AN EDUCATIONAL PROGRAM
TO USE IN THE SELECTION OF SHEEP

by

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CHAPTER I

INTRODUCTION

In agricultural education a part of the job of the instructor is to interpret some of the information that has to come largely from the laboratories of the public supported state and federal research institutions. This informational know-how should be interpreted and taught to the farmer and agriculture student in the light of how he can put it to a practical use in selecting animals more advantageously and efficiently. This task requires the teacher to be constantly alert to the research that has contributed much in leading the way to the progressive development of the livestock industry. This responsibility to keeping abreast of the technical advances as a result of research poses a constant challenge to the vocational agriculture teacher.

The livestock industry in America is a tremendous industry. Over half the gross farm income is derived from the sale of animal products. Livestock are used to market crops that otherwise have no value, and to help promote good land use for soil conservation and

improvement. Efficient selection of animals will become more and more important as lands become more scarce for farming and as our population increases.

Up to this point animal industry researchers have made more progress in the field of feeding and nutrition than in breeding and management. Geneticists in the meat animal fields must devote more of their attention to types of animals that produce meat more efficiently and yield meat more suited to consumer desires.

One of the problems of the livestock grower has been that he has been unable to guarantee to the consuming public that he can produce the quality carcass desired consistently. The grower would like to be confident that certain measurable external characteristics would indicate a certain carcass value.

At present very little information is available concerning objective live animal measures which indicate carcass value. The development of adequate selection criteria for carcass merit will facilitate genetic improvement. This in turn will benefit both the producer and consumer through the development of a more efficiently produced and acceptable meat product.

Purpose of the Study

The purpose of this study is to try to show some

relationship between live lamb measurements and carcass merit and how these could be used in teaching. These relationships should be understandable to the livestock man, practical and reliable so as to be of value in breeding stock selection.

Too often it has been demonstrated in field day programs at stockyards and killing plants that the "eye" of the recognized livestock judge is not reliable in selecting the so-called "meaty" animal. The placings of the animals on the hoof, in many instances, do not correlate well with the final evaluation of the same animals' carcasses when graded for market following slaughter.

An example which might illustrate some of the fallacies of relying too heavily on "type" as a meat animal selection standard is the "depth of body" point. The depth of the animal's body is often due to excessive paunch. The part of the body that is deep and thickset contains such a small portion of valuable economic cuts that it is not worthy of so much attention.

Again, a blocky thickset animal which is broad across the loins may be excessively fat and the fatty tissue is well covered in such proportions that makes it resemble muscling. These are some of the reasons that selection for type does not always increase production

for carcass merit. Sheep breeders, for instance, need methods not influenced by fatiness to identify superior musculing in the breeding animal. Selection for such musculing is difficult because slaughter is necessary for the most accurate appraisal. The rather low production rate and relatively long generation interval in sheep limit the practicability of slaughter testing progeny.

Vocational agriculture teachers and 4H club leaders, especially, stress livestock judging as a means of training the student to "see" an animal. This is not to be too harshly criticized but in view of the coming trend in marketing animals by the actual carcass yield, there must be an effort made to find a quicker, more reliable measure of quality.

Limitations of the Study

There has been no published work done on this specific problem at Oregon State University. There have been, though, many projects of carcass merit study based upon breeding of different inbred and crossbred lines. This work has done much to develop the technique of recommended lamb weighing, measuring and carcass cutting and evaluation procedure. This study makes use of the procedures Oregon State University used in its contributing project to the W-61 Western Regional Sheep Breeding Project.

The forty-six lambs used in providing the data for this study were originally used for the aforementioned project. The records and data have been made available through the Dairy and Animal Husbandry Department. The correlation coefficients have been statistically calculated by the author.

Due to constant referral to other studies in writing this paper the author finds it quite repetitious and difficult to have to constantly distinguish between his and the other studies in the many comparisons found in the discussion. Therefore all references to the work on the thesis at hand will be simply stated as "this study".

Definition of Terms

In order for the reader to better understand this study the anatomical terms used will be illustrated by drawings.

Fig. 1 Skeletal Parts

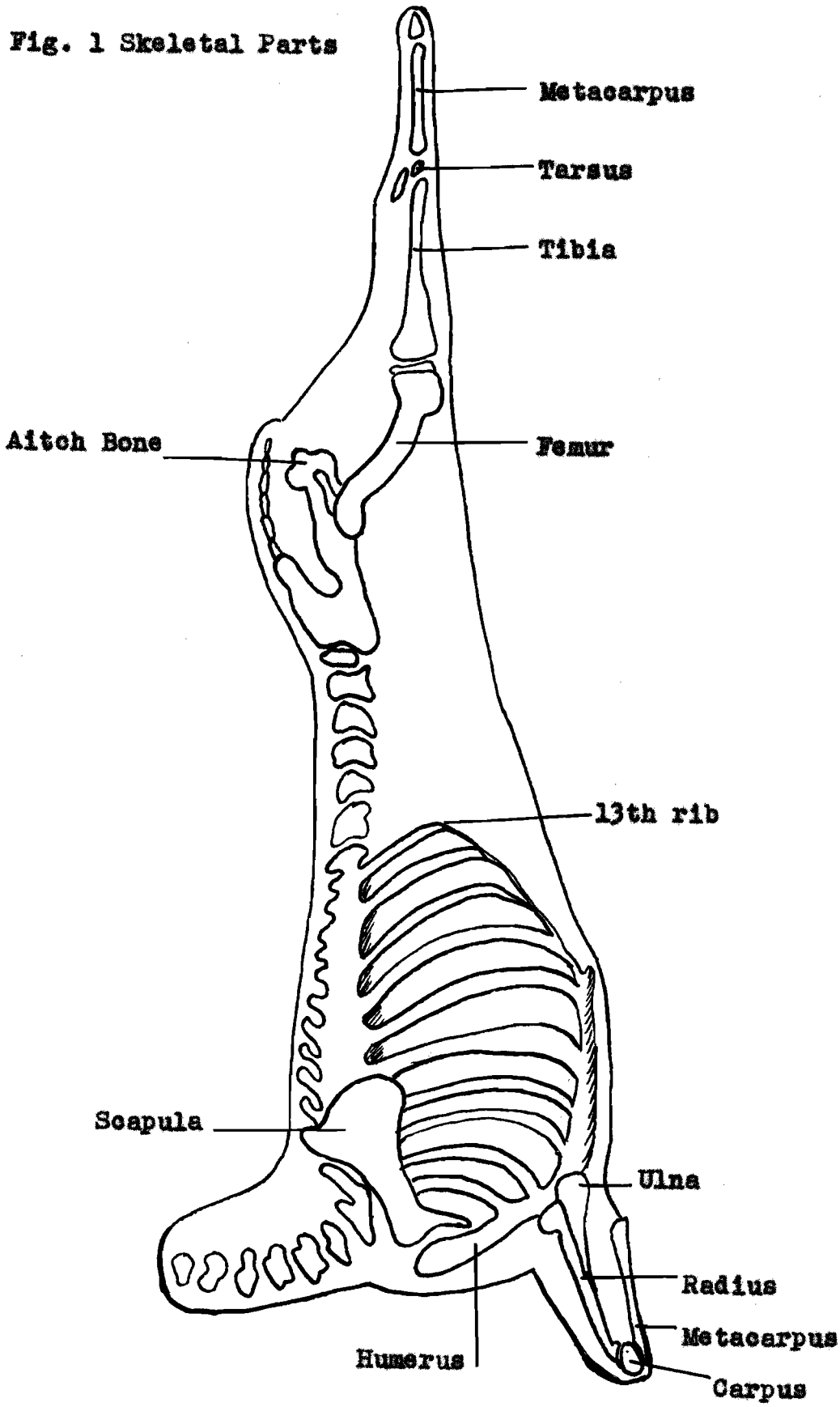
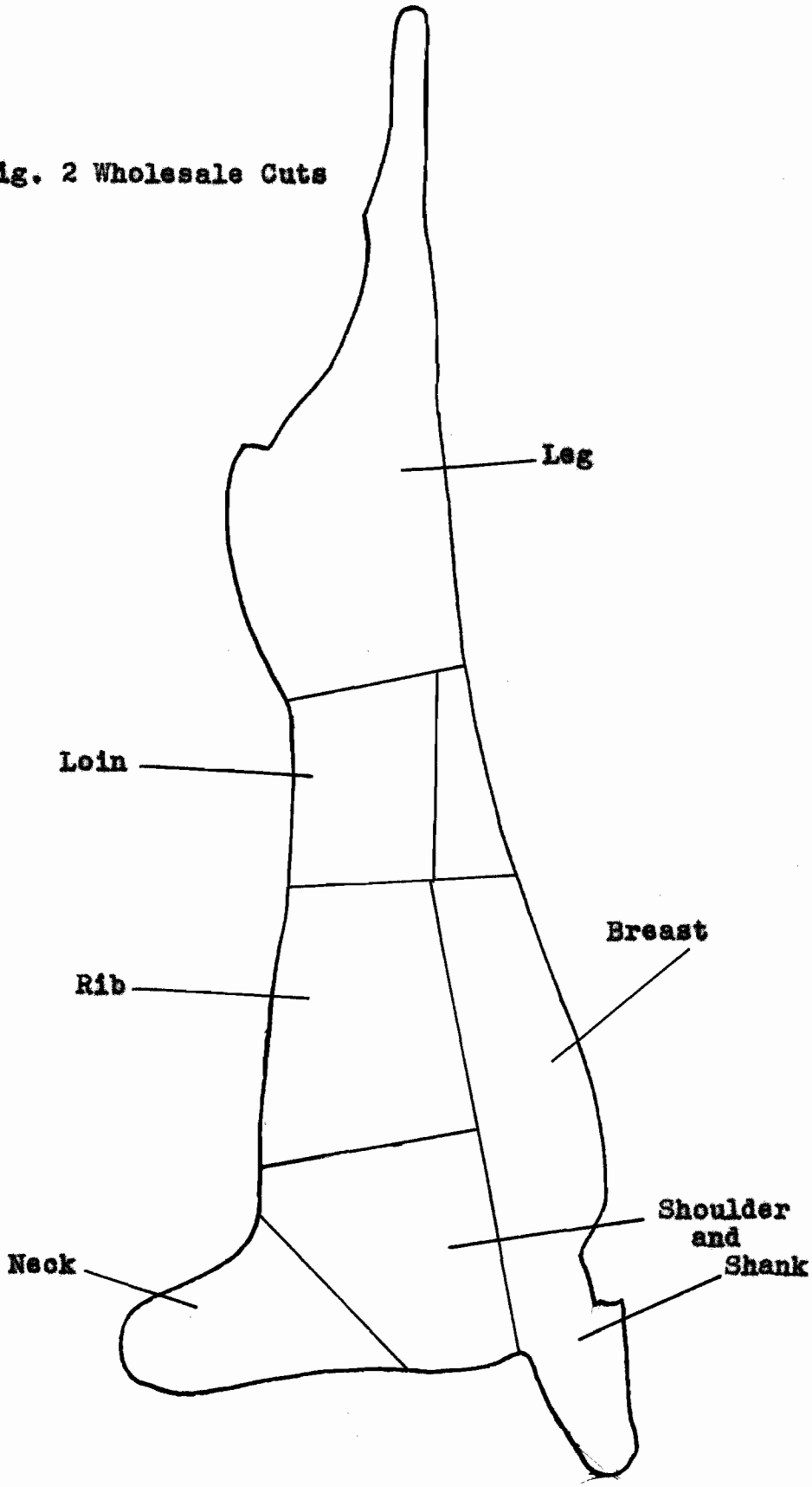


Fig. 2 Wholesale Cuts



CHAPTER II

REVIEW OF LITERATURE

Several objective methods for estimating the meatiness of an animal carcass have been studied and consequent proposals have been submitted. This research work of recent years tends to indicate that there is definitely a relationship between live animal measurements and carcass measurements. Also this work shows that significant correlations are more pronounced between some specific live animal measurements and carcass measurements than in others.

Consideration of certain live animal measurements with the longissimus dorsi muscle is popular with many scientists--this area being considered important because of its being one part of the desired cuts of meat by the consuming public.

In cattle, the area of the cross section of the longissimus dorsi muscle is referred to as the rib-eye and is used by research workers to estimate the amount of total lean meat produced by an animal. Cahill et al, (1956) reported that a direct relationship existed between the area of the rib-eye and the percentage of total edible portions of the carcass ($r = .85$). This gives us a hint that perhaps one of the key muscles of an animal's carcass

is the rib-eye muscle.

It has also been demonstrated by Orme et al, (1959) with 3 long-yearling steers that most live animal measurements and carcass measurements were highly repeatable. They found that the circumference of the body at the foreflank was closely associated with the rib-eye area. The width of rump was also significantly related to rib-eye area. In fact the animals with the larger measurements tended to have the larger area of rib-eye (width of shoulder, width of rump and round, width of crops, and depth of flank).

Two others, Brannaman (1940) and McMeekan (1941) have reported that the area of the longissimus dorsi is a good index of total muscling in sheep and swine.

Walker and McMeekan (1944) established that there were certain relationships between linear external carcass measurements and the quantitative composition of the carcass. The external measurements that provided the best index of muscle development were length of tibia and tarsus, and width of both legs.

Hankins et al, (1943) and Hankins and Howe (1946) indicated that the proportion of lean, fat and bone in the 9, 10, and 11th rib cut was a good indicator of the lean, fat and bone in the entire carcass.

Again, it would seem that animal scientists believe that the cross-sectional area of the longissimus dorsi muscle is one of the keys to carcass quality. To establish that any significant correlation of the measurements of an external part of an animal with the loin-eye existed would be valuable as a selection aid.

Other parts of the animal are regarded as desirable by the consumer also. Researchers have done a considerable amount of work with other muscle parts of sheep, such as the edible portion of the leg. More work has been done with external leg measurements, though, to ascertain how they correlate with quantitative carcass composition.

Live measurements were taken on 141 lambs over a period of 3 years by Botkin, Stanley, and Schoonover (1959) of Wyoming. Measurements included here were live leg length, carcass leg width, live cannon bone circumference and length, actual cannon bone circumference and length, and actual cannon bone widths. These measurements were studied for their relationship to loin-eye area. In all cases leg area was more closely related to the measurements than was loin-eye area. Carcass leg width was highly correlated to leg area. Physical separation of thirty carcasses into lean, fat and bone gives

indication that area of loin-eye and area of leg combined is reliable as a measure of lean meat content.

In studying the muscle-bone relationship in sheep, Hirzel (1939) reported that shortening and thickening of the cannon bone is associated with a thickening and shortening of muscle covering. Substantiating this statement, McMeekan (1956) stated that so strong is this relationship that the weight of muscle could be determined within one per cent if the weight of the cannon bones are known. He also stated that the finer boned animals have a smaller amount of lean tissue and a larger amount of fat than the heavier boned animals on a percentile basis. Wythe (1958) produced data on 28 steers indicating that a significant positive relationship existed between bone thickness and muscling.

Palsson (1939) concluded that the weight of the fore-cannon was the best single measure for estimation of the weight of total bone in the carcass. Palsson also found that the weight of the muscle in the one leg or loin provided an excellent index of weight of muscle in the whole carcass ($r = .90$ and $.84$, respectively).

Hammond (1955) indicated that shortness of the cannon bone can be used as a good guide to carcass conformation. In another article, Hammond (1955) stated that sheep of each breed, according to rate of maturity,

have an optimum weight at which the carcass contains the right proportion of muscle and fat to suit the customer. However, he failed to give us the benefit of these optimum weights.

Other possibilities of selection for carcass merit have been explored. Most of these are external linear measurements.

Palsson (1939), (1940), and Walker and McMeekan (1944) have used the ratio of width of gigots to length of leg as an index of blockiness. Length of leg, they found, is a reflection of two things, namely, length of bone and development of muscle within the crutch.

Clarke and McMeekan (1952) have also taken on the task of correlating external with internal carcass measurements. They feel that depth of eye-muscle and thickness of fat over the eye-muscle and over the flank are particularly useful measurements. It is impossible to make these latter measurements directly without cutting the carcass but it is possible to make estimates of the thickness of fat plus muscle by use of a probe.

The use of the probe is quite simple as explained by Matthews et al, (1960).

> "The lambs were restrained so they were standing squarely on their legs with the top-line level. The area over the transverse process was shaved and a

> small dot of ink was placed on the skin one inch laterally to the right of the mid-line. A solution of 70 per cent alcohol was applied and a small incision was made in the skin with a surgical scalpel at the inked site. The probing needle penetrated the fat with little resistance; however, it met marked resistance from the lumbo-dorsal fascia covering the longissimus dorsi muscle. At this point a cork, which held the needle, was pressed firmly against the skin. The needle was withdrawn and the distance from the point of the needle to the cork was recorded as skin thickness plus fat depth. The distance was measured on a steel rule to the nearest 1/10 inch. The needle was then reinserted and pressure was applied until it passed through the fascia and penetrated the longissimus dorsi muscle to the dorsal surface of the transverse process of the second lumbar vertebra. The cork was again pressed firmly against the skin and the needle withdrawn. The difference between depth of skin plus fat and total depth, measured to the nearest 1/10 inch was recorded as the estimate of cross-sectional depth of the longissimus dorsi muscle."

In general, the estimated probe depth of the loin-eye muscle taken at the 2nd lumbar vertebra was highly correlated to both the actual cross-sectional depth and to the actual cross-sectional area of the muscle as measured from muscle tracings taken at the 12th rib. Partial correlation coefficient between probe depth and actual depth was about .5 and between probe depth and area about .6.

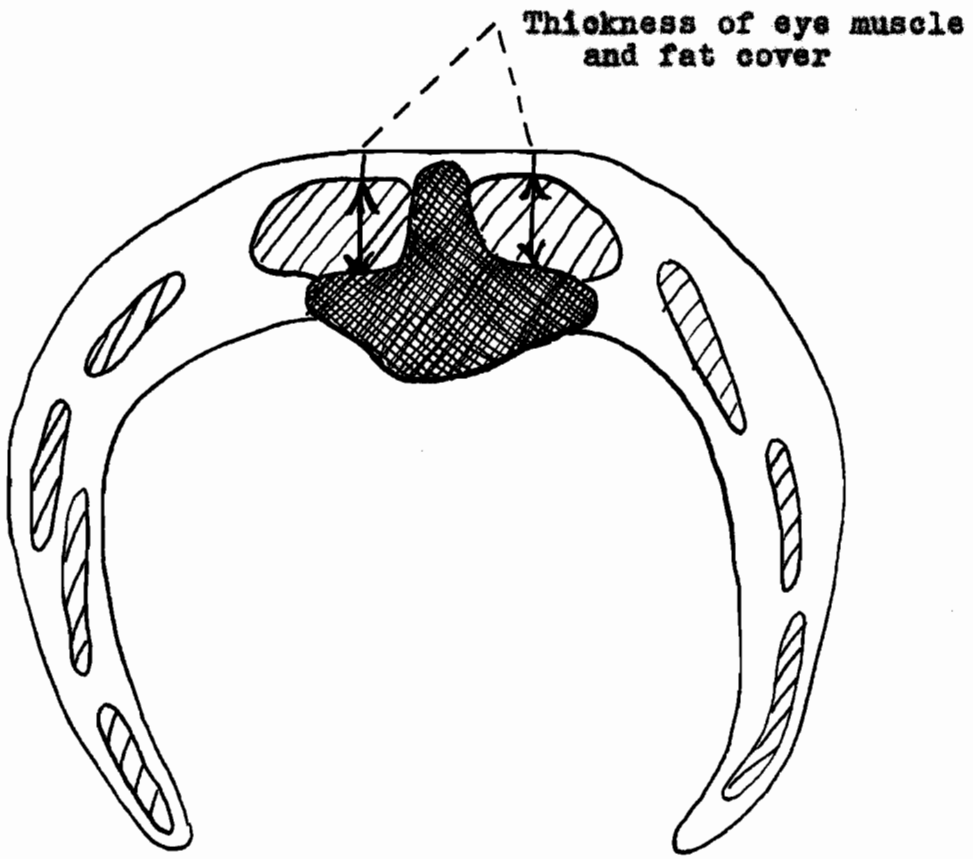
The area of eye muscle cross-section of carcasses may be accurately measured by tracing the boundary and

measuring the tracings with a planimeter. The planimeter is an instrument used in measuring the area of a piece of land shown in an aerial photograph. If a planimeter is not available, the area may be estimated by superimposing a grid on the tracings and counting squares; although this method is some 25 per cent less accurate than the planimeter method it is sufficiently repeatable for experimental use. In obtaining these tracings the lamb carcasses are separated into fore and hind saddles between the 12th and 13th rib, and the longissimus dorsi muscle and fat depth were traced at the 12th rib.

Fig. 3

Cross Section of Lamb Carcass

At 12th and 13th Rib



Robinson, Binet and Doig (1955) worked with 240 export lamb carcasses, representing 12 weight-grade classifications of 20 lambs each, with the object of determining measurements likely to be of value for the assessment of conformation. They succeeded in arriving at ten measurements that were convenient for discriminating between grades in three weight categories, namely, light, medium and heavy.

The ten measurements were length of leg, depth of thorax, thickness of loin, thickness of flank, length of carcass, thickness of shoulder, width of shoulder, width of flank, width of gigots and twist.

Palsson (1949) found that by establishing the relationship between linear carcass measurements and the quantitative composition of the carcass in terms of bone muscle and fat a scientific basis for the use of many measurements has been provided.

The weight of the skeleton can be estimated with a high degree of accuracy from the weight of the bones in either one leg or loin. The muscle of one leg or muscle of leg plus loin provides an excellent index of the weight of muscle in the whole carcass.

Loin length and width is the best internal index of muscle, while thickness of fat over deepest part of eye-muscle, thickness of fat over lower rib provides most accurate estimates of weight of fat.

Knight, Foote and Bennett (1959), working with twenty-six lambs, in general found that the correlations between live animal measurements and carcass measurements reflected the relationship of size of live animal to size of carcass. Carcass length was significantly correlated with the following: rump length .50, hip width .44, foreleg length .45, and leg circumference .50. A more significant correlation coefficient between live weight and carcass length of .84 indicates strong relationship between weight and length.

All of these studies and many others, as has been stated, are carried on within the confines of experimental stations or laboratories. Other work to train and educate the scientist and teacher as well as the rancher is being carried on in the form of carcass cutout shows and contests.

Summaries of The International Lamb Carcass Contests carried on at Chicago since 1956 have been reviewed by the author. Also studied has been the Lamb Carcass Contest in 1960 at the California State Fair and Exposition with the cooperation of the University of California at Davis. These shows are similar and the information derived from their evaluation sheets will be dealt with later in this thesis rather than at this time.

Other information on lamb carcass shows and contests reviewed in preparation for this paper was

found in The Shepherd, Volumes 4, 5, and 6. These viewpoints will also be used in Chapter IV of this study.

CHAPTER III

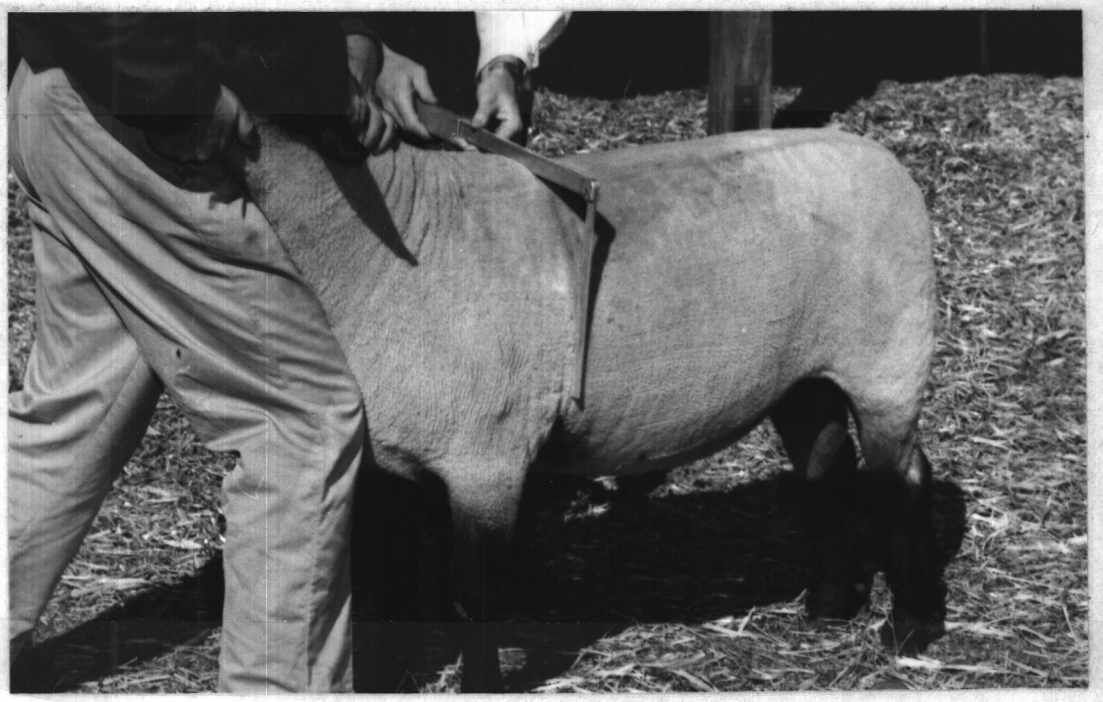
PROCEDURE

This study involves forty-six weaned lambs representing 3 major breed types (19 Hamp.-Col., 10 Col., 8 Tar., 4 Hamp.-Tar., and 5 Hamp.-Mixed.).

Just prior to slaughter all lambs were shorn and the following measurements to the nearest 0.5 cm. were taken:

1. The chest width was measured behind the shoulders at the narrowest point.

Fig. 4

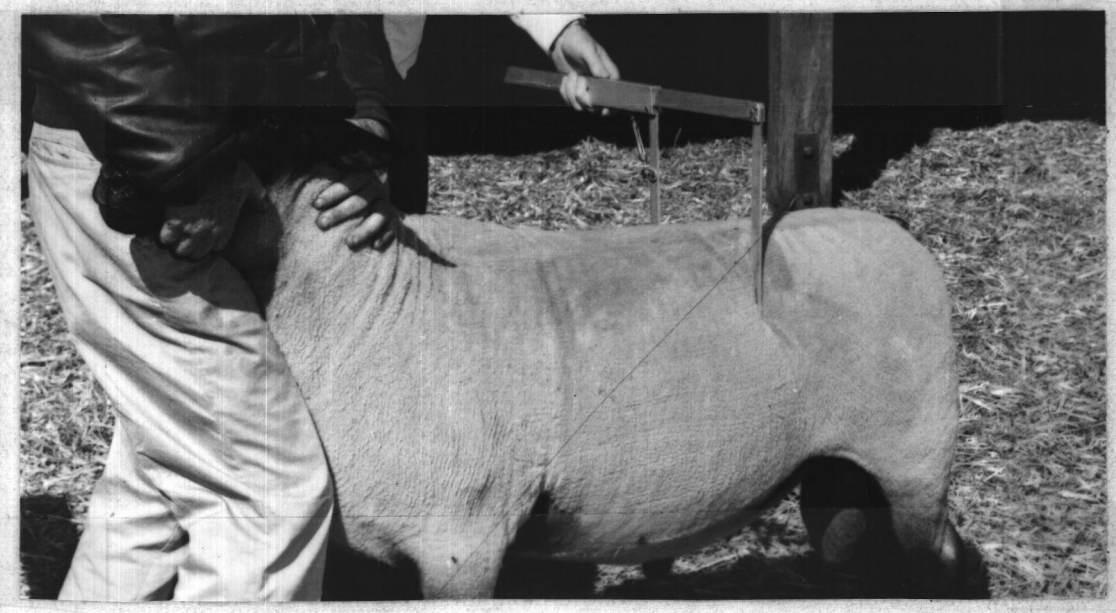


2. The chest depth, at the same point as chest width.

Fig. 5

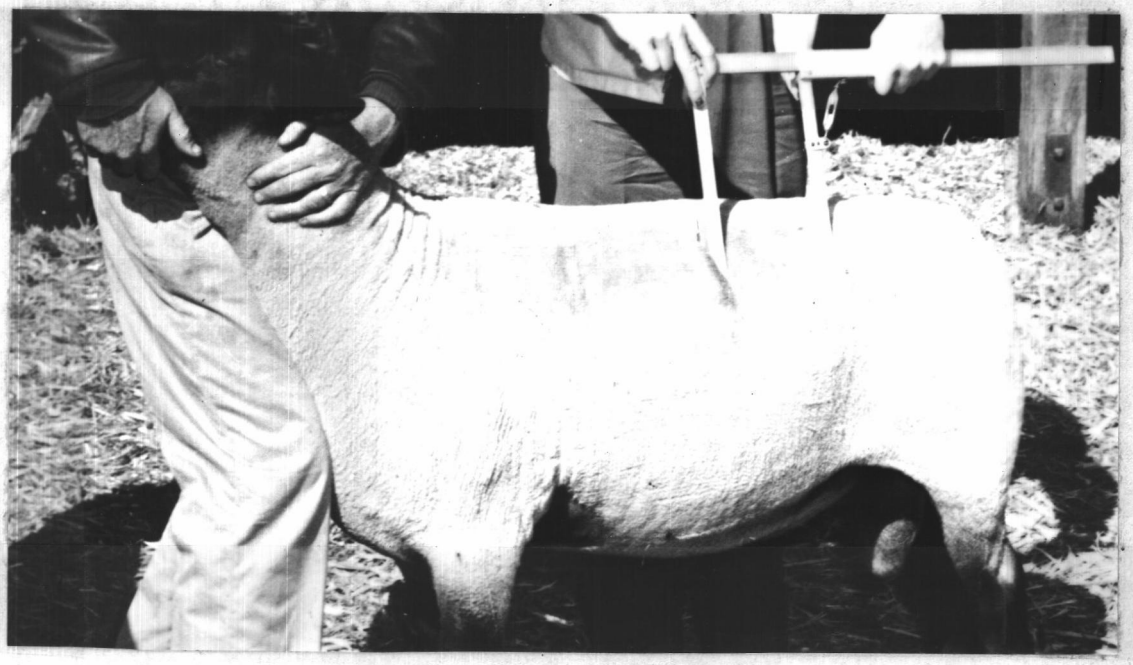
3. Loin width, immediately anterior to the hook bones.

Fig. 6



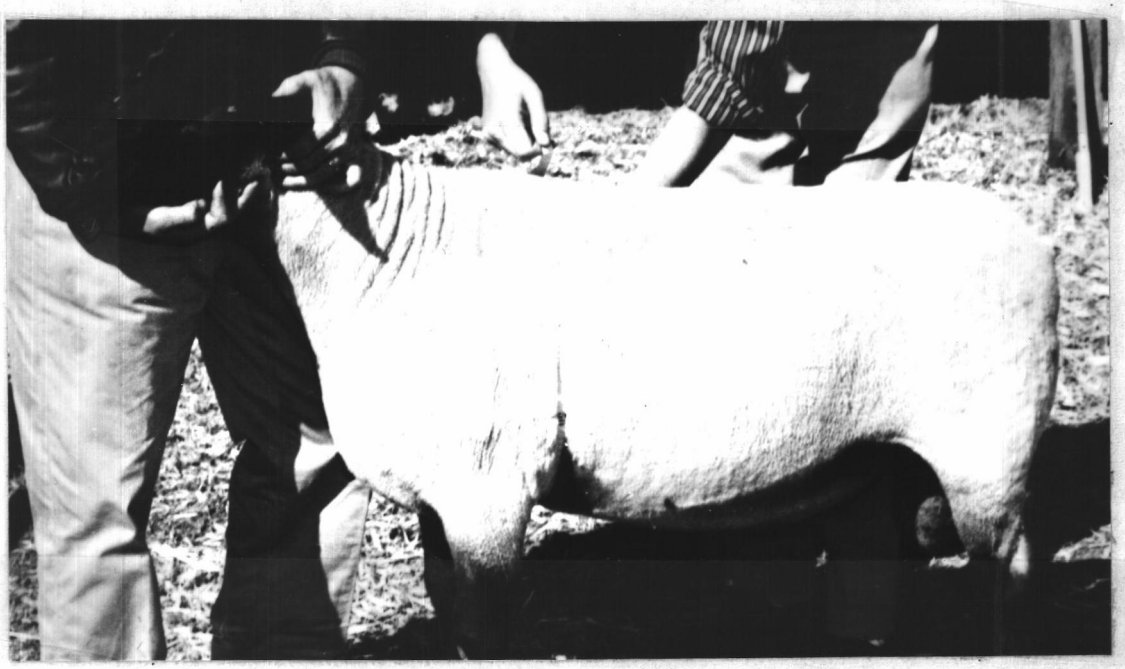
4. Length of loin, from the last rib to the hook bones.

Fig. 7



5. Heart girth or chest circumference.

Fig. 8



6. Condition score, graded according to the following scale:

Prime	5	Utility	2
Choice	4	Cull	1
Good	3		

7. Type score, also graded on a 5 to 1 scale, with 5 representing smooth, thick lambs with wide loins, deep full legs and well muscled throughout, and representing lambs with least meatiness as judged by external appearance.

TABLE 1

AVERAGE LIVEWEIGHT MEASUREMENTS FOR EACH BREED

	Hamp. x Mixed	Hamp. x Col.	Col. x Col.	Hamp. x Tar.	Tar. x Tar.
Condition Score	3.5	3.3	3.4	4.0	3.5
Chest Width	18.5	18.3	21.5	19.9	21.5
Chest Depth	25.9	25.8	28.1	25.3	28.5
Loin Width	12.4	12.4	14.5	12.6	13.3
Loin Length	10.8	10.5	7.0	8.4	7.8
Hip Width	21.5	21.3	24.5	21.6	23.5
Chest Circumference	77.0	75.1	89.2	79.0	87.5
Type Score	4.0	4.1	3.4	3.0	3.5

After slaughter the warm carcass weight was obtained on each lamb. Then a chilled carcass weight to the nearest 0.5 pound was taken following an overnight cooler

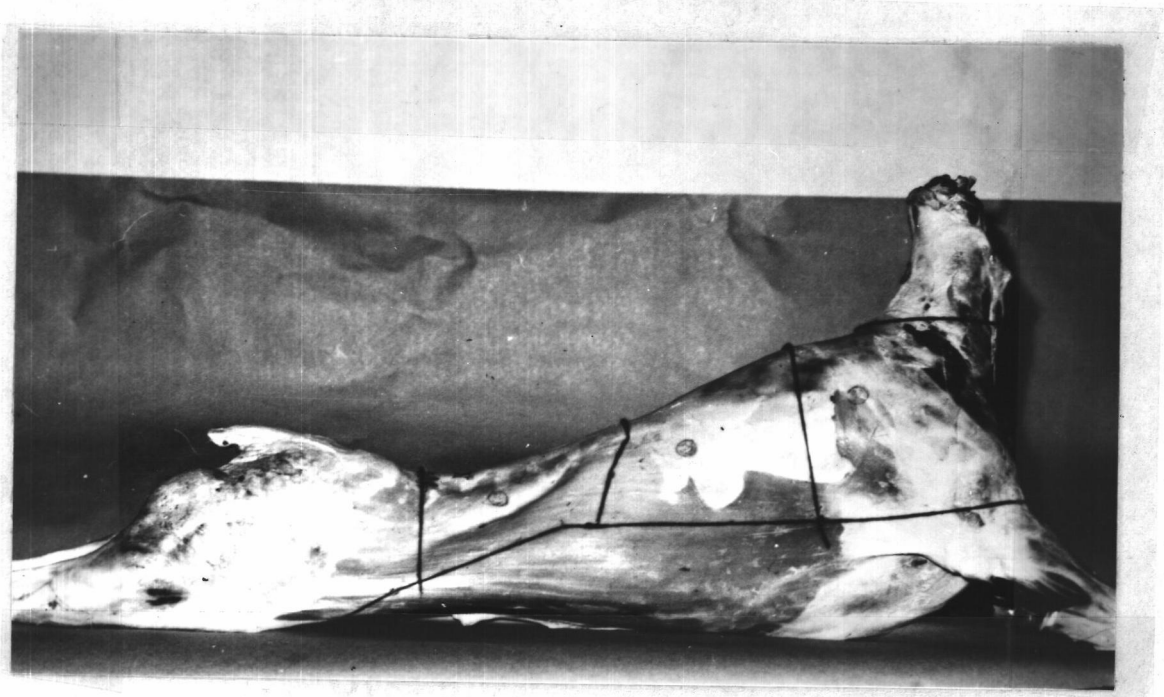
shrink.

A Federal grader's estimate of the following components of grade as well as the final grade was obtained: a. Quality, b. Finish, c. Conformation, and d. The components as well as final grade on a prime to cull scale.

The cutting procedure and data on the cut carcass involved the following steps:

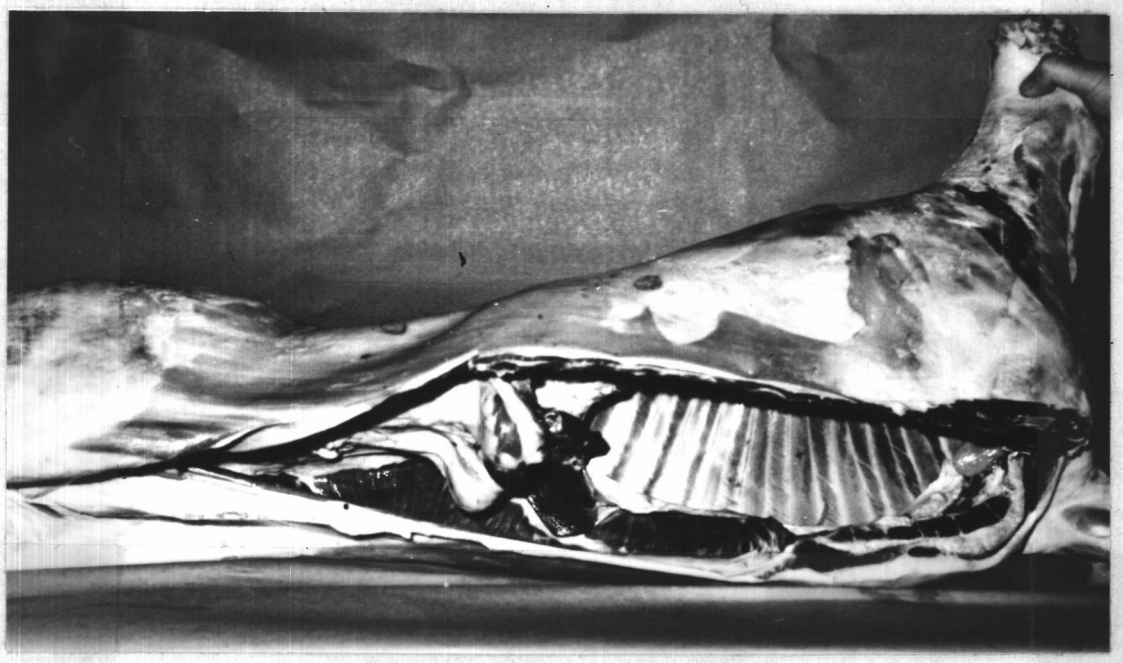
1. Lines showing carcass cuts.

Fig. 9



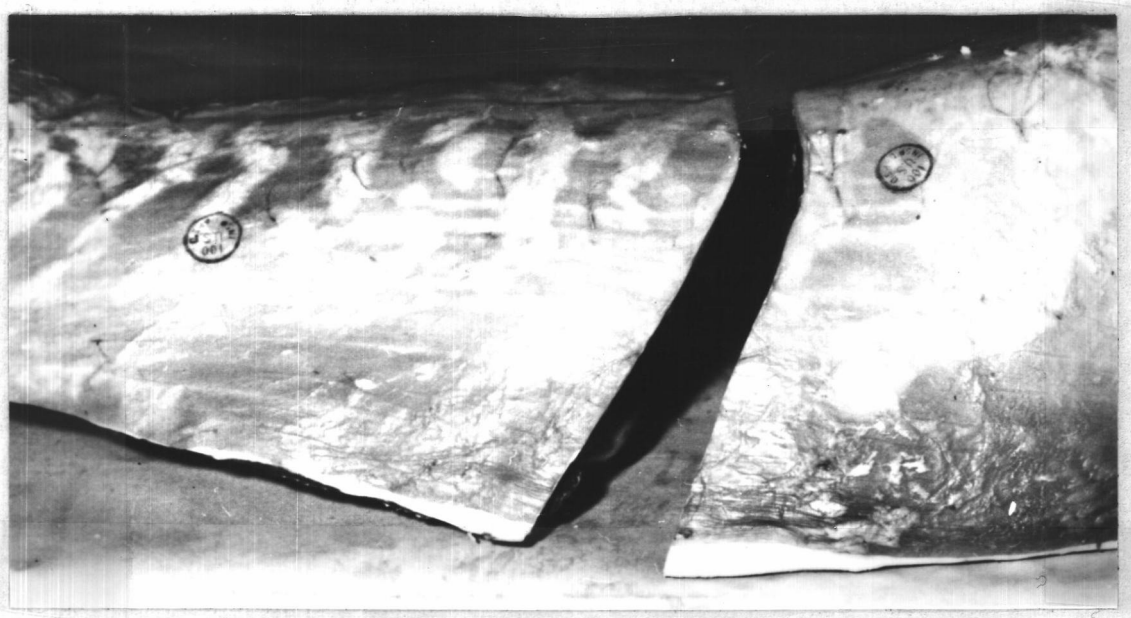
2. Removal of the shank, breast and flank by starting at the crotch and cutting to the inside edge of the flank muscle. By cutting to the end of the 13th rib and then straight to the apex of the angle made by the anterior edge of the shoulder and the anterior edge of the forearm. Then weighing the shank, breast and flank so removed.

Fig. 10



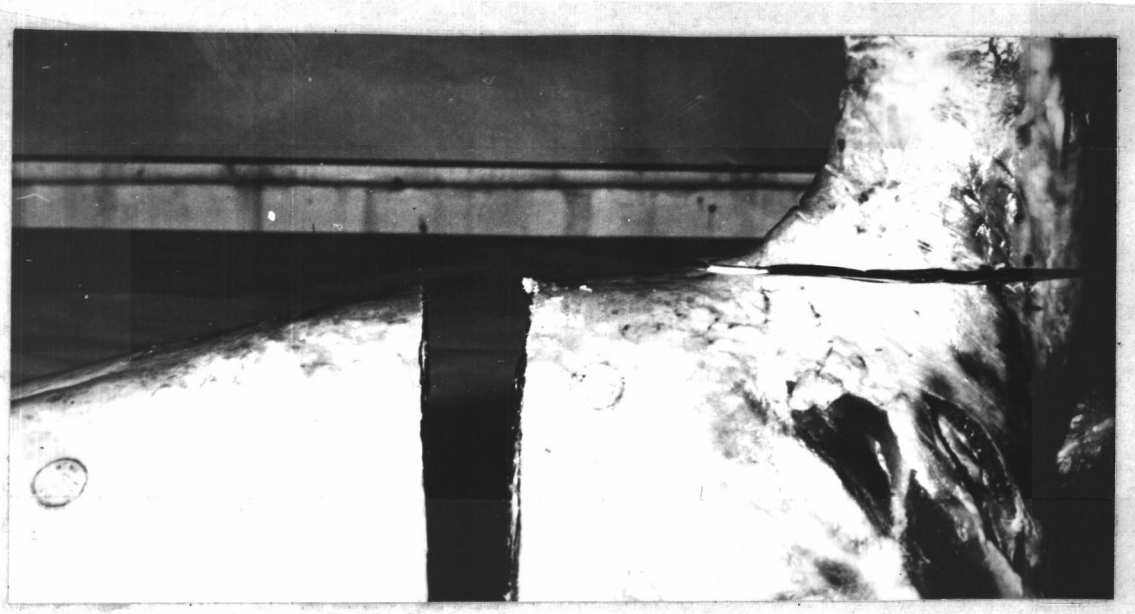
3. Removal of the shoulder by cutting along the posterior edge of the 5th rib.

Fig. 11



4. Weighing the shoulder which includes the neck.

Fig. 12



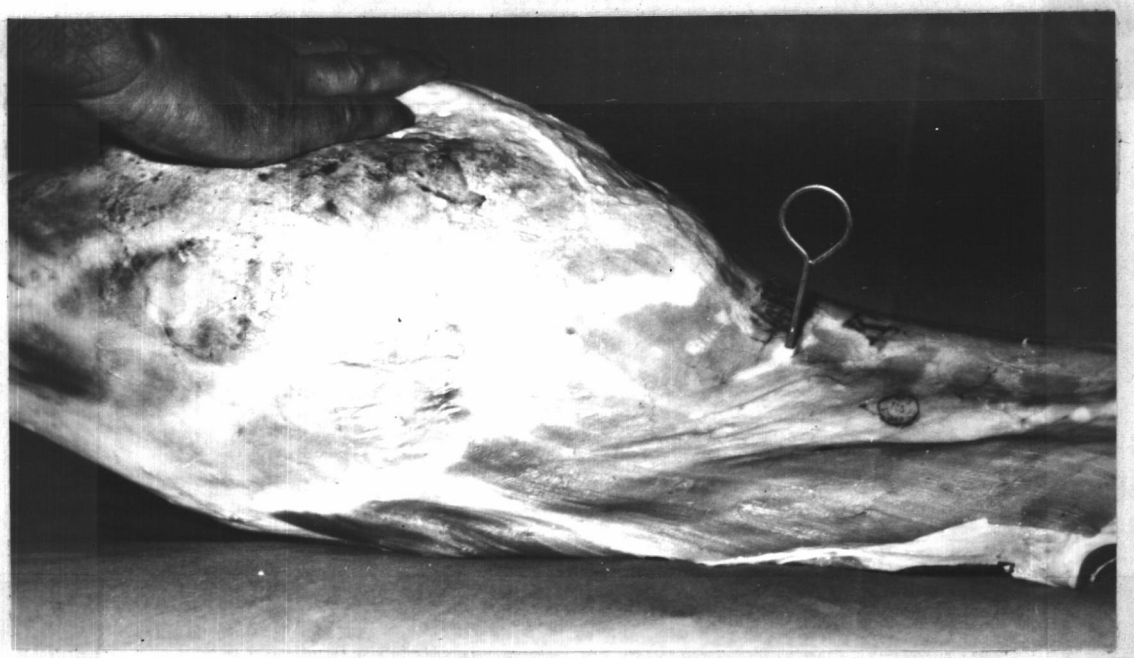
5. Removal of the 7-rib rack by cutting along the posterior edge of the 12th rib.

   After this the rack is weighed and the loin-eye area is recorded as well as the thickness of the fat over the loin-eye muscle, at the posterior end of the rack.

Fig. 13

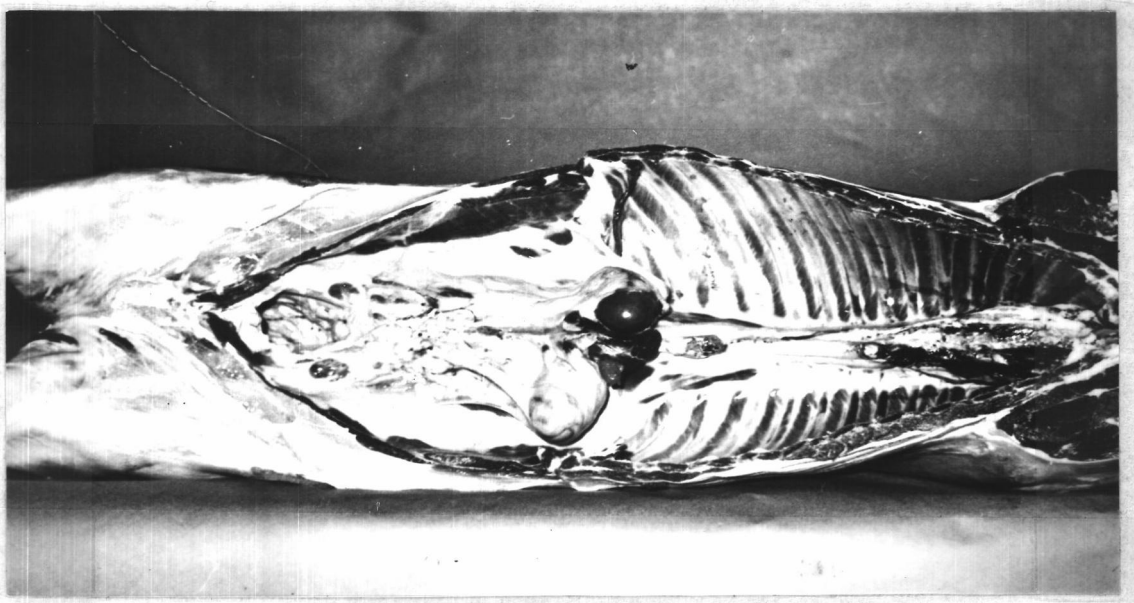
6. Separation of the loin and legs at the small of the back, or anterior edge of the ilium, with a cut parallel to the separation of the rack and loin.

Fig. 14



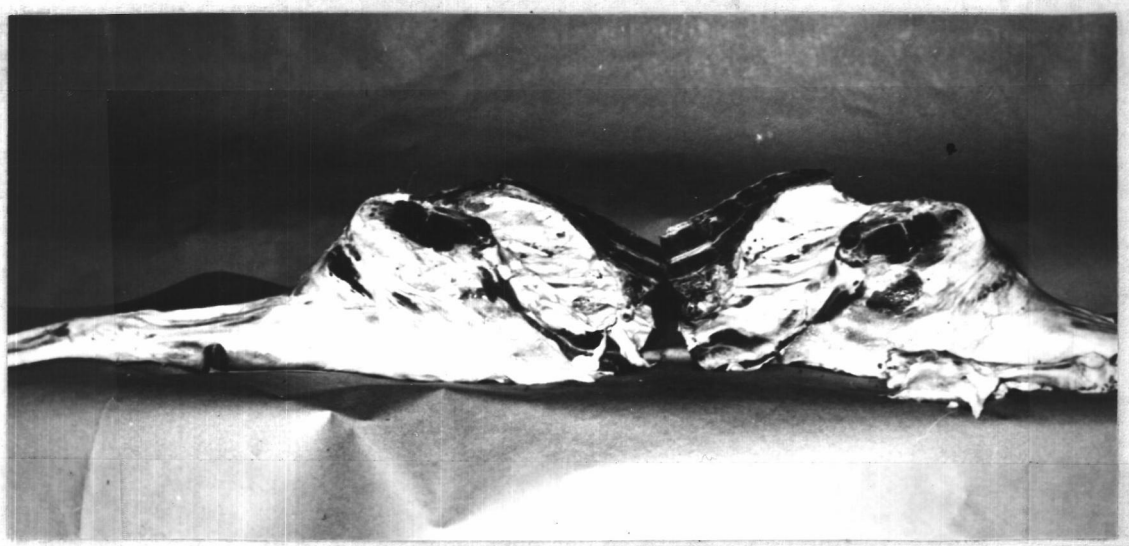
7. Removal of kidneys and kidney fat. Weighing of the two legs after loin removal. This is the untrimmed weight.

Fig. 15



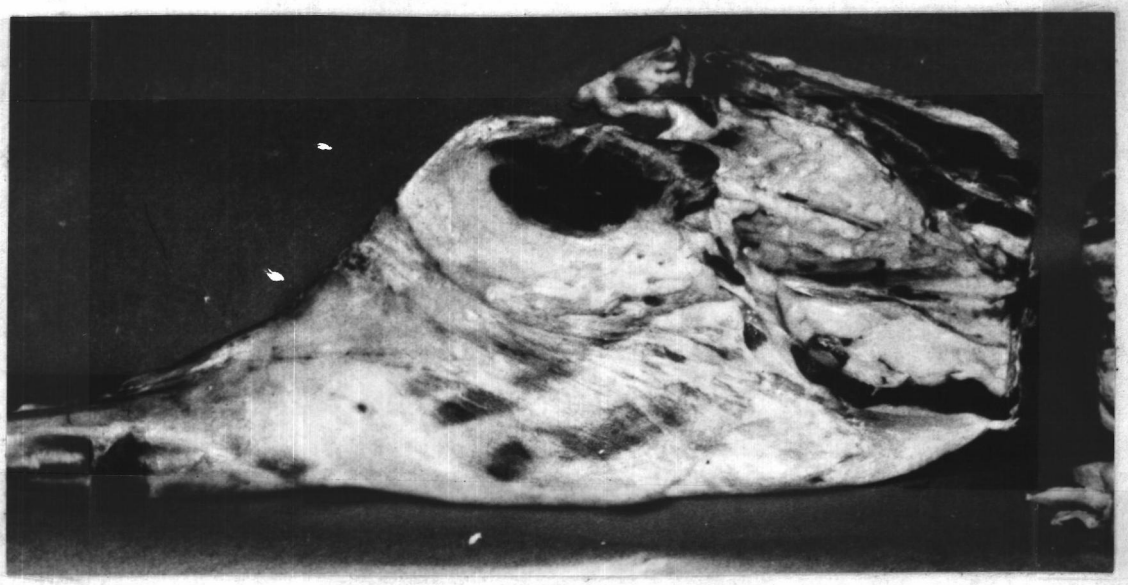
8. Splitting of the legs at the mid axis and removal of the shank at the break joint.

Fig. 16



9. Removal of all but two caudal vertebrae, removal of the loose surface fat, weighing of the trimmed legs and weighing of the meat of the trimmed legs.

Fig. 17



10. Wholesale cuts separated.

Fig. 18

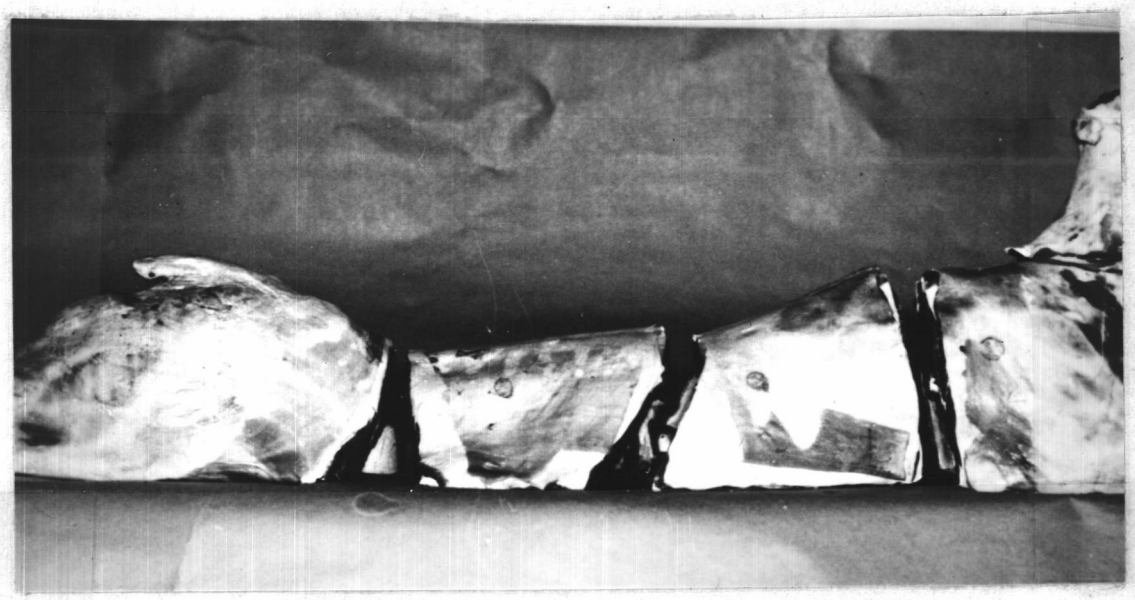


TABLE 2

AVERAGE MEASUREMENTS OF THE CARCASS CUTS FOR EACH BREED

	Hamp. x Mixed	Hamp. x Col.	Col. x Col.	Tar. x Tar.	Hamp. x Tar.
1st. rib to aitch bone - cms.	61.1	61.3	65.3	64.2	59.8
Wt. of legs (untrimmed) - lbs.	14.3	14.3	14.0	15.1	15.2
Wt. of legs (trimmed) - lbs.	13.3	13.2	13.9	14.3	14.9
Wt. of loin (untrimmed) -lbs.	5.8	5.3	6.7	7.2	6.7
Wt. of loin (trimmed) - lbs.	4.2	4.1	5.2	5.1	5.4
Loin eye muscle area - sq.in.	2.1	2.3	2.1	2.2	2.4
Fat depth at 12th rib - mm.	3.2	4.3	3.0	3.1	4.1
Wt. of rack - lbs.	4.5	4.1	5.7	7.5	5.5
Wt. of breast and shank - lbs.	7.5	7.2	7.8	8.0	7.7
Wt. of shoulder and neck - lbs.	12.3	11.8	13.5	12.5	12.8
Wt. of meat of leg - lbs.	5.6	5.5	5.8	6.0	6.2
Wt. of leg bone - lbs.	1.14	1.24	1.19	1.12	1.17
Wt. of leg - lbs.	6.8	6.8	7.0	7.1	7.3

Simple correlation coefficients were calculated between the following live animal and carcass measurements as well as between certain carcass measurements: Boned leg weight x loin-eye area, carcass length x loin-eye area, live animal loin width x loin-eye area, live animal loin width x loin-eye area, live animal loin length x loin-eye area, live animal type score x loin-eye area, depth of fat at 12th rib of live animal x loin-eye area, live animal carcass length x weight of meat of trimmed legs, live animal hip width x weight of meat trimmed legs, and live animal chest depth x live animal chest circumference.

Meatiness is probably the most important single factor contributing to overall carcass merit. In order to accurately determine the amount of meat in a carcass it is necessary to physically separate all the meat from the bones, weigh each separately and record. This is obviously a tedious process and leaves little to practicality. Therefore an indirect measure, easy to use is important.

The data from this study of 46 lambs certainly does not establish without doubt a practical method of lamb selection, but when added to the findings of other projects one can be reasonably assured that certain live

animal measurements can be developed and used as indications of carcass merit.

In this study several significant correlations between carcass length and various carcass parts were found as shown in Table IV. These findings coincide with the results of Knight, Foote, and Bennett (1959), who found that the average correlation coefficient of .84 between live animal measurements and carcass measurements reflected the relationship of size of live animal to size of carcass. They have done the only studies that deal specifically with carcass length as such. Some other researchers deal with linear measurements which will be discussed later.

TABLE 3

CORRELATIONS BETWEEN CARCASS LENGTH
AND MEASUREMENTS OF VARIOUS CARCASS PARTS

Carcass length	Weight of legs (trimmed)	r = .48
Carcass length	Chest circumference	r = .80
Carcass length	Weight of rack	r = .68
Carcass length	Weight of breast and shank	r = .19
Carcass length	Weight of shoulder and rack	r = .65
Carcass length	Weight of loin (untrimmed)	r = .68
Carcass length	Depth of fat at 12th rib	r = .17
Carcass length	Weight of meat of trimmed legs	r = .56
Carcass length	Loin-eye muscle area	r = .007

As the loin of any four footed animal is regarded as a desirable edible part, it seemed necessary to find some live animal measurement that would correlate to a high degree with the loin-eye area. It has already been established in this study that the loin-eye area and carcass length shows a low correlation. Likewise, as shown in Table 5, there is a correspondingly low correlation between loin-eye area and loin length. But the loin-eye area does show a significant correlation with loin width and type score (.52 and .46, respectively). This is understandable because of width of loin of the live animal being a factor in type score.

To substantiate this finding Orme et al, (1959)

found that steers of the same age, having the larger body circumference tended to have the larger rib eye. Again, Knight, Foote and Bennett (1959) show other live animal measurements such as metatarsus plus tuber calsis length significantly correlated with longissmus dorsi muscle width .63, depth .46 and area .66.

TABLE 4

CORRELATIONS BETWEEN LOIN-EYE AREA AND LIVE MEASUREMENTS

Loin-eye area	Loin width	.52
Loin-eye area	Type score	.46
Loin-eye area	Loin length	.03

The correlation coefficient between loin-eye muscle area and boned leg weight as shown in Table 5 is highly significant (.64). No less than six separate studies in the literature review specifically confirms this, namely; Palsson (1939), Palsson (1949), Knight, Foote and Bennett (1959), Orme et al, (1959), Botkin, Stanley and Schoonover (1959), Cahill et al, (1956), while others strongly hint at the possibility.

TABLE 5

CORRELATIONS BETWEEN LOIN-EYE MUSCLE AREA AND CERTAIN OTHER CARCASS MEASUREMENTS

Loin-eye muscle area	Boned leg weight	.64
Loin-eye muscle area	Carcass length	.007
Loin-eye muscle area	Depth of fat at 12th rib	.15

Another correlation of reasonably high significance (.62) was between hip width and weight of meat trimmed legs, or in other words, the leg bones, Hammond (1921, 1932), Palsson (1939), and McMeekan (1940, 1941, 1956) on many thousands of meat animals established a strong correlation between the weight of bones and weight of muscle tissue. McMeekan (1944) indicated that external measurements that show strong correlation with muscle will therefore be correlated with bone. Therefore if the leg, bone and muscle together or separately is to be a good index of muscle development it is understandable that the hip width of a live animal correlates with the weight of the legs.

TABLE 6

CORRELATION BETWEEN HIP WIDTH OF LIVE ANIMAL AND A CARCASS MEASUREMENT

Hip Width X Weight of meat trimmed legs	.62

Studies made thus far including the work of this author bring out certain findings which will lend themselves to a more efficient and profitable livestock program, namely:

1. A so-called "typey" animal may be a "wastey" animal with high fat proportions where muscle should be.
2. It is difficult and almost impossible to consistently identify muscular fleshing in live sheep by observation or "seeing" the animal with the hands.
3. The meaty animals are the ones with wide, deep bodies; wide, full heart girths; wide, thick loins; and plump, deep legs of mutton. (No different than the standards set for selection on the hoof or livestock judging.) The difference lies in the fact that we cannot always detect these characteristics accurately in the live animal.

It would seem, then, until some of the several new methods of identifying meatiness are perfected and

in use, slaughter methods are the only practical ways of identifying meaty animals at present.

The problem and purpose behind writing this paper, as has been previously stated, is to show a way to teach the vocational agriculture student or farmer how to better select breeding stock. If necessary this can be done by slaughter tests. In other words, we can teach a selection program by working from the carcass backwards, using the correlated factors we are reasonably sure now exist.

Nationally and somewhat locally a new innovation in educating the farmer in producing a meat type animal has developed. This is known as the carcass cutout shows. Varied are the procedures in handling such events but basically the idea is to identify shortcomings and potentialities of certain lines of breeding stock.

CHAPTER IV

A PROPOSED EDUCATIONAL ACTIVITY IN SELECTION OF SHEEP

This proposed lamb carcass contest is based as nearly on reality as possible. This is because it will be part of the author's program toward sheep breeding improvement work in a familiar area.

The Situation

Sheepmen of our country today are faced with so many obstacles that in order to survive in a highly competitive business with other countries many changes will have to be made. Faced with mounting production costs and low markets it is small wonder they can survive.

Competing beef and hog industries are making recent tremendous advances in putting more meat and less fat in animal carcasses. The "education" of the consumer away from excessive fats is being carried on ceaselessly by those who try to show scientific evidence that indicates fat as one of the major culprits in the nation's No. 1 killer--heart disease. The hog and beef men have been doing something about this, especially in eliminating the back fat and giving their animals the lean look.

To meet this situation the sheep industry is

bringing into practice the carcass cutout evaluation as a progressive follow-up to the on-hoof comparisons. This program is showing how the average judge does not have the ability to foretell the cutout and retail value of the lamb.

Interested segments of the industry--breeders of purebreds, commercial stockmen, feeders, and meat packers--all of whom have a great financial stake in the sheep industry must be educated to undergo this change to the new concept of animal selection.

Carcass cutout activities can and have been used as an educational device recently by all age groups interested in the sheep industry. These activities have become a part of the Junior Fat Lamb shows held each year.

Purpose of the Program

The purpose of a lamb carcass show would be to give students an opportunity to observe positively and objectively the type of offspring certain flock sires were producing. Also from an educational standpoint it might serve to bring out some breed differences. Notwithstanding all of this the community service performed by such an activity could be inestimable.

Method of Procedure

1. The motivation for holding such an event would be proportional to the students' awareness of the livestock situation in their area. Perhaps this unit should follow a series of marketing studies and a field trip or two where an opportunity was given the students to observe a well planned lamb carcass show in another part of the state.

At any rate such an ambitious undertaking should be within the auspices or sponsorship of a local service organization. Therein could be found resource personnel and the necessary support. Also, and a factor not to be taken lightly, this would add to the stature and prestige of the vocational agriculture program.

Printed material on other carcass cutout displays should be reviewed and adaptations made to fulfill the local objectives.

2. Besides service groups, those involved could conceivably be bank fieldmen, marketing specialists, county extension agents, and above all, a cooperating owner of a slaughter house or packing association.

3. The date to set for the contest should be about June 15. At this date more grass fat lambs will be at a market weight of from 80 to 85 pounds live weight.

4. Exhibitors should be contacted at least 6 months prior to the contest in order to ear tag lambs at birth and identify the lamb with the sire and dam. This will take a little planning and may even necessitate earlier control of the sire and flock breeding. Perhaps with the use of marking harness the sire's coverage of the ewe may be better recorded. A suggestion that the vocational agriculture student and the instructor follow this procedure from the beginning either actively or by observation should be considered. It would certainly establish rapport with the rancher involved.

Exhibitors should be allowed to show up to five lambs apiece if they desired.

5. Arrangements should be made for slaughter and necessary cutting and grading of the carcasses the day of the contest and for a place suitable to hold the event.

6. Students and ranchers should be allowed to observe the placing of the live grades on the lambs immediately before slaughter. Participation by all concerned would be desirable.

7. Since there is a time lapse between the live weight grading part of the show and the carcass evaluation some arrangements will have to be made to take care of this interval. Perhaps the show could be started in the afternoon of one day and concluded the forenoon of the

following day. The slaughter, cutting and chilling could be done on the evening between the two parts of the contest.

8. From an educational standpoint ideal lamb carcass standards should be set up. Following are standards worked out by the Rath Meat Packing Company for the Waterloo Meat Animal Show. These are suggested for use in a local lamb carcass contest:

Lambs will be weighed and ear tagged.

Lambs will be re-weighed for killing weights at the packing plant just prior to the kill. This is the weight that will be used for adjusting the live weight.

Slaughter floor data:

A. Pelt will be identified, weighed, and graded.

B. Digestive tract (esophagus, stomach, intestines) will be weighed so standard fill can be figured on the lamb.

C. Ear tag is placed on the hot carcass. Chilled carcass will be graded according to United States Department of Agriculture Government standards with a federal grader doing the grading.

Carcasses will be broken into front quarters and hind saddle with the last rib remaining on the hind saddle. This cut is made at right angle to the back bone. Front quarters and hind saddles will be weighed and the weight recorded.

The loin-eye and outside fat rind will be traced. Both loin-eye muscles will be measured with a planimeter and the sum of the two divided by 2 to get average loin-eye area. The fat rind thickness will be measured on each of the loin-eyes--with a measurement at the start of the curvature on each end of the loin-eye and at the center of these two measurements. The total will be divided by 6 for an average fat thickness.

Add or subtract 4 cents per cwt. carcass weight for each .01 square inch of loin-eye above or below standard.

Add or subtract 10 cents per cwt. carcass weight for each .01 of an inch loin fat below or above the minimum standard.

Carcass Weight	Sq. In. Loin-eye	Average Loin Fat
35-40	1.50	.20
41-45	1.75	.23
46-50	2.00	.26
51-55	2.25	.29
56-60	2.50	.32
61-65	2.75	.35
66-70	3.00	.38

Current market price per cwt. will be used to put a monetary value on each carcass. Pelts will be credited on a per pound basis.

To insure that exhibitors may not take advantage of "fill" or "shrink" in presenting their entries, Rath

researchers determined the normal fill of a market lamb. The viscera and its contents were found to average 33.7 per cent of the chilled weight, and this factor is applied as a correction to all entries. So the chilled carcass weight x .337 equals a normal filled tract.

The total value then can be calculated as follows:

Hind Saddle x Value per pound	=	$
Front Quarter x Value per pound	=	
Pelt Credit	=	
Total Value	=	
Total Value ÷ Adjusted Live Wt.	=	
Killing Cost	=	
Net Value per 100 lb. Live Wt.	=	$

Final ranking will be based on the value per cwt. of live weight.

Evaluation of the Program

This program is recognized to be extremely ambitious for a class of teen-age boys but if they are highly motivated and supported by adults the experience can be a memorable one. The danger that exists if proper planning is not done by the vocational agriculture teacher is that the students will be crowded out of their important roles in the project. It must be understood that the students are to be involved in every step.

A well thought out and coordinated activity of this magnitude will fulfill even the most demanding philosophy

of a vocational agriculture program in that there is an excellent opportunity for "learning by doing".

Lamb carcass cutout shows are excellent "result demonstrations" of the end product of a complete livestock cycle. The vividness of the effect of good or poor livestock selection practices is portrayed for even those who are only remotely connected with the livestock industry.

For the student actively engaged in livestock production there is absolutely no question left in his mind as to the standards he must strive for in producing a desirable lamb as long as he is acquainted with the requirements of the retail consumer.

At a recent Roseburg, Oregon Fat Lamb Show a simple device was constructed to help educate the visitors to the show. Any leader or teacher working with youth could find time to supplement a youth fair or lamb show with the following described display:

Four pairs of lambs were selected from donors. Each pair was purposely and obviously different in conformation and degree of fleshing than any of the other pairs as was possible to be. The two lambs that made up each pair were as identical in all respects as possible. Ideally, twins would be desirable. One lamb of each pair was slaughtered and dressed out for hanging on the hook, the body cavity held open for inspection so that

viewers could see the degree of internal fattiness. The four carcasses were hung in a transparent plastic case just above their penned counterparts. Appropriate signs invited the viewing public to "feel" and "view" the differences in the lambs. The degree of fleshing and fat covering of a wooled lamb is determined by manipulation of the backbone, shoulders and certain body parts. This the viewers were invited to do and at the same time they could check themselves by looking at the twin carcass. This activity was one of the most popular and better attended events at the lamb show.

Such devices as this are limited only as the imagination of the student and teacher is limited and exemplifies the best in educational techniques.

The follow-up evaluation and publicity of a selection activity of the types previously described will be one of the most valuable parts of the educational service to the community and to all cooperators. The resultant publicity of a lamb carcass show can be visualized to strengthen the breeding program of any individual exhibitor or of the flocks in the entire community. Here is proof positive without subterfuge, bias or traditional concepts that a livestock breeder is or is not fulfilling the demands that the retail public has placed upon him. This is a starting point for him in his breeding program

and if he is wise he will follow through and demand an opportunity to participate in future carcass evaluation events in his community.

Internationally the lamb carcass cutout show is coming to the forefront. Many Cinderella stories of the show ring have emerged as often the rejected lamb of the show ring has topped the entire class after slaughter evaluation. As these stories continue to be told it becomes more apparent that there is much work to be done to reconcile the live animals with the retail cuts the housewife, the final judge, demands.

A revamped educational program by our agricultural educators can provide a lot of answers to the bewildering problems faced by our livestock men.

If by any techniques or tools of education the educator can bring about a change in animal breeding programs, the results will make their mark favorably in the entire program in feeding this nation as well as other nations depending upon us. The livestock man will follow if shown the way.

To summarize the benefits to agriculture of this new method of evaluating lambs in a selection program does not complete the list of benefits. It is necessary to evaluate any educational program in the light of what it can do for the student. The vocational agriculture

program has a primary purpose in developing leadership in agriculture, citizenship, and cooperation.

In working at such a project as we have been discussing, the student finds himself part of a group working toward a well defined goal. He will learn to accept responsibility and to evaluate the results achieved. Experience gained in sound well managed cooperative activities will make him a better farmer and a better citizen.

CHAPTER V

SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

Summary

This study was designed for the purpose of exploring some carcass characteristics that a vocational agriculture teacher could employ in teaching better selection methods in sheep production to his students or to farmers in an adult program. Data on 46 lambs were analyzed as a basis for identifying characteristics.

Established in this study is a strengthened theory that there is a close relationship of both bone and meat of the legs and the loin-eye muscle area. This would be of definite commercial value.

In turn, the weight of the leg is related to live animal hip width and carcass length. Both of these live animal characteristics are easy and convenient to measure.

The loin-eye muscle area is related to live animal loin width and typiness. This, too, is a measurable qualification that is recognized as an indicator of meatiness in livestock.

Although all of these correlations are statistically significant, none are high enough to be of predictable value, when one considers selection for cuts of meat of

high commercial value, such as leg and loin.

This study can be regarded as one more bit of evidence that there may be some relationship between live animal measurements and carcass parts.

A practical teaching aid that is rapidly becoming of universal use in the livestock industry and in agricultural education groups is the various carcass cutout shows. These are suitable for direct use by the vocational agriculture teacher and the student. The value of this type of teaching lies in the student's first-hand observation of the procedure with the opportunity to evaluate results and to draw his own conclusions.

Recommendations

For some time and until much more supporting information can be collected, this work on correlation of carcass parts should be kept in the category of research. This information is not recommended for use by the teacher or county agent as an established theory, but should be used as a part of his training and speculation.

It is further recommended that more studies be made involving other factors:

The loin width of the live animal, determined by calipers, should be studied in correlation with the weight of the fat trimmed loin; the weight of the leg less

the bone; and the weight of the leg that has been fat trimmed.

In turn, such measurable characteristics of the live animal as the depth of twist and heart girth should be studied in correlation with the weights of the highly valued commercial carcass parts.

The visible live animal measurements which are convenient to obtain rapidly could very well be related to the weight of commercially important parts. It is felt that weight is a more accurate measure of quality than area of linear measurements.

It is further recommended that more carcass shows be promoted on a carcass cutout basis, even on a community basis. It is very possible for an individual rancher to hold his own carcass cutout contest. The rancher can soon find out privately how he stands in this matter of carcass improvement before exposing himself to criticism before a large audience.

Conclusions

To perceive and admit the necessity for change is never easy. But when "on the hoof" judges of our livestock shows fail so often in predicting "on the hook" placings of meat animals, some new techniques of evaluation need to be developed. Especially is this so when our

entire sheep industry is so dependent upon the guidance and teaching of those few colleges and graduated teachers that are trying to lead the way.

As far as the sheep industry in the United States is concerned it must of necessity switch from the present conventional methods of show-ring judging or be beaten out of the market by the Australians and New Zealanders. Also it is going to have to put on special effort to catch up to the rapid strides being made by the swine and beef industry.

Vocational agriculture teachers must be prepared and willing to lead out with any new innovations proven successful by our animal scientists. This will be necessary if they propose to maintain their present status as community leaders and fulfill their role as an educator in agriculture.

BIBLIOGRAPHY

1. Botkin, M. P., Marion Stanley, and C. O. Schoonover. Relationships between lamb measurements and meatiness. Journal of Animal Science 18:1165-1166. 1959.

2. Branaman, G. A. Some factors in lamb production associated with size and type in mutton sheep. Journal of Agricultural Research 60:473-486. 1940.

3. Cahill, V. R., L. E. Kunkle, E. W. Klosterman, F. E. Deatherage, and E. Wierbicki. Effect of diethylstilbestrol implantation on carcass composition and the weight of certain endocrine glands of steers and bulls. Journal of Animal Science 15:701. 1956.

4. Clarke, E. A., and C. P. McMeekan. New Zealand Journal of Science and Technology A 33:1-15. 1952.

5. Fowler, Stewart H. Let's raise meat type sheep. The Shepherd 6:3. February, 1961.

6. Hammond, J. Anatomy of meat animals. Resume of a lecture given to the Institute of Meat Teacher's Conference at Cambridge. Truslove and Bray, Ltd. West Norwood, England. 1955.

7. Hankins, D. G. and Paul E. Howe. Estimation of the composition of beef carcasses and cuts. 1946. 20p. (U.S. Dept. of Agriculture. Technical Bulletin 926)

8. Hankins, O. G., Bradford Knapp, Jr., and Ralph W. Phillips. The muscle bone ratio as an index of merit in beef and dual purpose cattle. Journal of Animal Science 2:42. 1943.

9. Hirzel, R. Factors affecting quality in mutton and beef with special reference to the proportions of muscle, fat, and bone. Onderstepoort Journal of Veterinary Science 12:379. 1939.

10. Knight, A. D., W. C. Foote, and James A. Bennett. Some relationships of live animal and carcass measurements to carcass characteristics and breed type differences in lambs. Journal of Animal Science 18:1167. 1959.

11. Maryland carcass show. The Shepherd 5:14. July, 1960.

12. Matthews, D. J., R. A. Merkel, J. D. Wheat, and R. F. Cox. A technique for measuring the cross-sectional axies of the longissimus dorsi muscle and fat depth in lambs. Journal of Animal Science 19:803-809. 1960.

13. McMeekan, C. P. Growth and development in the pig, with special reference to carcass quality characters. Journal of Agricultural Science 31:1-49. 1941.

14. McMeekan, C. P. Beef carcass judgement by measurement. The Pastorial Review and Graziers Record. 66:1273. 1956.

15. Orme, L. E., A. M. Pearson, W. T. Magee, and L. J. Bratzler. Relationship of live animal measurements to various carcass measurements in beef. Journal of Animal Science 18:991-999. 1959.

16. Orme, L. E., J. W. Cole, C. M. Kincaid, and R. J. Cooper. Predicting total carcass lean in mature beef from weights of certain entire muscles. Journal of Animal Science 19:726-734. 1960.

17. Palsson, H. Meat qualities in the sheep with special reference to the Scottish breeds and crosses. Journal of Agricultural Science vol. 29, p. 544, vol. 30, p. 1. 1939, 1940.

18. Palsson, H. Meat qualities in the sheep with special reference to the Scottish breeds and crosses. Journal of Agricultural Science 29:544-626. 1949.

19. Robinson, T. J., F. E. Binet and A. G. Doig. Fat lamb studies in Victoria. I. Aust. Journal of Agricultural Research 7:345-365. 1955.

20. Schoonover, C. O. and P. O. Stratton. A photographic grid used to measure rib eye areas. Journal of Animal Science 16:957-960. 1957.

21. Snedecor, G. W. Statistical methods. 4th ed. Ames, Iowa State College Press. 485p. 1946.

22. Stauffer, J. R., D. E. Hogue, D. H. Marden and G. H. Wellington. Some relationships between live animal measurements and carcass characteristics of lamb. Journal of Animal Science 17:1151. 1958.

23. Walker, D. E., and C. P. McMeekan. Canterbury lamb. New Zealand Journal of Science and Technology 26:51-73; 99-120. 1944.

24. What price ring glory? The Shepherd 6:2. February, 1961.

25. Wythe, L. D. The relationship of bone to muscle in beef carcasses. Reciprocal Meat Conference, Chicago, Ill. Proceedings 11:209-215. 1958.