

DEVELOPMENT OF METHOD AND AUTOMATED SYSTEM FOR REGISTRATION AND QUALITY ASSESSMENT OF BEEF CARCASSES

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INTRODUCTION: The problem of objective quality assessment of beef carcasses, development of methods and instrumental means for carcass classification is studied by many scientists all over the world.

Specialists of the Institute conducted series of research, aiming at revealing possibilities for predicting composition of beef carcasses for objective measurement. Analysis of the available data made it possible to conclude that with the use of certain linear measurements it is possible to predict carcass composition. Quality of slaughter animals and of resulting carcasses is determined first of all by yield of meat after boning, which can be expressed by its actual and calculated percentage by weight of the carcass. Actual content of muscle tissue in a carcass can be determined after its full dissection. Calculation value of the muscle tissue level is determined by instrumental measurement of muscle and fat thickness in certain carcass sites, and the obtained result is recalculated by a formula into content of lean meat in a carcass. Thus, carcasses are graded according to the predicted meat content.

MATERIALS AND METHODS: Development of method for objective quality assessment of cattle carcasses is based on the study into interrelation between meat content in a carcass and its certain parameters. For this purpose control processing of young beef cattle, having different weight, sex and fatness levels, was made on a meat-packing plant. Aiming at establishment of interrelation between yield and objective parameters, the possibility of composition prediction was checked according to different measurements, mainly of carcass dimensions. In doing so, in the majority of cases high correlation coefficients were obtained. Parameters, having high correlational dependencies with lean meat yield were chosen, that could be quickly and accurately determined with the help of measuring device, which is designed at present at the Institute for its on-line use.

As far as this device, meant for beef carcasses quality assessment will have form of a "penetrating probe", the following measurements, characterizing muscle thickness, were chosen: depth of muscle layer at 9, 10, 11 and 12 rib; muscle thickness in the most prominent part of the beef round (A_1), in the point of intersection with the line along prominent part of the back, which is parallel to backbone and perpendicular to the 3rd lumbar vertebra line (A_2).

55 Carcasses of young beef animals were studied by their measurement according to the above-mentioned parameters in a hot state. After weighing and chilling carcasses were boned. The received experimental data were subjected to mathematical analysis. Multiple

regression equations were calculated for determination of theoretical yield of lean meat.

RESULTS: Analysis of correlation coefficients of lean meat yield using measurements at the level of 9, 10, 11 and 12 rib showed possibilities of carcass composition prediction by means of muscle tissue determination in any point of 9-12th rib site (\bar{A}).

		Twofold correlation coefficient				
Carcass weight (W_c)	Measured site					
	9 th	10 th	11 th	12 th	Mean \bar{A}	
Lean meat weight (W_m)	0,993	0,710	0,659	0,581	0,632	0,739

To minimize error during calculation of theoretical value of lean meat yield, it is necessary to use in regression equation at least two values. With this aim extra measurements of muscle layer thickness in sites A_1 and A_2 were chosen. Data analysis of correlation matrix shows that muscle thickness, measured in the named sites, has relatively high correlation with lean meat yield ($r=0,522$ in site A_1 ; $r=0,561$ in site A_2).

Taking into consideration, that site A_1 is situated in a high point of a carcass, and practically, it is rather difficult to measure it, we considered to use measurement in A_2 - site.

Regression equation, composed with the use of two measurements \bar{A} and A_2 , is as follows:

$$W_m = -14,295 + 0,83 W_c + 1,292\bar{A} - 0,021A_2$$

$$R = 0,994$$

$$S = 3,794$$

For introduction of the developed method for determination of beef carcasses quality, we are developing, at the present moment, an automated system for registration and quality assessment of beef carcasses, which is shown in fig. 1. The system includes: electronic monorail scale for determination of weight (manufactured in the USSR), device for carcass transfer to the scale, personal computer with a printer and and grading device, i.e. a penetrating probe with light generator and radiation detector (general view of the grading probe is shown in fig. 2).

Conclusions:

1. On a carcass measuring sites were determined, having high correlation dependencies with lean meat yield.
2. Regression equations for analytical determination of lean meat yield were calculated.

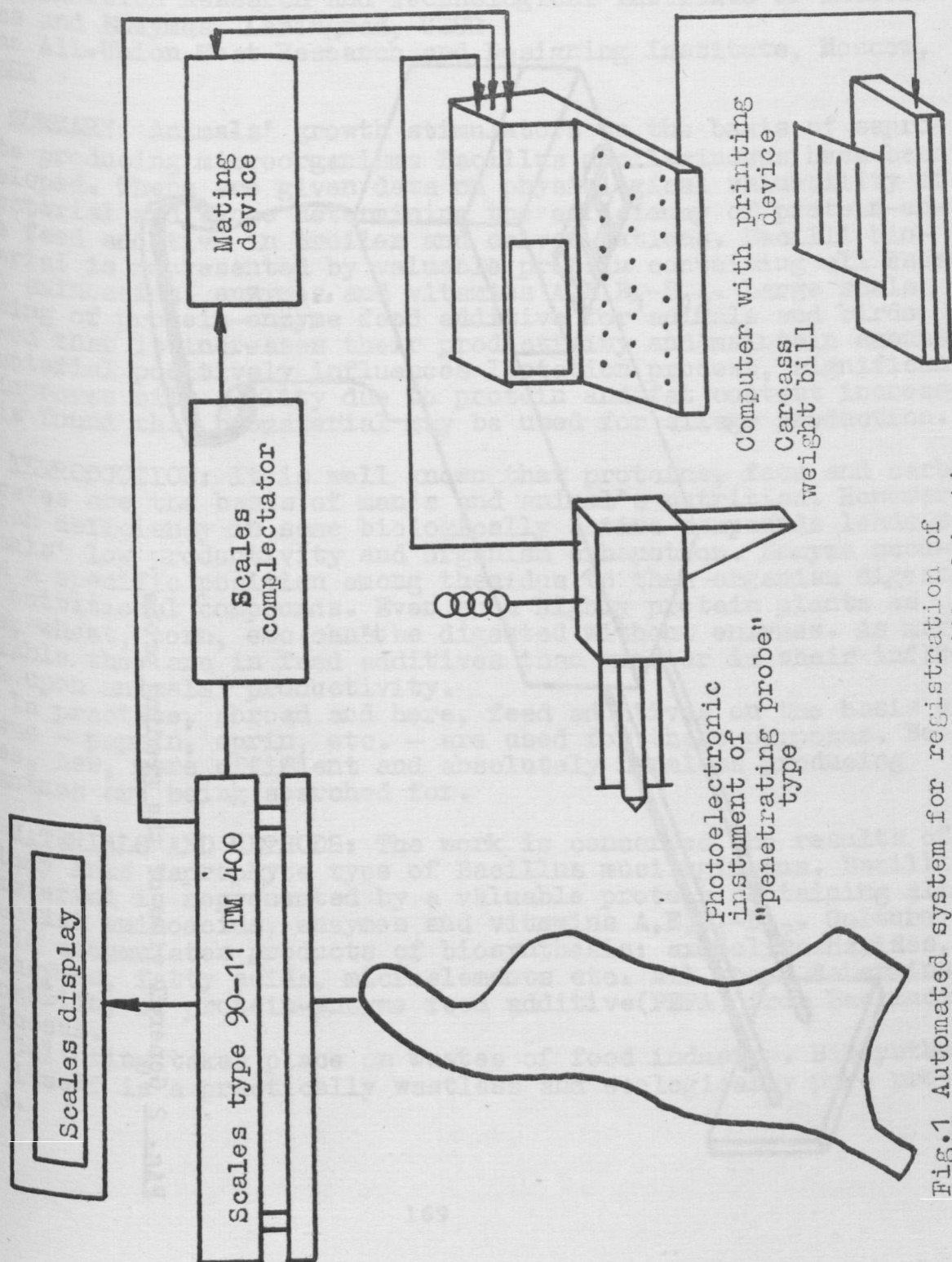


Fig.1 Automated system for registration of slaughter animal carcasses with objective quality assessment

3. The approach to development of automated system for registration and quality assessment of beef carcasses was established with the use of an instrument of "penetrating probe" type.

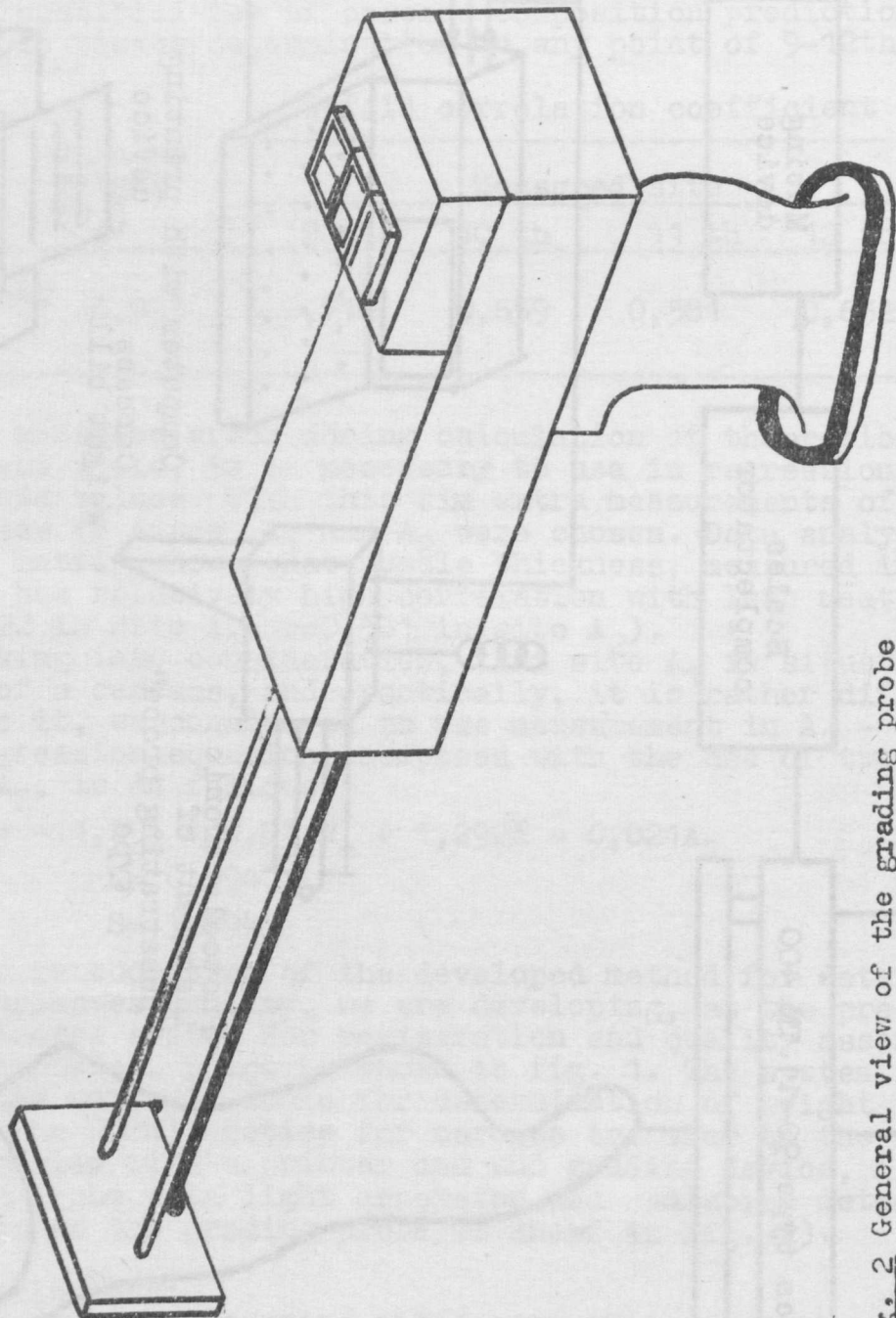


Fig. 2 General view of the grading probe