QUALITY OF BEEF PRODUCED IN ESTONIA

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SUMMARY. The following study was carried out to evaluate the quality of carcasses and beef of young fattening bulls and heifers of the Estonian Red dairy breed from state (big) and private (small) farms. The quality of carcasses evaluated by the carcass classification system valid in Estonia was compared to the E.U.R.O.P. classification system. The percentage of kidney fat was calculated. Beef quality alterations (PSE - pH<5,8 and DFD-pH>6,2) were assessed by pH_1 and pH_{48} values in the M.Longissimus dorsi. The physical composition (muscles, fatty tissue and bone) of half-carcasses and chemical composition (content of protein, fat, water and ash) of M.Longissimus dorsi was determined.

The results show that there were no carcasses meeting the demands of the two best classes of E.U.R.O.P. classification (E. and U. by meatiness) due to the unsufficient development of muscles. The percentage of kidney fat was 1.1 - 5.6. The quantity of PSE beef was small and that of DFD was bigger in state farms in comparison with private farms (20 and 33.3%, respectively, of the animals studied).

It can be concluded that the young cattle of the Estonian Red dairy breed produce carcasses with acceptable meat quality.

INTRODUCTION. The total number of cattle in Estonia in 1990 was 757800, among them 280700 cows. The beef production has been increasing. In 1990 it was 116500 tons (in live weight), including cows 38.4%, young cattle 61.5% and calves 0.1%.

Beef in Estonia is mainly derived from the cattle of two Estonian dairy breeds: the Estonian Red and Estonian Black and White breed. The aim of this study was to evaluate the quality characteristics of the cattle of Estonian Red breed that makes up ca 50% of the total number of cattle in Estonia. Beef breeds and cross-breeding are of little importance.

The changing marketing situation for beef requires a thorough analysis of beef production. Today's beef classification system in Estonia is not satisfactory because it over-estimates the existence of the subcutaneous fat layer. As the E.U.R.O.P. classification system estimates the development of muscles in detail, it was necessary to evaluate the carcasses of Red Estonian dairy breed according to this system.

MATERIALS AND METHODS. The animals used in experiments were young fattening bulls (n=35) and heifers (n=16) of Red Estonian dairy breed from private and state farms. The animals were selected in the preslaughter room and were slaughtered immediately after their arriving and weighing. The slaughtering was carried out according to the technological instructions valid in slaughterhouses. The kidney fat was removed and a sample of LD muscle on the level of the 8 - 10th rib was taken for pH determination. Analogous LD muscle samples

for determining their pH_{48} and chemical composition were obtained after chilling the carcasses in the refrigator at 0 - 4°C during 48 hours.Half-carcasses were fully deboned into muscle with fat and connective tissue,and bone. The chemical composition was determined according to the routine method used in Estonia.

RESULTS AND DISCUSSION. The young fattening bulls and heifers were slaughtered and the carcasses were classified both according to the classification system valid in Estonia and to the E.U.R.O.P. classification system (Table 1).By our classification system that is based on the estimation of both muscles and fat all carcasses belonged to the 1st category. The carcasses of the 1st category are required to have satisfactorily developed muscles and fat depositions in the area of tale head and on the inner side of the thighs.According to the E.U.R.O.P. classification system the carcasses belonged to two classes (R. and O.) by meatiness and to 3 groups (1, 2 and 3) by fatness (Table 2). As shown in tables 1 and 2,the best carcasses were derived from young fattening bulls from private farms,they also showed the best mean carcass weight.The age at slaughtering ranged from 15 to 21 months for state farm bulls,from 21 to 32 months for heifers and from 12 to 18 months for private farm bulls.

It is obvious that the young bulls from private farm reach higher slaughter weights at a younger age than the young bulls and heifers from state farms.The percentage of kidney fat was the highest in the heifers' group. It can be explained by the fact that only those heifers are slaughtered that are not suitable for breeding purposes , mainly due to their infertility.Therefore they exceed the young bulls by age and deposit fat more easily than young bulls do.

Table 1. Results of carcasses classification by meatiness

Description	No of animals	Carcass weight mean kg	range kg	Distribution of carcasses by quality,% E.	U.	R.	O.	P.	Kidney fat,% mean	range
State farms:										
young bulls	11	211	173-248	-	-	36.4	63.6	-	1.6	0.7-2.3
heifers	16	239	154-384	-	-	81.3	18.7	-	3.2	1.4-5.1
Private farms:										
young bulls	24	242	177-317	-	-	87.5	12.5	-	2.5	1.2-5.6

Table 2. Results of carcass classification by fatness,%

Description	Distribution of carcasses by fatness classes				
	1	2	3	4	5
State farms:					
young bulls	36.4	45.4	18.2	-	-
heifers	-	37.5	50.0	-	12.5
Private farms:					
young bulls	8.3	70.8	16.7	4.2	

The pH alterations are given in Table 3.

Table 3 pH alterations

Description	PSE beef,% pH_1<5.8	DFD beef,% pH_{48}>6.2	Normal beef,%
State farms:			
young bulls	-	33.3	66.7
heifers	18.7	-	81.3
Private farms:			
young bulls	9.5	20.0	70.5

The pH data show that 1/3 of the young bulls from state farms give carcasses with a high pH_{48} (DFD beef) against 1/5 of the beef from private farms.

The chemical composition analysis of the LD muscle showed a difference in the protein and fat content in the beef of heifers and that of young bulls (Table 4).The beef from heifers had the highest protein and fat content but there was practically no difference between the state farm and private farm data.

Table 4. Chemical composition of LD muscle,%

Description	Protein		Fat		Water		Ash	
	mean	range	mean	range	mean	range	mean	range
State farms:								
young bulls	18.61	13.44-21.71	3.20	0.58-6.49	77.12	74.45-79.42	1.07	0.95-1.19
heifers	20.47	17.00-25.79	4.36	2.11-7.81	73.83	70.03-77.57	1.34	0.67-1.73
Private farms:								
young bulls	18.83	13.93-21.05	3.32	1.09-7.76	76.57	74.00-79.40	1.28	0.97-3.41

As for the physical composition of half-carcasses (Table 5) ,there was no remarkable difference between the state and the private farm young cattle in their percentage of bone and muscles with fatty tissue. Muscles with fatty tissue show a comparatively high

proportion because the fatty tissue was not separated,the meat was later classified into sorts according to its fat content on the assumtion that all beef will be used either in sausage manufacture or sold as retail cuts.

Table 5: **Physical composition of half-carcasses**,%

Description	Muscles with fatty tissue	Bone
State farms:		
young bulls	79.1	20.9
heifers	80.8	19.2
Private farms:		
young bulls	80.4	19.6

CONCLUSIONS. The results suggest that the genetic potential for beef production of the Red Estonian and Black and White dairy cattle is comparatively high.Unfavourable economic conditions (different fattening conditions,shortage of feeds and especially of high-quality concentrates,unbalanced rations,variable feeding within a year etc) affect greatly the daily mass gain,feed expenditure,live weight at slaughtering,and carcass and beef quality.Regadless of all these difficulties we must evaluate the quality of beef produced in Estonia regarding the classification systems of the European countries.The defective management and technology here influence the quality of beef to a large extent (high percentage of DFD beef). The lack of instruments and laboratory equipment is a significant obstacle in research.There is much room for progress in more efficient production of high-quality beef.