a complete response over all steps from processing to breeding.

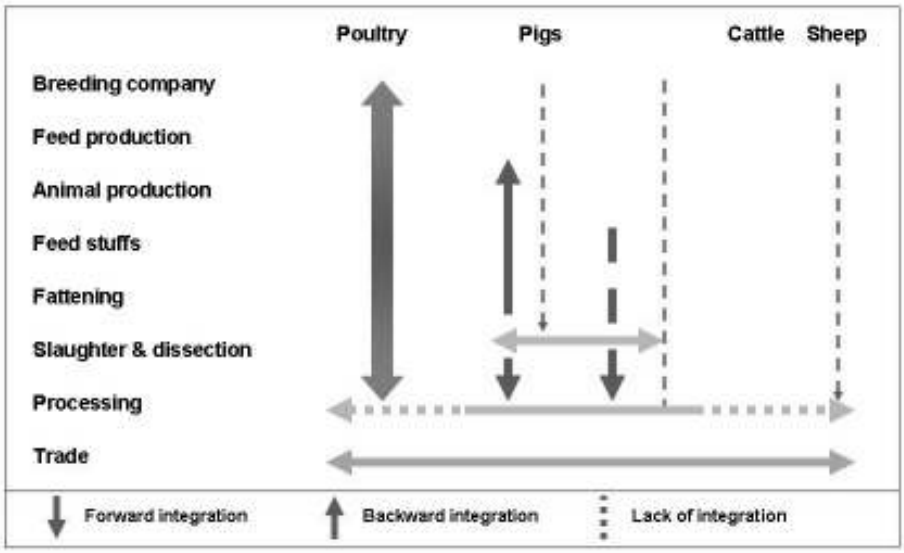

Figure 5. Integrated production (Schweer, 2007)

In pork there has been a close cooperation between the different production sections on the one hand and extension service up to the packing plant since long. This was already discussed in 2001 in Ljubljana (Kallweit et al. 2001). The last gap between trade, processing and "slaughter and dissection" is just about to close. This is partially due to the recent growing involvement of large discounters in the meat business.
They buy and sell large amounts and are seriously aware of quality. Therefore the supplier depends on such a customer too much as not to fulfil his requirements.
Unfortunately pork market is not very stable, since prices vary too much. On the long run, however, the efforts described will be successful to improve and stabilise pork quality.

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