THE CONVENTIONAL CARCASS EVALUATION AND THE CARCASS DISSECTION ANALYSIS OF PIGS

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Abstract. The information provided by conventional carcass evaluation concerning the carcass quality established by analyses of dissection was investigated on progeny testing pigs (n = 153).

After conventional carcass evaluation, the left half of the carcass was cut up. In the most valuable part of the half carcass (ham + carré + back + fore back + shoulder + kidney fat) the skin + fat component was separated from the meat + bone component. The material was processed by stepwise multiple regression analysis.

It was possible by means of the results of conventional carcass evaluation to explain 69 % of the variation in the weight of the skin + fat component and 64 % of the variation in its percentage, 61 % of the variation in the weight of the meat + bone component and 56 % of the variation in its percentage, 59 % of the variation in the weight of the most valuable part of the carcass and 17 % of the variation in its percentage.

The estimations calculated for the skin + fat component and its percentage had the same characteristics in conventional carcass evaluation as explanatory variables. The estimations calculated for the meat + bone component and its percentages differed from each other. The estimations calculated for the most valuable part of the carcass and its components also explained the shoulder, back and ham, as follows: a) the shoulder, most weakly, b) the skin + fat of the back, best by the skin + fat estimations (56 % of the variation), c) the meat + bone of the ham, best by the meat + bone estimations (58 % of the variation).

The length of the carcass and of the side did not occur in the estimations.

In carcass evaluation by litter testing there has occurred a switch from a system of subjective evaluation by a points scale to a system of objective measurements. There has also been a concurrent increase in the application of various degrees of cutting and dissection of the carcass in order to clarify its anatomical composition and to compare various methods of measurement (e.g. RITTLER *et al.* 1965, BLENDL 1966 a and b, FEWSON *et al.* 1967, STOUFFER & BURGKART 1967, PEDERSEN 1968, and ČUPKA 1968).

In 1967—1968 pigs at the Pohjanmaa litter testing station were evaluated not only by cutting and dissection but also by conventional litter testing. It is thus possible in the present study to analyse methods of measuring carcass quality on the basis of domestic material. The purpose of the study is to examine the information provided by traditional carcass evaluation concerning the most valuable part of the carcass, its skin + fat and meat + bone components, and the ham, back parts and shoulders.

Material

The material consists of a total of 153 Landrace and Yorkshire pigs. This is part of a material gathered for genetical analysis. The pigs were received at the testing station in 1967 and the first half of 1968. The feeding was the standard-mixture normally supplied at litter testing stations (PARTANEN 1969). The pigs were slaughtered at a live weight of approximately 90 kg (average 89.66, standard deviation 2.44). Conventional carcass analysis was performed 24 hours after slaughter, and the left side of the carcass was cut immediately thereafter in the manner presented by UUSISALMI (1969 a and b).

In the cutting and dissection analysis, attention was paid chiefly to the most valuable part of the half carcass (= ham + carré + back + fore back + shoulder + kidney fat) and to its skin + fat and meat + bone components. The carcass was also weighed, and the weight of its left half was calculated as the aggregate weight of the parts obtained by cutting.

Mention should be made of the following linear measurements and area measurements in conventional carcass evaluation: thickness of back fat, thickness of side fat, i.e. of s.o.l., length of carcass, length of side, area of cross-section of musculus longissimus dorsi, fat/meat ratio (Fig. 1).

Further, a points scale of 9—15 was used to evaluate the characteristics: distribution of back fat, hams, quality of belly, meatiness, shoulder region, fineness of skin and bacon type. Of these, the hams, the shoulder region and the fineness of the skin were evaluated sensorily. Apart from the above characteristics expressing anatomical composition, evaluation was also made of the meat quality by the intensity of colour (scale 1—7) and of the quality of the fat by its firmness (scale 9—15).

Among the characteristics expressing feed consumption and weight growth, the most important are the following, which were calculated by litter group: feed consumption, feed units per day per pig, daily gain per pig.

The bases for the calculations of the progeny test index (the »old» index) are: thickness of back fat, area of m. long. dorsi, length of side, daily gain and hams (graded in points). The index is based on the results obtained by VARO (1962) with factor analysis.

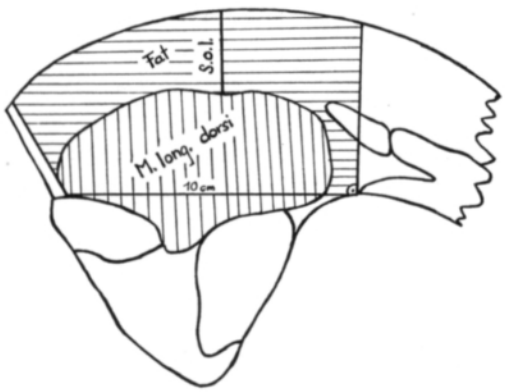

Fig. 1. Area of musculus longissimus dorsi and area of fat.

Processing of the material

By means of stepwise multiple regression analysis (State Computer Centre 1966) estimations were calculated for the most valuable part of the carcass, for its skin + fat component and for its meat + bone component and the percentages of these. Each of the above was treated in turn as the dominant function and the others as ordinary functions together with the other results of cutting and dissection. The optional explanatory variables were a total of 30 results of conventional carcass evaluation.

The programme of the stepwise multiple regression analysis proceeds stepwise, adding or subtracting one factor at a time. In the processing of the material, use was made of a free model in which the factor most improving the correlation coefficient is selected as the new factor at each step. The F-test ($F \geqq 4.000$) was used as the criterion for the factor to be added or subtracted. In addition to the estimations, the analysis produced the means, the standard deviations, a correlation matrix and regression coefficients. This study did not proceed to detailed explanation of the partial regression coefficients, for several of the optional explanatory variables were correlated to each other.

Results

Table 1 shows the means, standard deviations and coefficients of variation of the characteristics (a total of 50 characteristics) describing carcass quality and capacities of growth and feed consumption. The results show that the skin + fat component of the most valuable part of the half carcass is 17.26 per cent of the half carcass, and its meat + bone component 46.48 per cent, and that the most valuable part of the half carcass amounts to 63.74 per cent of the half carcass.

The coefficient of variation for the live weight is only 2.72 per cent. It should be remembered in this context that the intention is to slaughter the animals at the same live weight, but that slaughtering was done at intervals of one week. For the sake of comparison it may be mentioned that the coefficient of variation for the carcass weight is 3.66, for the half carcass weight 4.16, for the most valuable part of the carcass 5.06 and for the meat + bone component of the most valuable part 6.31 and for the skin + fat component thereof 11.64. The coefficients of variation for individual parts of the carcass, such as shoulder, ham and back parts, are greater than the coefficient of variation for the most valuable

Table 1. Averages and standard deviations for certain dissection data and results of conventional carcass evaluation at the Pohjanmaa litter testing station 1967—68. n = 153.

	Mean	Standard deviation	
		Actual unit	% of mean
Dominant functions			
(results of cutting of carcass half)			
1 Skin + fat of the most valuable part of carcass, g	5 715	665	11.64
2 Meat + bone » » » g	15 381	970	6.31
3 The most valuable part of carcass, g	21 096	1 067	5.06

4 Skin + fat of most valuable part, % of carcass	17.26	1.80	10.43
5 Meat + bone » » » »	46.48	2.23	4.80
6 The most valuable part, % of carcass	63.74	1.59	2.50
Ordinary functions			
(results of cutting)			
7 Half the carcass, g	33 096	1 378	4.16
8 Skin + fat of shoulder, g	940	175	18.62
9 Meat + bone » g	3 047	311	10.21
10 Shoulder, g	3 987	390	9.78
11 Skin + fat of ham, g	1 377	197	14.31
12 Meat + bone of ham, g	4 918	352	7.16
13 Ham, g	6 295	396	6.29
14 Meat + bone of back, g	3 748	371	9.90
15 Skin + fat of back parts, g	2 772	373	13.46
16 Meat + bone » g	7 415	570	7.69
17 Back parts, g	10 187	703	6.90
18 Skin + fat of back parts, % of carcass	8.37	1.04	12.43
19 Meat + bone » »	22.40	1.29	5.76
20 Back parts, % of carcass	30.77	1.44	4.68
Optional explanatory variables			
(results of conventional carcass evaluation)			
21 Live weight, kg	89.66	2.44	2.72
22 Age, days	178.66	12.71	7.11
23 Belly, mm	33.32	3.11	9.33
24 Area of musculus longissimus dorsi, cm^2	30.27	3.44	11.36
25 Fat/meat ratio, %	112.36	26.47	23.56
26 — Distribution of back fat	12.65	1.27	10.04
27 — Firmness of fat	12.50	0.55	4.40
28 — Hams	12.82	0.85	6.63
29 — Quality of belly	12.45	0.63	5.06
30 — Meatiness	13.87	1.05	7.57
31 — Colour of meat	2.60	0.45	17.31
32 — Shoulders	12.71	0.62	4.88
33 — Skin quality	12.71	0.58	4.56
34 — Bacon type	12.85	0.91	7.08
35 — Quality class	1.50	0.55	—
36 Number of days at testing station	112.66	10.27	9.12
37 Weight at 25 % slaughter loss, kg	88.52	3.24	3.66
38 Original weight at testing station, kg	17.91	1.96	10.94
39 Carcass weight, kg	66.40	2.43	3.66
40 Slaughter loss % of live weight	25.92	1.94	7.49
41 Length of carcass, cm	96.45	2.47	2.56
42 Side length, cm	76.25	2.22	2.91
43 Thickness of back fat, mm	26.71	3.88	14.53
44 Thickness of s.o.l., mm	23.06	49.3	21.38
45 Feed units per kg growth	3.06	0.20	6.54
46 Feed consumption fu/kg	1.88	0.05	2.66
47 Daily gain, g	617	37	5.98
48 Age at weight of 20 kg	67.23	7.38	10.98
49 Age at weight of 88 kg	177.85	10.80	6.07
50 Test index	281.57	256.51	—

part of the carcass. It may be mentioned that the coefficients of variation for the back fat and the s.o.l. fat according to conventional carcass evaluation (v-% 14.53 and 21.38) are higher than the variation coefficient of the skin + fat component of the most valuable part of the carcass.

The variation of visual scores for such characteristics as hams, belly, shoulder region and fineness of skin is smaller than the variation of the characteristics in which the points value was also affected by objective measurement.

Table 2 shows the phenotypical correlation of the results of the cutting and dissection with the results of conventional carcass evaluation. The correlation coefficient between live weight and half carcass is 0.71, that between carcass weight and half carcass is 0.71, that between carcass weight and half carcass 0.76, and that between carcass weight and the most valuable part of the half carcass 0.72.

Table 2. Phenotypical correlation of the dissection data with the results of conventional carcass evaluation (see Table 1). n = 153.

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
1	43	02	29	-18	57	-62	44	-06	-40	-34	-16	12	14	-62	43	02	36	-17	38	-13	-26	-22	65	71	00	03	-01	03	02	-23	1
2	35	02	10	54	-52	39	-25	39	31	55	10	-13	-02	42	-29	05	56	-04	54	-40	33	23	-34	-31	-28	-27	20	-00	-12	38	2
3	57	03	27	37	-11	-04	05	31	04	29	-00	-04	06	-00	-00	05	72	-15	72	-44	14	07	10	16	-24	-23	17	01	-10	20	3
4	19	-02	19	-33	67	-65	46	-20	-44	-48	-16	16	11	-66	45	-00	09	-12	12	01	-34	-28	67	72	08	07	-08	-02	02	-34	4
5	-17	-05	-14	43	-62	60	-42	25	43	53	17	-12	-14	62	-46	01	04	10	05	-21	33	23	-59	-57	-19	-25	12	-11	-14	34	5
6	-03	-09	01	24	-12	11	-08	13	11	21	06	01	-08	14	-14	01	15	01	20	-28	08	01	-08	00	-18	-27	09	-18	-17	10	6
7	71	09	33	32	-07	-11	10	30	-02	23	-04	-06	12	-08	08	05	79	-18	76	-38	12	08	16	19	-19	-10	16	12	-02	18	7
8	23	04	14	-28	35	-37	20	-16	-11	-32	-17	-13	-07	-34	26	-01	22	-06	22	-11	-39	-34	31	35	05	07	-04	09	08	-29	8
9	13	15	-01	07	-22	23	-18	00	22	15	12	-31	-24	28	-17	14	30	-02	29	-28	09	07	-32	-22	-01	-28	-09	09	13	03	9
10	20	14	05	-07	-01	02	-05	-07	12	-02	02	-30	-22	07	-02	11	33	-04	33	-27	-10	-09	-11	-02	01	-19	-08	11	14	-10	10
11	30	-14	21	-11	41	-39	31	17	-43	-23	-11	22	18	-40	22	-06	28	-11	25	-08	-21	-19	43	49	-11	-00	10	-15	-18	-05	11
12	25	01	10	46	-46	36	-25	51	26	47	05	-09	-02	41	-27	11	52	-11	50	-45	19	11	-34	-39	-26	-25	19	-08	-17	38	12
13	37	-06	20	35	-20	12	-06	53	02	30	-00	03	07	17	-13	06	60	-15	56	-43	07	00	-08	-10	-29	-22	21	-15	-24	31	13
14	28	13	19	53	-30	09	-01	30	13	46	06	-00	08	10	-02	05	41	-04	40	-27	32	29	-01	-01	-14	-13	10	14	03	21	14
15	37	-08	21	-09	50	-58	37	-14	-37	-22	-06	12	06	-56	41	-04	27	-08	31	-08	-12	-10	63	68	-06	-00	04	-06	-08	-24	15
16	38	-02	13	57	-43	27	-14	33	23	54	05	01	09	26	-20	-06	46	-02	45	-25	37	27	-16	-11	-28	-16	25	03	-14	-34	16
17	50	-06	21	41	-09	-08	08	19	-01	32	01	07	10	-08	05	-07	51	-05	53	-24	24	17	20	26	-26	-13	23	-01	-15	15	17
18	16	-12	11	-20	56	-59	36	-27	-39	-32	-05	15	03	-57	42	-07	03	-02	08	05	-17	-13	63	67	00	03	-01	-11	-08	-33	18
19	-01	-10	-06	53	-52	44	-26	22	33	55	09	07	03	41	33	-12	04	11	05	-06	41	31	-33	-28	-24	-13	22	-05	-17	32	19
20	10	-17	03	33	-07	-02	02	01	01	27	05	17	05	-04	-00	-16	05	09	11	-02	25	18	15	22	-21	-09	19	-12	-21	06	20

r > 0.16 signif. at 5 % level
r > 0.21 " 1 % "
r > 0.27 " 0.1 % "

The skin + fat component. Table 3 shows the estimations calculated for the skin + fat component of the most valuable part of the carcass and for its percentage of the carcass. The optional explanatory variables in these regression analyses, as in all the other regression analyses in the present study, are 30 characteristics obtained from the results of conventional carcass evaluation. The following characteristics have been included in the skin + fat estimation of Table 1: s.o.l., live weight, distribution of back fat, slaughter loss percentage, meatiness and test index. The coefficient of multiple determination (= R^2) amounted to 0.689. The model calculated for the percentage of the skin + fat component included s.o.l., distribution of back fat, area of m. long. dorsi and test index. R^2 amounted to 0.640.

Table 3. Skin + fat component of the most valuable part of the carcass estimated by means of stepwise multiple regression analysis. Optional explanatory variables = 30 characteristics of conventional carcass evaluation. n = 153.

Step	Characteristics	r	r^2 %	Cumulative R	Cumulative R^2 %
	Estimation of skin + fat component				
1	S.o.l., mm	0.71	50.4	0.71	50.4
2	Live weight, kg	0.43	18.5	0.76	57.8
3	Points: — distribution of back fat	— 0.62	38.4	0.80	64.0
4	Loss in weight at slaughter %	— 0.13	1.7	0.81	65.6
5	Points: — meatiness	— 0.34	11.6	0.82	67.2
6	Test index	— 0.23	5.3	0.83	68.9
	Estimation of percentage of skin + fat component				
1	S.o.l., mm	0.73	53.3	0.73	53.3
2	Points: — distribution of back fat	— 0.65	42.3	0.78	60.8
3	Area of m. long. dorsi, cm^2	— 0.33	10.9	0.80	64.0
4	Test index	— 0.34	11.6	0.80	64.0

$r > 0.16$ signif. at 5 % level
$r > 0.21$ » 1 % »
$r > 0.27$ » 0.1 % »

The multiple correlation coefficients between each of the 20 dissection results and the estimations of the skin + fat component (in g and in %) are shown in Table 4.

The meat + bone component. Table 5 shows the estimations for the meat + bone component of the most valuable part of the carcass and for its percentage. The meat + bone model includes the characteristics: meatiness, weight at 25 % slaughter loss, distribution of back fat, hams and skin quality. R^2 amounted to 0.608. The final model calculated for the percentage of the meat + bone component includes the bacon type, s.o.l., skin quality, slaughter loss percentage, area of m.long. dorsi and firmness of fat. It might be mentioned that meatiness was included at the second step but dropped at the seventh step. R^2 amounted to 0.563.

The multiple correlation coefficients between each of the 20 dissection results and the estimations of the meat + bone component (in g and in %) are shown in Table 6.

The most valuable part. Table 7 shows the estimations for the most valuable part of the carcass and its percentage. The final estimation for the most valuable part of the carcass includes the area of m.long. dorsi, live weight, slaughter loss percentage, point of ham, s.o.l., and meat colour. R^2 amounted to 0.593. The weight with 25 per cent slaughter loss was included in the first step but dropped from the model at the fourth step, when the live weight was included. The slaughter weight was dropped from the model at the eighth step, when the slaughter loss percentage was included. The s.o.l. was included in the estimation at the third step, dropped at the seventh and re-included at the eleventh. In the model for the precentage of the most valuable part of the carcass the characteristics included were the average number of feed units per animal per day, the slaughter loss percentage, the age at a weight of 20 kg and the area of the m.long. dorsi. The coefficient of multiple determination was low ($R^2 = 0.168$).

The multiple correlation coefficients between each of the 20 dissection results and the estimations of the most valuable part (in g and in %) of the carcass are shown in Table 8.

Table 4. The multiple correlation of the following carcass dissection results with the characteristics included in the estimate of the skin + fat component in the most valuable part. n = 153.

Dissection results	Estimate for skin + fat component *a) in g*		*b) in %* (of carcass)	
	R	R^2 %	R	R^2 %
Skin + fat of the most valuable part of carcass	0.83	68.9	0.77	59.3
Meat + bone » » »	0.76	57.8	0.61	37.2
The most valuable part of carcass	0.76	57.8	0.44	19.4
Skin + fat of the most valuable part, % of carcass	0.80	64.0	0.80	64.0
Meat + bone » » »	0.73	53.3	0.72	51.8
The most valuable part of carcass, % of carcass	0.29	8.4	0.20	4.0
Half carcass	0.83	68.9	0.42	17.6
Skin + fat of shoulder	0.49	24.0	0.44	19.4
Meat + bone »	0.44	19.4	0.23	5.3
Shoulder	0.40	16.0	—	—
Skin + fat of ham	0.58	33.6	0.53	28.1
Meat + bone »	0.72	51.8	0.58	33.6
Ham	0.62	38.4	0.39	15.2
Meat + bone of back	0.54	29.2	0.53	28.1
Skin + fat of back parts	0.75	56.3	0.72	51.8
Meat + bone » »	0.67	44.9	0.59	34.8
Back parts	0.66	43.6	0.53	28.1
Skin + fat of back parts, % of carcass	0.70	49.0	0.72	51.8
Meat + bone » » »	0.60	36.0	0.61	37.2
Back parts, % of carcass	0.41	16.8	0.41	16.8

Characteristics of the carcass evaluation included in estimate:

a) S.o.l.
Live weight
Points: — distribution of back fat
Slaughter loss %
Points: — meatiness
Test index

b) S.o.l.
Points: — distribution of back fat
Area of m. long. dorsi
Test index

Table 5. Meat + bone component of the most valuable part of the carcass estimated by means of stepwise multiple regression analysis. Optional explanatory variables = 30 characteristics of conventional cascass evaluation. n = 153.

Step	Characteristics	r	r^2 %	Cumulative R	Cumulative R^2 %
	Estimation of meat + bone component				
1	Points: — meatiness	0.55	30.3	0.55	30.3
2	Weight at 25 % slaughter loss, kg	0.56	31.4	0.71	50.4

3	Points: — distribution of back fat	0.39	15.2	0.77	59.3
4	Points: — hams	0.39	15.2	0.77	59.3
5	Points: — skin quality	— 0.02	0.0	0.78	60.8
	Estimation of percentage of meat + bone component				
1	Points: — bacon type	0.62	38.4	0.62	38.4
2	Points: — meatiness	0.53	28.1	0.69	47.6
3	S.o.l., mm	— 0.57	32.5	0.71	50.4
4	Points: — skin quality	— 0.14	2.0	0.72	51.8
5	Loss in weight at slaughter %	— 0.21	4.4	0.73	53.3
6	Area of m. long. dorsi, cm^2	0.43	18.5	0.74	54.8
7	Points: — meatiness (dropped from model)	0.53	28.1	0.74	54.8
8	Points: — firmness of fat	— 0.42	17.6	0.75	56.3

$r > 0.16$ signif. at 5 % level
$r > 0.21$ » 1 % »
$r > 0.27$ » 0.1 % »

Table 6. The multiple correlation of the following carcass dissection results with the characteristics included in the estimate of the meat + bone component of the most valuable part. n = 153.

Dissection results	Estimate for meat + bone component *a) in g*		*b) in %* (of carcass)	
	R	R^2 %	R	R^2 %
Skin + fat of the most valuable part of carcass	0.72	51.8	0.76	57.8
Meat + bone » » »	0.78	60.8	0.68	46.2
The most valuable part of carcass	0.73	53.3	0.53	28.1
Skin + fat of the most valuable part, % of carcass	0.71	50.4	0.80	64.0
Meat + bone » » » »	0.69	47.6	0.75	56.3
The most valuable part of carcass, % of carcass	0.18	3.2	0.32	10.2
Half carcass	0.73	53.3	0.47	22.1
Skin + fat of shoulder	0.49	24.0	0.45	20.3
Meat + bone »	0.47	22.1	0.45	20.3
Shoulder	0.43	18.5	0.36	13.0
Skin + fat of ham	0.53	28.1	0.52	27.0
Meat + bone »	0.76	57.8	0.67	44.9
Ham	0.72	51.8	0.49	24.0
Meat + bone of back	0.55	30.3	0.53	28.1
Skin + fat of back parts	0.62	38.4	0.70	49.0
Meat + bone » »	0.65	42.3	0.58	33.6
Back parts	0.54	29.2	0.52	27.0
Skin + fat of back parts, % of carcass	0.62	38.4	0.70	49.0
Meat + bone » » »	0.60	36.0	0.60	36.0
Back parts, % of carcass	0.24	5.8	0.41	16.8

Characteristics of the carcass evaluation included in estimate:

a) Points: — meatiness
Weight at 25 % slaughter loss
Points: — distribution of back fat
Points: — ham
Points: — skin quality

b) Points: — bacon type
S.o.l.
Points: — skin quality
Slaughter loss %
Area of m. long. dorsi
Points: — firmness of back fat

Table 7. The most valuable part of the carcass estimated by means of stepwise multiple regression analysis. Optional explanatory variables = 30 characteristics of conventional carcass evaluation. n = 153.

Step	Characteristics	r	r^2 %	Cumulative R	Cumulative R^2 %
	Estimation of the most valuable part in carcass				
1	Weight at 25 % slaughter loss, kg	0.72	51.8	0.72	51.8
2	Area of m. long. dorsi, cm^2	0.37	13.7	0.74	54.8
3	S.o.l., mm	0.16	2.6	0.75	56.3
4	Carcass weight, kg	0.72	51.8	0.75	56.3
5	Live weight, kg	0.57	32.5	0.76	57.8
6	Weight at 25 % slaughter loss, kg (dropped from model)	0.72	51.8	0.76	57.8
7	S.o.l., mm (dropped from model)	0.16	2.6	0.75	56.3
8	Loss in weight at slaughter %	— 0.44	19.4	0.76	57.8
9	Carcass weight, kg (dropped from model)	0.72	51.8	0.76	57.8
10	Points: — hams	0.31	9.6	0.76	57.8
11	S.o.l., mm	0.16	2.6	0.77	59.3
12	Points: — colour of meat	— 0.00	0.0	0.77	59.3
	Estimation of percentage of the most valuable part in carcass				
1	Feed consumption fu/kg	— 0.27	7.3	0.27	7.3
2	Loss in weight at slaughter %	— 0.28	7.8	0.34	11.6
3	Age in days at 20 kg live weight	— 0.18	3.2	0.38	14.4
4	Area of m. long. dorsi, cm^2	0.24	5.8	0.41	16.8

$r > 0.16$ signif. at 5 % level
$r > 0.21$ » 1 % »
$r > 0.27$ » 0.1 % »

Table 8. The multiple correlation of the following carcass dissection results with the characteristics included in the estimate of the most valuable part of the carcass. n = 153.

Dissection results	Estimate for the most valuable part of carcass *a) in g* R	*a) in g* R^2 %	*b) in %* (of carcass) R	*b) in %* (of carcass) R^2 %
Skin + fat of the most valuable part of carcass	0.79	62.4	0.22	4.8
Meat + bone » » »	0.75	56.3	0.61	37.2
The most valuable part of carcass	0.77	59.3	0.51	26.0
Skin + fat of the most valuable part, % of carcass	0.76	57.8	0.31	9.6
Meat + bone » » » »	0.68	46.2	0.49	24.0
The most valuable part of carcass, % of carcass	0.28	7.8	0.41	16.8
Half carcass	0.84	70.6	0.43	18.5
Skin + fat of shoulder	0.50	25.0	0.34	11.6
Meat + bone »	0.39	15.2	0.34	11.6
Shoulder	0.38	14.4	0.33	10.9
Skin + fat of ham	0.58	33.6	0.14	2.0

Meat + bone »	0.77	59.3	0.58	33.6
Ham	0.72	51.8	0.52	27.0
Meat + bone of back	0.60	36.0	0.54	29.2
Skin + fat of back parts	0.74	54.8	—	—
Meat + bone » »	0.66	43.6	0.56	31.4
Back parts	0.67	44.9	0.41	16.8
Skin + fat of back parts, % of carcass	0.70	49.0	0.16	2.6
Meat + bone » » »	0.55	30.3	0.53	28.1
Back parts, % of carcass	0.43	18.5	0.34	11.6

Characteristics of the carcass evaluation included in estimate:

a) Area of m. long. dorsi
Live weight
Slaughter loss %
Points: — hams
S.o.l.
Colour of meat

b) Feed comsumption fu/kg
Slaughter loss %
Age at weight of 20 kg
Area of m. long. dorsi

Discussion

The carcass quality of pigs is chiefly dependent on the anatomical composition of the carcass, which, in the measurements of carcass quality, is understood to be a) the amounts of meat and fat and the ratio between these, b) the sizes of the different parts and the relationships between these. The basic units adopted for measurement in the present study were, consequently, the most valuable part of the carcass, its skin + fat component and meat + bone component and the percentages of these. It was also possible to note information on shoulder, back parts and ham.

Owing to economic reasons, dissection of the left half only was performed. On an average, the left half amounted to 49.85 per cent of the carcass weight (45.62 %—53.58 %, observations on 109 pigs). Thus splitting of the carcass brings in a factor of error, which mainly affects the back parts. The carcasses were weighed to an accuracy of about 100 g, and the parts of the left side of the carcass to an accuracy of 10—20 g. Another difficulty in dissection was the comparability of the separations of shoulder from fore back. Likewise, the separation of the skin + fat and meat + bone components was difficult to perform on the shoulder as accurately as on the ham and back parts, for the fat layers on the shoulder penetrated the meat layers. It is partly for this reason that the coefficients of variation of the shoulder and its components are greater than the respective coefficients of variation for the ham and the back parts. Clarification of the shoulder was desired on account of »shoulderham».

Concerning the ratios between carcass weight, the half carcass and the most valuable part of the half carcass, it should be remembered that the correlation between the carcass weight and the half carcass ($r = 0.76$) is only slightly greater than the correlation between the carcass weight and the most valuable part of the half carcass ($r = 0.72$).

The skin + fat component. It can be seen from Table 4 that the estimations for the skin + fat component of the most valuable part ($R = 0.83$) and its percentage ($R = 0.80$) calculated from the results of conventional carcass evaluation measured best the respective characteristics, although the skin + fat model measured the half carcass equally well ($R = 0.83$). This phenomenon is probably explained by the presence of live weight and slaughter loss percentage in the model. The two models were almost

identical (see Table 3). Thickness of s.o.l. occupied first place in both models, but the distribution of back fat and the test index were also common variables. A closer examination shows that the meatiness points appearing in the skin + fat model are replaced by the area of the m.long. dorsi in the model expressing percentage. It should be remembered that the meatiness points are chiefly determined on the basis of the area of the m.long. dorsi.

The meat + bone component. It can be seen from Table 6 that the estimation calculated for the meat + bone component of the most valuable part of the carcass measures the meat + bone component (R = 0.78) best, and, thereafter, the most valuable part of the carcass and the half carcass (R = 0.73). The model calculated for the percentage of the meat + bone component measures best the percentage of the skin + fat component (R = 0.80), next best the skin + fat component (R = 0.76) and third best the percentage of the meat + bone component (R = 0.75). The models measuring the meat + bone component and its percentage also show characteristics in common, such as meatiness and skin quality. The final coefficients of multiple determination of the estimations calculated for the meat + bone component (in g and in %) are slightly smaller than the final coefficients of multiple determination of the models calculated for the skin + fat component (in g and in %). It can be concluded from this that it is not possible by means of conventional carcass evaluation to measure as accurately the meatiness of the carcass as its fattiness (Fig. 2).

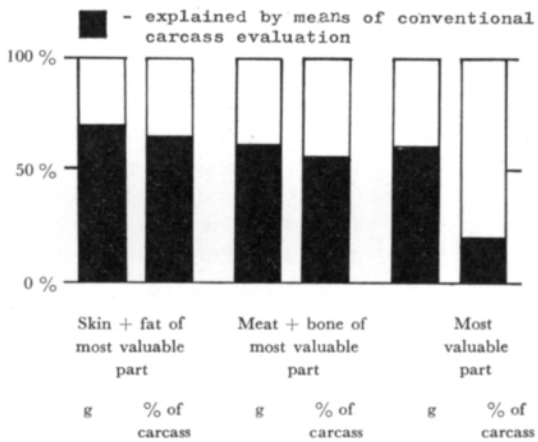

Fig. 2. Variation of the most valuable part of carcass and its dissection results and their percentages explained by means of characteristics of conventional carcass evaluation.

The most valuable part. The model calculated for the most valuable part of the carcass (see Table 8) measures best the weight of the half carcass (R = 0.84) and next best the skin + fat component of the most valuable part of the carcass (R = 0.79) and third best the most valuable part of the carcass (R = 0.77). When it is remembered that the model included both the live weight and the slaughter loss percentage, it is easy to understand why the model best measures the weight of the half carcass. The coefficient of multiple determination has become as high as that of the meat + bone component of the carcass. It was not possible to estimate to any appreciable extent the

percentage of the most valuable part of the carcass from the data obtained by carcass evaluation ($R = 0.41$, $R^2 = 0.168$).

Characteristics. The following characteristics of conventional carcass evaluation were those most commonly included in the estimations presented: the thickness of s.o.l., in most models occupying first place in the estimations of the skin + fat component and its percentage; the back fat and the distribution of the back fat, partly replacing each other; the meatiness, in first place in the models measuring the meat + bone component and its percentage; the area of the m.long. dorsi, alternately with the previous, for instance in the skin + fat model; the live weight together with the slaughter loss percentage; replacing the carcass weight; the bacon type and the ham points as characteristics of meatiness.

The colour of the meat as an index of quality, and the firmness of fat as an index of fat quality, each occur once almost significantly in the estimations.

It may be mentioned that the carcass length and the side length, which affect the structure and appearance of the pig, did not occur in the models. Nor did characteristics measuring additional growth and feed consumption appear to any extent.

The shoulder, back parts and ham. The estimations calculated for the most valuable part of the carcass and its components also provide an explanation of the shoulder, the ham and the back, as follows: a) the shoulder, most weakly, b) the back, generally best by the skin + fat estimation, and c) the meat + bone of the ham, best by the meat + bone estimation (Tables 4, 6 and 8).

REFERENCES

Blendl, H. M. 1966a. Objektive Methoden zur Bestimmung des Schlachtkörperwertes beim Schwein als Hilfsmittel für die züchterische Selektion. Z-kunde 38: 234—246.

—»— 1966b. Die Muskelflächen des Schinkens und ihre Beziehungen zum Fleisch- und Fettanteil im Schinken und Schlachtkörper sowie dem Schinkengewicht. Ibid. 38: 362—377.

Čupka, V. 1968. Untersuchungen über die Eignung einer direkten Auswertung der Merkmale am Kotelettschnitt bei Schweinen. Ibid. 40: 116—126.

Fewson, D., Gressel, A., Rittler, A. & Kokoschka, H. 1967. Untersuchungen über den Einfluss der Zufallsschwankungen auf die Ausschlachtungsbefunde beim Schwein. Ibid. 39: 200—209.

Lohse, B., Flock, D. & Schröder, J. 1969. Untersuchungen über die Schlachtkörperzusammensetzung von Schweinen in Abhängigkeit vom Endgewicht (90—150 kg). Ibid. 41: 24—35.

Partanen, J. 1969. Mastleistungsprüfungen in Finnland. Europäische Vereinigung für Tierzucht, Schweinekomission, Helsinki 24. Juni 1969.

Pedersen, O. K. 1968. Sikojen teuraslaatu. Sika 5: 5—18.

Rittler, A., Werkmeister, F., Fender, M. & Fewson, D. 1965. Untersuchungen über die Beziehungen zwischen Massen an der Schlachthälfte und dem Anteil der fleisch- und fettreichen Teilstücke beim Schwein. Z-kunde 37: 216—222.

SCC 1966. Valikoiva regressioanalyysi (multiple stepwise regression analysis). St. Computing Center. Dep. of Planning X 40, 1578.

Stouffer, J. R. & Burgkart, M. 1967. Untersuchungen zur Abschätzung der Schlachtkörperzusammensetzung von Yorkshire-Schweinen. Z-kunde 39: 106—116.

Uusisalmi, U. 1969a. Vorläufige Ergebnisse über das Messen der Schlachteigenschaften beim Schwein. J. Sci. Agric. Soc. Finl. 41: 50—59.

—»— 1969b. Carcass analysis as aid in pig breeding. Acta Agr. Scand. 19: 214—220.

Varo, M. 1962. Über die Begrenzung der Beurteilungseigenschaften bei der Eberauslese. Ergebnis der Faktorenanalyse. Ann. Agr. Fenn. 1962: 267—283.

SELOSTUS

KOESIKOJEN PERINTEELLINEN TEURASARVOSTELU JA LEIKKELYANALYYSI

UNTO UUSISALMI

Helsingin Yliopisto, Kotieläinten jalostustieteen laitos

Tutkittiin Pohjanmaan sikatalouskoeaseman kantakoesioista perinteellisen teurasarvostelun antamaa informaatiota leikkelyanalyysillä todetusta teuraslaadusta (n = 158 maatiais- ja yorkshiresikaa).

Perinteellisen teurasarvostelun jälkeen ruhon puolisko paloiteltiin. Ruhon puoliskon arvokkaimmasta osasta (kinkku + carré + kyljysselkä + etuselkä + lapa + munuaisrasvat) leikattiin nahka + rasva-komponentti erilleen liha + luu-komponentista. Materiaalia käsiteltiin valikoivan regressioanalyysin avulla.

Perinteellisen teurasarvostelun avulla kyettiin selittämään ruhon arvokkaimman osan nahka + rasvan painon muuntelusta 69 % ja prosenttiosuuden muuntelusta 64 %, liha + luun painon muuntelusta 61 % ja prosenttiosuuden muuntelusta 56 %, ruhon arvokkaimman osan painon muuntelusta 60 % ja prosenttiosuuden muuntelusta 17 %. Nahka + rasva-komponentin ja sen %-osuuden arvioissa on selittäjinä samoja perinteellisen teurasarvostelun tuloksia. Liha + luu-komponentin ja sen %-osuuden arviot sen sijaan poikkesivat toisistaan. Ruhon pituus ja kylkipituus, samoin kuin lisäkasvua ja rehunkäyttökykyä kuvaavat tulokset eivät juuri esiintyneet arvioissa.

Ruhon arvokkaimmalle osalle ja sen komponenteille lasketut arviot ovat sivussa selittäneet lapaa, selkää ja kinkkua seuraavasti: heikoimmin lapaa, nahka + rasva-malli parhaiten selän nahka + rasva-osaa (56 % sen muuntelusta), liha + luu-malli parhaiten kinkun liha + luu-osaa (57 % sen muuntelusta).