

# The Quality of Pork Produced in Estonia

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SUMMARY. This investigation was carried out on 228 samples of pork from big farms, 67 samples from middle-sized farms and 24 samples from private farms during 1984-1990. Water, protein, fat, ash content, pH, colour and organoleptic qualities were determined in fresh, salted and smoked-cooked meat. Water holding capacity and heat loss were measured in fresh and salted meat. These quality characteristics were evaluated by correlation and dispersion analysis.

On the basis of pH<sub>48</sub> it was estimated that the amount of PSE-pork (pH < 5.6) from big farms was 7.2-46.7 %, from middle-sized farms 25.0-74.0 %, the quantity of DFD-pork (pH > 6.3) from big farms was 0-22.5 %, from middle-sized farms - 0-25.0 %.

Having analyzed all technological and chemical characteristics of pork from big and middle-sized farms we concluded that investigated pork was very unstable in quality.

INTRODUCTION. Stockbreeding, pigbreeding in particular, has been one of the main branches of Estonian agriculture. The total production of meat was 144419 tons in 1990. It made 91.8 kg per person. The production of pork was 77328 t (53.5 % of total production), beef and veal - 57924 t (40.1 %). Depending on years about 20-40 % of meat has been exported mainly to Russia.

The investigated pigs were bred under different conditions. The number of pigs in big farms was 30 000-60 000, in middle-sized farms - 2000-3000.

In this work the following pork-carass classification has been used.

I category - young pigs under 8 months, thickness of fat 1.5-3.5 cm above the backbone between the 6-7 ribs, live weight 80-105 kg;

II category - young pigs, thickness of fat 1.5-4.0 cm, live weight 60-150 kg;

III category - fat pigs, thickness of fat 4.1 cm and more.

MATERIALS and METHODS. This investigation was carried out on 228 samples of pork from big farms (191 from farm N° 1 and 37 from farm N° 2), 67 samples from middle-sized farms and 24 samples from private farms of Estonia.

We branded the experimental pigs in pre-slaughter room. They were slaughtered in an usual way. After slaughtering we fixed the sex, category, slaughter weight of carcasses and measured pH (pH<sub>1</sub>). After chilling them during 48 hours in the refrigerator at 0-2 °C we took the samples for chemical, physical and organoleptical analyses from both semi-carasses from m. longissimus dorsi above the 6-11 ribs. One sample was minced and determined in-dexes as shown in Figure 1. The other sample from the same carcass was salted with the use of parameters for smoked-cooked pork chop (Технологические ..., 1978).

One part of salted meat was analyzed after salting, the other part was smoked-cooked and analyzed after that (Fig.1.).

## Pork sides (semi-carcasses) chilling 48 hours at 0-2 °C

Left side	Right side
Sample from m. longissimus dorsi	Sample from m. longissimus dorsi
- water content	<u>salted for 7 days</u>
- protein content	- water content
- fat content	- protein content
- ash content	- fat content
- pH	- ash content
- colour	- pH
- water holding capacity	- colour
- heat loss	- heat loss
- organoleptic quality	- water holding capacity
- - of cooked meat	<u>smoking, cooking</u>
- - broth	- chemical and technological characteristics as in the salted meat
- smell of fat	- organoleptic quality

Fig.1. Experimental procedure

Chemical characteristics was determined according to the Soviet Union standards, water holding capacity - with filter paper press method by Grau and Hamm (1957). Organoleptic quality of fresh meat and fat were estimated in 9-point system, cooked meat and broth - in 50-point system. All characteristics was evaluated by correlation and dispersion analysis.

Investigated pigs belonged to the I category (bacon) - 114 (36 %), to the II category (meat pigs) - 176 (55 %), to the III category (fat pigs) - 29 (9 %).

RESULTS and DISCUSSION. In 1983-1984 in several meat factories of Estonia bad quality of pork became a problem. As we did not have sufficient data in that field in our republic, we began to study the quality of pork and raw fat in the laboratory of meat technology of Estonian Agricultural Academy.

The results of fresh meat colour (Fig.2) and smell of raw fat (Fig.3) showed, that the investigated material had low indexes (in 1984+1985 70 % the meat from big farm N° 2 and 50 % of fat out of investigated samples were low quality). As the situation was really un-nerving we decided to study in greater detail the influence of feeding and maintaining on the quality of pork.

One of the simple determinable indexes is pH. Many conclusions about other parameters may be made on the basis of pH, too. On the basis of pH meat can be divided into PSE-meat ( $\text{pH} < 5.6$ ), normal ( $\text{pH} 5.7-6.2$ ) and DFD-meat ( $\text{pH} > 6.3$ ).

The main defect of investigated pork was PSE-syndroma. Having compared the amount of PSE-meat in different farms (Table 1) we concluded that maximum quantity of exudative pork was in 1990 in middle-sized farms (74.7 %), it might be caused by unfavourable economic conditions. Arithmetical means of low quality pork were: big farm N° 1 - 32.22 %, big farm N° 2 - 42.10 % and middle-sized farms - 45.44 %.

Tables 2 and 3 show arithmetical means and differences of pork characteristics from different farms. The colour is quite unsteady of fresh meat 1.0-9.0 ( $\bar{x}$ -5.16) points and smoked-cooked pork 1.0-8.0 ( $\bar{x}$ -5.24) points. From the technological side it is important that heat loss is very high in big farm N° 1 20.00-58.69 % (D-38.69 %), that index was not so unstable in middle-sized farms 35.75-55.56 % (D-19.81), it causes low yield of meat products from meat of big farms. The lowest water holding capacity was in middle-sized farms pork on

Fig. 2. The colour of fresh meat (max 9 points)

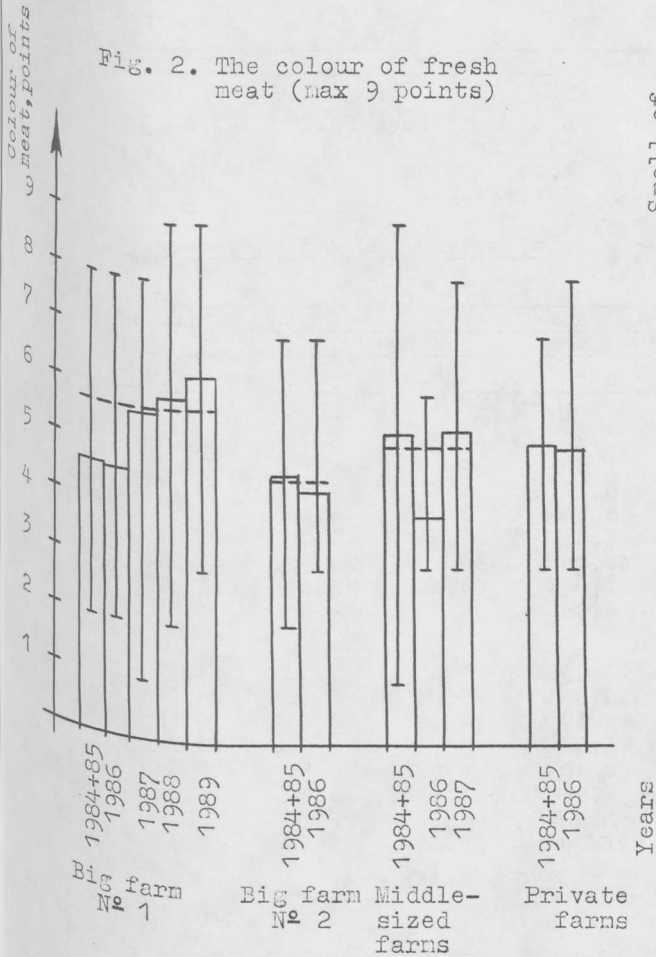
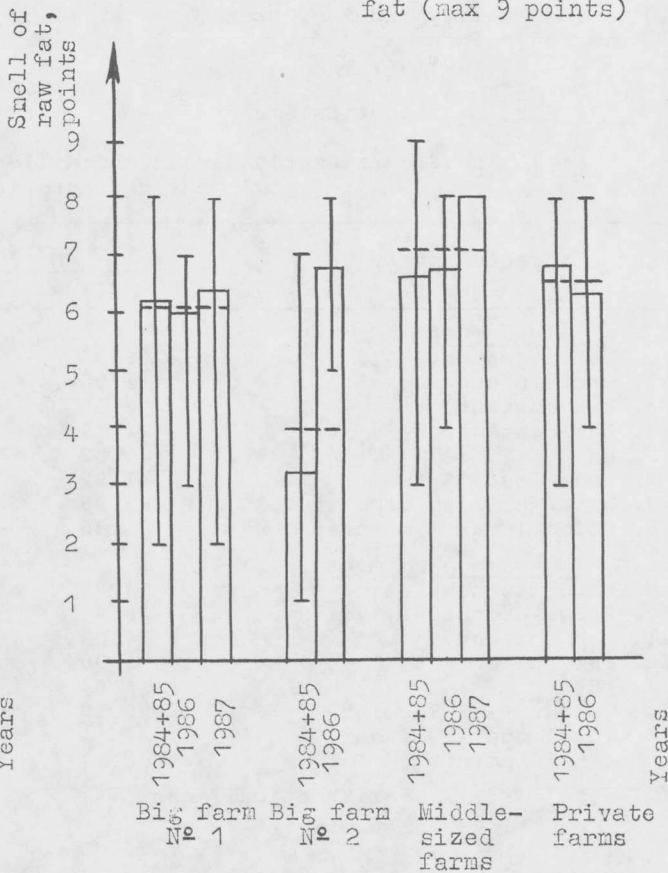


Fig. 3. The smell of raw fat (max 9 points)



Tab.1. Frequency of occurrence of PSE, normal and DFD-pork in big and middle-sized farms, %

Tab.1. Frequency of occurrence of PSE, normal and DFD-pork in big and middle-sized farms, %						
Years of investigation	Origin of pigs	The number of carcasses	pH <sub>48</sub> value			PSE+DFD pork
			< 5.6 PSE-pork	5.7-6.2 normal	> 6.3 DFD-pork	
1984+1985	<u>Big farms</u>					
	N° 1	26	15.4	61.5	23.1	38.5
1986	N° 2	30	46.7	53.3	-	46.7
1987	N° 1	24	41.6	58.4	-	41.6
1988	N° 2	32	37.5	62.4	-	37.5
1989	N° 1	14	7.2	92.8	-	7.2
	N° 1	35	11.4	80.0	8.6	20.0
	N° 1	26	46.2	46.2	7.6	53.8
1984+1985	<u>Middle-sized farms</u>					
		32	18.7	78.1	3.2	21.9
1986		14	57.2	42.8	-	57.2
1987		27	25.9	74.1	-	25.9
1988		40	25.0	52.9	22.5	47.5
1990		79	74.7	25.3	-	74.7

Tab.2. Arithmetical mean and differences of fresh meat characteristics

Characteristics	Big farms				Middle-sized farms		Private farms	
	N° 1		N° 2		farms		farms	
	$\bar{x}^*$	D**	$\bar{x}^*$	D**	$\bar{x}^*$	D**	$\bar{x}^*$	D**
1. Fresh meat	74.21	6.32	73.60	9.45	73.48	9.71	72.15	7.44
2. Water content, %	22.54	6.87	22.76	4.58	21.99	7.57	22.72	3.86
3. Protein content, %	1.21	1.98	1.32	1.77	1.41	3.50	1.24	1.03
4. Ash content, %	2.02	6.26	2.37	6.62	3.16	7.35	3.87	8.88
5. Fat content, %	5.99	1.60	5.72	0.70	5.73	0.91	5.65	0.80
6. pH <sub>48</sub>	41.52	38.69	42.15	13.97	45.15	19.81	43.40	9.71
7. Heat loss, %	64.50	32.40	54.83	29.33	57.64	34.94	54.47	25.40
8. Water holding capacity, %	5.72	8.00	4.54	5.00	5.18	8.00	5.20	5.00
9. Colour, max 9 points	37.55	16.66	36.17	32.24	37.76	17.86	38.67	15.72
10. Total quality index of cooked meat, max 50 points								



	1	2	3	4	5	6	7	8	9
10. Total quality index of broth, max 50 points		38.14	15.53	36.80	15.50	33.25	36.60	39.33	12.60
11. Smell of raw fat, max 9 points		6.17	6.00	4.03	7.00	7.16	6.00	6.67	5.00
* - $\bar{x}$ - arithmetical mean					** - D - difference				

Tab.3. Arithmetical mean and differences of salted and smoked-cooked meat characteristics

Characteristics	Big farms				Middle-sized farms	
	N° 1		N° 2			
	$\bar{x}^*$	D**	$\bar{x}^*$	D**	$\bar{x}^*$	D**
<u>Salted meat</u>						
1. Water content, %	69.34	8.32	70.86	8.79	68.89	9.19
2. Protein content, %	21.00	5.36	20.00	6.46	20.93	6.25
3. Ash content, %	7.50	5.21	5.81	4.85	6.68	7.84
4. Fat content, %	2.16	5.90	3.34	8.85	3.50	7.94
5. pH	5.82	0.60	5.88	0.70	5.76	0.60
6. Heat loss, %	41.92	40.75	40.55	26.37	44.19	39.96
7. Water holding capacity, %	63.99	17.07	64.26	15.21	62.72	18.19
8. Colour, max 9 points	5.30	6.00	4.89	4.00	5.55	6.00
<u>Smoked-cooked meat</u>						
9. Water content, %	64.78	13.36	67.05	7.13	63.76	12.31
10. Protein content, %	26.41	15.83	25.04	5.11	26.31	10.49
11. Ash content, %	6.09	5.19	4.16	2.93	5.58	9.44
12. Fat content, %	2.90	6.32	3.74	6.91	3.96	7.35
13. pH	6.04	0.70	6.02	0.50	5.98	0.60
14. Colour, max 9 points	5.10	6.00	4.68	5.00	5.58	7.00
15. Total quality index, max 50 points	38.17	22.20	39.29	6.60	39.72	11.26
* - $\bar{x}$ - arithmetical mean				** - D - difference		

1984 + 1985 years (35.32 %), the highest - in pork from big farm N° 1 in 1989 (75.69 %).

Smoked-cooked pork from middle-sized farm raw material had better quality: total quality index 39.72, colour - 5.58 points.

The next quality characteristics of pork from big farm N° 1 was of high positive correlation: pH<sub>24</sub> of fresh meat with colour ( $r=0.471$ ), water holding capacity (0.443), water content (0.459); water holding capacity of salted meat with colour of fresh meat (0.481) and water content of salted meat (0.432); water content of smoked-cooked meat with the same characteristics of salted meat (0.654).

#### CONCLUSIONS.

1. Investigated pork was very unstable in quality, it might be caused from breed, feeding and keeping conditions, from size of farms.

2. It is needable to continue the investigation of pork quality in Estonia on the basis of boar-lines, feeding-keeping conditions, the standards of European countries.

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