The purpose of this outline is to list the more common tests and measurements which may be performed on beef. References which provide procedures are also given for making the various tests or measurements. It is not the purpose of this outline to furnish all the tests and measurements which may be performed on beef.

I. Physical Measurements.


B. Marbling.

1. Determined by ether extraction of the rib eye. (See reference for fat chemical tests).

2. Descriptive evaluation as used by U.S.D.A. Grading Service using one through eleven gradations. (FMA Regulation No. (1)).


C. Color.


D. Tenderness. Tenderness score by mechanical shear on the cooked sample. (Warner-Bratzler shear test as reported by Professor Bratzler at the 2nd Annual Reciprocal Meat Conference, 1949).

II. Chemical Tests.

A. Fat.


B. Total Nitrogen. (Kjeldahl-Gunning-Arnold method given in AOAC).

C. Non Protein Nitrogen. (Method given in AOAC).


III. Organoleptic Tests.

A. Tenderness, juiciness, flavor of lean fat, aroma, texture, and color of lean and fat.

B. Method of conducting tests.

1. Prepare ninth, tenth and eleventh rib of opposite side when possible or the seventh and eighth rib of the same side by roasting according to the standard procedure given by "Meat and Meat Cookery" of the National Live Stock and Meat Board.

2. Palatability committee of at least five members to estimate tenderness, juiciness, flavor of lean and fat, aroma, texture, and color of lean and fat using Meat Cooking Record Sheet No. 7 as developed by the Cooperative Meat Investigation Committee and in "Meat and Meat Cookery."

IV. Histological Samples.


V. Physico-Chemical Tests.

MR. HANKINS: We made some recent studies on this item A here, that is, separable lean, fat and bone of ninth, tenth and eleventh rib cut, especially to get at the question as to whether the method works as well with a group of cattle that are quite uniform in weight. In one case we had 84 steers, as I remember it. Those 84 steers varied widely in weight and age and fatness, and what have you. So recently we pulled out a group -- I cannot tell you now just how many it was, but we pulled the hearts out of these 84 so we could narrow it down to a narrow range of final weights and we ran the correlations again and we found very little change in the correlation values.

I think you will be interested in that. Some of you boys are facing the job of evaluation work in connection with breeding projects where they aim at a certain final weight. This would indicate that the uniformity of the final weight is no obstacle to the use of this method.

MR. ADAMS: Thank you very much. I need some encouragement because I have work to do with this regional group 3 laboratory.

MR. WANDERSTOCK: On this Munsell color method, we use the spinning disk method, and it is rather laborious to get your final hue, chromo, and so on, values. It is also rather difficult to interpret the results once you get the three values. After we had determined the values and had gotten a preliminary idea what the values represented, I wrote to the Munsell Company and asked them if they could check the interpretations. Those of you who are using the spinning disk, Munsell system might write and send a summary of your data to the company for checking. They did not charge us for the service and I am sure they won't charge you. It has given us a more expert idea of just how we are interpreting the data.

MR. PEARSON: I have several comments to make.

First of all, I think under the ether extraction we should add the words "of the rib eye" there or some particular muscle. Otherwise, I think we will run into the intermuscular fat as well as the intramuscular fat.

Then the question of juiciness. I rather question the desirability of the Carver Press as a measure of juiciness. In a questionnaire which we conducted last year, there was very little confidence expressed in the Carver Press as a measure of juiciness. I think Dr. Hall may have some comments to make on that.

Then finally on coming to the chemical test for fat, I should like to state that the specific gravity method is not adapted to small cuts and small samples. As I understand it, it was developed for carcass measurements.

MR. ADAMS: Dr. Hall, would you like to carry on about the Carver Press?

DR. HALL: I agree with what Dr. Pearson has to say about that. The business of getting a juice sample from a piece of meat by the use of the Carver Press has some general applications, but I don't believe one of them is to try to correlate with the palatability quality with regard to
the juiciness of the meat. We continue to use this procedure for purpose of obtaining press filler for analysis. We determine total nitrogen and non-protein nitrogen, and sometimes in organic phosphorus in press fluid and that gives a measure of various factors which can be used to correlate with the changes that take place in meat during storage, freezing or aging.

It has some merit for that use, but as an attempt to correlate it with palatability quality of juiciness, I don't think it is much good because of a number of reasons. A variation in the pH of meat can cause a tremendous difference in the amount of fluid that can be pressed out of it. Ordinarily if you have a normal carcass that is not going to vary much. You will strike the bottom value of the pH around 5.4 for beef, and there is a greater variation in pork. If you have one that is a little skimpy on lactic acid, as I mentioned a while ago, its pH will be a little high and it just won't come out and you will not register a corresponding deficiency in the way it tastes when you eat it.

MR. ADAMS: I wonder, then, if it would not be advisable to change the heading of Section E from Juiciness and just call it "Press Fluid," because that is, after all, what we are actually determining as the physical measurement and I think that should clear that up, because if you are going to run some of these tests on the press fluid, there is no reason you should not enter that as part of your data.

MR. AUNAN: Shouldn't that second statement also be changed, "Use of the Carver Press for obtaining press fluid" instead of "measuring" or "extracting"?

MR. ADAMS: Let's change that to extracting.

There is one other thing that I want to clear up now and that is the use of this modified Babcock method. Davey, do you want to take the floor on this and tell us a little about it?

MR. MACKINTOSH: I don't know how much Dr. Hall is going to say this afternoon, but I am going to say from the standpoint of a layman, not a chemist, that statistically the results obtained on the modified Babcock test, using Dr. Hall's classifications are very much more uniform and within a much narrower margin than the standard method of procedure now used.

DR. HALL: I think Davey misunderstood me a little. Dr. Pearson is going to discuss that this afternoon.

There is one other point in this same section. I think it is a matter of wording. No. 1 under fat, "Ether extraction of fat of the ninth, tenth and eleventh rib cut." Do you mean that you are going to extract all of the fat out of that cut with ether?

MR. MACKINTOSH: No, that was just corrected.

DR. HALL: That correction was made on the first page.

MR. MACKINTOSH: I made the correction here. It should be followed up over here.
MR. COLE: I am constantly quizzed by Dr. Warwick, who is the regional beef coordinator, about how we might do a little better job of analysis or evaluation of carcasses without tearing up the carcass too much. In other words, this is the problem they are faced with: They have to sell these carcasses to the packing plants and how can we get the most information maybe from a small sample? For instance, take the twelfth rib. Can we get the chemical analysis and maybe the shear test either from one rib or one of that area that possibly the packer would let us have and then we would not be out too much expense and it will give us a lot of good information.

MR. HANKINS: From my point of view there is only one way to determine that question. That is to set out and accumulate a set of data. It may take considerable data.

While I am on my feet I might say that we have the same question thrown at us more or less -- well, I would say more or less frequently, but when it comes, it is a serious question. We did some work recently on the area of the eye muscle in relation to weight of lean. We also did about the same time work on the thickness of fat over the eye in relation to the weight of the fat. You cannot do anything with percentages there. You get lost. But you can do something with weights. Having estimated a weight of lean and a weight of fat, then, of course, you obviously have a ratio which may be very useful to you between fat and lean, and still from those prime, basic data having a way to get at the weight of the bone. But I think, Bill, that aims in the direction that Warwick has been trying to steer you.

MR. MACKINTOSH: I think we should remember, however, at least it is my recollection, that all our data to date indicates that the usefulness of the Warner-Bratzler shear is limited to the cooked sample and not the raw sample.

Any other changes? If not, do I hear a motion to adopt this?

MR. PEARSON: I so move.

CHAIRMAN BRAY: Second.

MR. MACKINTOSH: All those in favor of accepting this in addition to our standard procedure signify by saying "aye"; opposed. All right, we have adopted another section.

The third part is measuring and grading carcass beef. That is by Mr. Naumann from Missouri.