At your first Reciprocal Meat Conference, held a year ago, the ques-
tion of what method to use in cutting hog carcasses for experimental work was
raised, and apparently not satisfactorily answered, as your program committee
has given me that assignment for discussion today.

The basic consideration in cutting pork is to divide the carcass
into a series of uniform cuts with specific uses.

With this in mind, and the fact that in research, for example, prob-
lems dealing with breeding, feeding, management and grade, where yield is a
major consideration, a uniform method for cutting hog carcasses is imperative.
Thus in 1929, the Conference of Representatives of Institutions engaged in Co-
operative Quality in Meat Investigations adopted a standard procedure for cut-
ting hog carcasses. There is little guess work in this procedure as it re-
lates to untrimmed cuts, which are made at definite anatomical points. This
method is not perfect, but it does have the advantage of being as near a uni-
form procedure as can be followed by those of us engaged in cutting hog car-
casses for research purposes. My belief is that the procedure as adopted was
one generally practiced by packers at that time.

Before proceeding further I would like to outline briefly the cutting
procedure we follow at the laboratory at Beltsville. First, the warm dressed
carcass is center split, the leaf fat is loosened by left hanging, the head is
dropped at the atlas joint and the hams are not faced. In other words, before
chilling we remove only the contents of the thoracic and abdominal cavities.

After the carcass is chilled approximately 72 hours it is cut into
various parts. This is done by continuing the cut through the atlas joint,
removing the full cut head. The ham is removed by cutting at right angles to
the shank between the 2d and 3d sacral vertebrae. It is trimmed by removing
the tail bone and cutting away the surplus fat from the face, cushion side,
flank side, and pelvis and rounding the corners of the butt slightly. The
shank is removed at the upper point of the hock.

The shoulder is removed at right angles to the side at a point midway
between the attachment of the 2d and 3d ribs. The shoulder ribs and neck bones
are removed. The shoulder is then separated into picnic and butt, beginning
at the point where the neck bone was removed and cutting at right angles to the
shoulder. The shoulder butt is separated into clear plate and Boston butt,
leaving not over 1/2 inch of fat on the butt. The picnic shoulder is trimmed
by removing the minimum amount of meat necessary to make a smooth, well shaped
shoulder. The foot is removed at right angles to the hind shank and about one
inch above the knee joint.

The middle piece is divided into rough back and rough belly on a line
connecting the ventral side of the tenderloin muscle at a point just below the
chine bone of the third rib. The cut is made at right angles to the table
while the middle piece is lying normally. The backfat is removed from the loin allowing about 1/4 inch of fat to remain on the loin.

The bacon is trimmed by removing the spareribs, keeping the knife close to the bone and leaving the white cartilagenous ends of the rib in the bacon. The ends are square and the belly side trimmed on a line just above the teats.

The kidneys and tail bones are weighed as one. The leaf is weighed separately. The trimmings from the ham, shoulders and bacon are divided into lean and fat trimmings and skin, then weighed.

Undoubtedly you will ask, or at least be thinking, why do we not change our cutting method to conform to that of the packer method? A fair question for me to ask is, "Do the packers have a method?" In my observation, after working in several packing houses in widely separated areas of the country and in one packing house at frequent intervals over a period of a year and a half, - they do not have a uniform standard of cutting. They use basically the same principle we do but many of them vary cuts to suit the market. As an example, last year I was working in a packing plant where the cutters would leave at least an inch and a half of back fat on the bacon and three-fourths of an inch of fat on the loin if one did not watch them all the time. At this plant we were studying the effect of the introduction of the meat type hog in commercial distribution. The cutting method that was to be followed in our study was different from the one in general use at this plant. Therefore, it was necessary for close supervision on our part, if we were to get reliable and comparable data. This year the story is quite different - the cutters follow the scribe line in separating backfat and bacon and I even noticed that they retrimmed the lower side of the bacon after our part of the work was finished. The loins were also trimmed very closely. The reason for this change in procedure is that this packer has too much green uncured bacon in the freezer.

An example of another procedure might be in order. At a certain plant, instead of separating the picnic shoulder and butt at the point where the neck bone was removed and cutting at right angles to the shoulder, the procedure was to cut across the humerus bone and make a small "picnic ham" and a large shoulder butt. In the case of the bacon, this packer was following the scribe line. Why was the packer cutting a large shoulder butt? Because it was a money maker. I have no quarrel with the packer for these changes. But such changes cannot be made when one is getting comparable research data.

During the past 15 years there has been a definite trend by packers to skin their hams and now it is nearly a universal practice. A ham without the thick layer of fat has a strong appeal to one who is purchasing it, and with keen competition among meat packers, it soon became a universal practice, except for certain specialty hams, such as the Smithfields.

Another packer practice is that of cutting the jowls loose and removing the head. From the packer standpoint, this is good practice, but we as research men need to know what the head weighs. It is part of the carcass and must be accounted for. The removal of the leaf fat on the killing floor facilitates chilling, but it is a part of our original animal. Some day we may find that leaf fat is a good index for some quality factor.
The procedure we use at Beltsville for cutting hog carcasses is not perfect but it has been consistent. It is an error when we leave from 1/4 to 1/2 inch of fat on the trimmed loin. If the untrimmed loin had only 5/8 inch of backfat, practically all of it remains on the loin, whereas in a carcass with 2 inches of backfat, nearly 75 percent of it is removed.

We at Beltsville are very reluctant to make any change in the method of hog cutting that was recommended by the Co-operative Meat Investigations Committee. If any change were to be made at this time, the data obtained in our breeding experiments involving Danish Landrace hogs and certain American breeds and crosses would be of no value unless we made certain corrections. For example, in an analysis of 1700 hogs, all cut as previously outlined representing 17 breeds and crosses, we found that the yield of the five cuts based on live weight at slaughter of approximately 210 pounds varied from 38 to 51 percent. This represents a variation of about 30 pounds in weights of preferred cuts. Without a uniform cutting procedure this would not have been possible. It is of interest to note that of these 1700 hogs, about 2 percent met the proposed ideal of 50 percent or better.

Applying this principle to our studies of breeding to establish superior strains of swine, we found that the earlier Danish Landrace-Poland China cross had a yield of preferred cuts of approximately 47 percent. The latest average for this line is nearly 50 percent. This represents an increase of approximately 7 pounds of preferred cuts.

With the distribution of the meat type hogs among the breeders to study the effect on improving our market hogs, it is necessary that we cut the carcasses of hogs resulting from these matings in the same manner as that used in developing them. Leaving that inch of backfat on the bacon, as practiced by many packers, which incidentally you and I do not like to buy at bacon prices, would indicate such breeding procedures result in a marked increase in yield of preferred cuts.

All of us would like to know which breed or strain or cross of hogs is superior. But we cannot compare the results of the work of one station with that of another unless both use the same cutting procedure, not only this year, but also in the years to come. True enough, certain correction factors can be calculated and applied. We have worked out some and have found occasion to use them, but they are only estimates and are not recommended except as a last resort.

As previously stated, it is now a universal practice to skin hams. But do we, as research workers, want to do that? Are we not as much interested in how much fat the ham has, as in how much backfat the carcass has? The fat on the ham is an integral part of the hog. Fatness is one of the important considerations in plumpness. As we reported several years ago, the correlation coefficient between index of plumpness and separable fat in the ham of Poland China hogs was .58. A closer and highly significant relationship was that of ratio of edible to inedible meat with plumpness, or + .79.

The skinning of hams is not a uniform procedure, and if it is done another error is introduced. I have observed that in one packing plant skinning was started about two-thirds of the distance from the butt to the hock of the ham. Moreover, some cutters take off only the skin until they are within a couple of inches of the butt, then make a rather deep cut, ending up with little or no fat. Others end up with a quarter to a half inch.
However, if it is necessary to have skinned hams, by all means record the weight of the ham before skinning as well as after. We are following this procedure in work at one packing company.

Another question that is troubling several research workers is whether to cut the entire carcass and record weights of the cuts, or for economy's sake cut only one side. I have had only limited experience with this procedure. But that limited experience has led me to believe it is not a particularly desirable procedure. It is more by accident than by good splitting or cutting procedures that one gets both sides split evenly or a pair of hams trimmed to the same weight.

As an example, I took at random 50 hog carcasses that had been cut this past winter at the laboratory. All these hogs were of approximately the same live weight when slaughtered and were slaughtered under uniform conditions. The same man split all the carcasses and the same 2 men cut and trimmed all the cuts. The right ham weighed more than the left 15 times, the left ham was the heavier 30 times. In only 5 cases, or 10 percent, were they the same. The variation, using the right ham as a base, was plus 1.1 to minus .5 pounds. In the majority of cases the variation was .3 or .4 pound. On the average the left hams weighed .23 pound more than the right.

With the bacon the analysis was quite different. The left bacon average .71 pound less than the right. Of the 50 carcasses, 36 had the heavier right bacon, 8 had heavier left bacon, and in 4 the right and left bacon weighed the same. The variation was plus 1.0 to minus 2.4 pounds much larger than for the hams.

With the picnic shoulders, in 22 cases the right side cut was heavier and in 38, the left. The variations between right and left were more in favor of the left picnic shoulder, as the average for the 50 cases was plus .15 pound. The variation was plus 1.2 pounds to minus .6 pound.

This analysis would indicate that the cutting of only one side is not a recommended procedure. However, if it is absolutely impossible to get the two sides cut, a better procedure mathematically would be to calculate the yield of the individual cuts based on the half carcass weight. Then apply these percentage figures to the weight of the other half carcass, thus obtaining a calculated weight for the corresponding cuts. Thus the new weights will be more representative than that of doubling the weights from the one side.

As a final point with respect to results that can be shown by a uniform cutting procedure, the following analysis was made of hog carcasses varying in average thickness of backfat from 1.2 to 2.2 inches at .2 inch intervals. Each group of hogs had an average slaughter weight of approximately 212 pounds. The six groups of carcasses with approximately 1.2, 1.4, 1.6, 1.8, 2.0 and 2.2 inches of backfat had 11.0, 13.0, 13.9, 16.7, 17.7, and 19.4 pounds of skinned backfat. This is as consistent an increase as would be expected. The same increase was noted for cutting fat - it increased from 5.2 to 8.2 pounds. Leaffat, which I have already mentioned, increased from 5.0 to 7.6 pounds.

Weight of ham changed little as backfat thickness increased. However, weight of bacon increased with increase in thickness of backfat until the latter reached approximately 2.0 inches, then the weight of bacon decreased. In the case of picnic shoulders and loins, there was a gradual decrease in weight,
whereas the shoulder butt remained about the same weight until the backfat thickness of 2.0 inches had been reached, after which there was a sharp decrease. These results are of interest from several points of view. But I have used them only to illustrate what can be determined by a uniform method of cutting, as practiced in our laboratory.

In addition to cutting yields as an index of hog carcass merit, we have developed and used other procedures that can be easily duplicated.

In certain studies we are desirous of knowing the amount of lean and fat in the cross section bacon. This is obtained by making a cross section cut of the bacon at the sixth rib and photographing it. A standard distance is used in setting the camera as well as size of negative. The picture is blown up to a workable size, or about 3 times. The area of lean, as well as that of the entire area, is determined by a planimeter. The area of the lean is then subtracted from that of the whole and the difference is that of the fat. These area figures are then expressed as a percentage.

From this study we find that area of lean in bacon varies from approximately 12.5 percent to 37.8 percent. The ideal seems to be about midway or about 26 percent. From a study involving 47 Danish Landrace, 53 Poland China and 48 Duroc hogs produced at Beltsville under uniform feed and management conditions, the same average type and individually slaughtered at approximately 225 pounds, we found that the average percentage area of lean in Landrace hogs was approximately 26.7 percent; Poland China, 24.0 percent, and Duroc 21.3 percent. Average thickness of backfat and percentage of fat, including back, leaf, plate and cutting fat were intermediate for the Landrace, least for the Poland China and highest for the Duroc. These results indicate thicker muscling of the Landrace than of the two American breeds.

Another valuable observation we made for evaluating muscling in hogs is the area of "eye" muscle. This is made by tracing the "eye" muscle at the last rib which is then measured by a planimeter. For example, the following areas of "eye" muscle were found in hogs representing certain breeds and crosses: Landrace X Chester White, 4.50 sq. in.; Landrace X Poland China, 4.26 sq. in., whereas the four-way cross of Duroc X York X Landrace X Hampshire was only 3.60 sq. in. The Landrace X Chester White hogs also had the highest yield of preferred cuts.

CHAIRMAN BUTLER: Thank you very much, Mr. Hiner. Discussion for this particular paper will be led by Mr. R. L. Henrickson of Kansas State, please.

PROF. HENRICKSON: I am sure that you will all agree with me that this has been a very interesting and timely topic for discussion, mainly because I think we all have an eye on the work that is being done up at Austin, Minn., at the Hormel Packing Company, as well as perhaps some of the other work being done throughout the states.

I am sure that this paper has brought up some questions, and if any of you have questions to direct to Mr. Hiner at this time, let us have them.
CHAIRMAN BUTLER: I have a question: What about this hypothetical percentage for top quality bacon, half fat and half lean? Did you ever reach that?

MR. HINER: You mean on that area of lean that I was speaking of? Well, when you get an area of 50 per cent lean and 50 per cent fat and get that cooked you have a rather hard piece of bacon that is all drawn up. We find that the average is around twenty-six per cent. That seems to be desirable. In fact, I think we have never quite reached 55 per cent. I think some of our highest figures run close to 40.

CHAIRMAN BUTLER: I have heard that Wm. Reneker had stated that the Minnesota breed of hogs, as developed by the U.S.D.A. in conjunction with the Minnesota group, did not have the quality of lean that some of the other hogs have. Do you have something on that?

MR. HINER: No, I am not acquainted with that at all.

PROF. BRATZLER: We have had more Minnesota No. 1 brought into Michigan than perhaps existed in the State of Minnesota, due to the fact that a co-operative packing company in Detroit brought in these boars and gave them to the farmers free. We have just recently been working on the second year, or the third in fact, testing some of these crossbred hogs. We did not have any of the straight bred Minnesotas to test, because the farmers were not selling any gilts or boars. They needed them all to keep ahead of the demand.

As far as quality goes, as to the lean, I do not think Mr. Reneker has a leg to stand on. A year ago we took tracings of the belly and also of the ham, of about 700 hogs and there was not any particular difference in the Minnesota No. 1 hogs; that is in the crossbred carcasses.

I would like to strengthen Dick's assertion there. I would not like to eat bacon that had 50 percent lean and 50 percent fat. I thought I sensed something yesterday when we were talking about this fat problem. I think we should keep in mind that while we would like, perhaps, to have a pork loin all lean, or with very little fat, we still need, as Dick said, maybe about 60 to 70 percent fat in our bacon. I do not like to think of the livestock growers going to the other extreme and getting them too long and stringy.

PROF. BULL: Mr. Chairman, I would like to call attention to the fact that you men are talking about percentage of surface area, not percentage by weight. A lot of bacon bellies will trim out 50 per cent lean and be perfectly good, well-finished bacon. There is a difference between percentage by weight and the percentage by surface area, which Mr. Hiner is talking about.

PROF. WILFORD: Remember, he took the sixth rib, too. The bacon changes from end to end. Everybody knows that.

PROF. BRATZLER: I might say, also, that the Minnesota crossbreds cut out just an average hog. They were not the most superior and not the most inferior. Some of the straight breeds cut higher than the crossbreds. They did improve the Durocs, I will say that.

PROF. COLE: Bob, I would like to have Mr. Hiner amplify a little more on this matter of leaving the head on or taking it off, as the packers do.
MR. HINER: Well, the head is part of a hog, and if you are selling a hog carcass, you should keep the head on, because there are differences in the weight of the head. Some of them are heavy jowled. That influences the yield of the animal, and I think it is something we know in our research work.

The packers generally drop the bony portion of the head and take that out. It does not make any difference whether you get the weight of a jowl or the weight of a bony portion, as long as we get the weight of the head.

PROF. COLE: How do you figure the weight of the head? What value do you give the bony part in evaluating the carcass?

MR. HINER: We use the weight of the ham, the loin, bacon, picnic shoulder, and the shoulder butt, and base their yield on the slaughter weight on the hog. Of course, we are aiming for hogs that would yield at least 50 per cent in these five cuts. After all, what you are after is the yield you have when you take it in the yard. The other 50 per cent is made up of fat, head, etc.

PROF. COLE: You mean you leave fat in that?

MR. HINER: Yes. Of course, we do not put too much stress on dressing, because if you are figuring dressing weight of the head, that would cause considerable variation.

PROF. WILFORD: Did the weight of the head include the jowl?

MR. HINER: Yes.

PROF. WILFORD: You cut right straight around it?

MR. HINER: Yes, right straight over. I believe the Conference recommendation on that was to cut the jowls loose, but we cut the entire head off.

PROF. HENRICKSON: How do you account for the stomach and intestines? Is that part of the yield?

MR. HINER: No. But it would make up part of that other 50 per cent. We take primal cuts and base their yield on live weight.

PROF. FARWELL: Dick, along the same line, there is a little controversy over how long an animal should be kept off feed before slaughter. What do you recommend as far as your work at Beltsville is concerned? How long do you shrink hogs?

MR. HINER: We shrink all our hogs 24 hours, and give them nothing but fresh water.

PROF. WELLINGTON: What does the shrink amount to?

MR. HINER: I do not know exactly. We aim to take our hogs off the test at 225 pounds, and I think the average slaughter weight is around 212 to 215, which would be about an eight to ten pound shrink.
PROF. CHRISTIAN: I was wondering if there was any significant difference in the economy of gain of these crossbreeds and so-called fat-type hogs, especially these Landrace crosses.

MR. HINER: I do not know. I am not in too much on the production end of this, but just as a casual observation that I made, the crossbreds usually come into slaughtering pretty early, which would indicate some of them are pretty fast gainers. I think the variation within a breed is probably as much as between crossbreds and pure breeds.

PROF. HECK: I would not venture to stick my neck out on that right now but we, at the University of Arkansas, have a cross of a Minnesota No. 2 boar on Poland China sows. We have some of the pigs on feeding trials now to test with inbred Polands to see what the efficiency of production is. This is their first year with the crossbreed.

I might just say this in observation of the crossbred pigs. I am telling all the boys the crossbreds are a pig and a half long and a half a pig high, which are pretty nice type pigs. They look very nice as compared with the other pigs. We are going to run some meat tests and cut-out values on them this fall and this winter.

PROF. HENRICKSON: Are there any further comments?

DR. BRADY: I did not get that, Dick. If you got 26 per cent lean area, did you have a figure that related that to what Professor Bull was talking about, and how much lean that is on the side?

MR. HINER: No, we have not figured the physical separation of the fat and lean as compared with the preliminary reading.

PROF. WELLINGTON: I just wondered what you considered the most desirable thickness.

MR. HINER: Desirable thickness -- you mean back fat?

PROF. WELLINGTON: The thickness of the bacon.

MR. HINER: Oh, thickness of bacon.

PROF. WELLINGTON: You said 26 per cent lean area. How thick do you like to have it?

MR. HINER: I do not imagine the thickness would make very much difference, but offhand I would say a thickness of about an inch and a quarter to an inch and a half would give you a pretty nice piece of bacon.

MR. WARNER: I wish to raise a question. These five principal cuts that are used for evaluating the efficiency of a hog contain the bacon which in my understanding, in my experience, is not a lean cut, but a fat cut. Ham and loin percentage of the carcass increases with the thinner hogs - with the meat-type hogs; the percentage of bacon increases with the fat-type hogs. Now, all five of them are important, but do we cloud the issue or do we confuse ourselves when we measure or evaluate a pig on the basis of his comparative yield
of really four lean cuts and one fat cut? Would the ham and the loin and the skinned butt and the picnic alone be a better measure of the meat-type pig than those four cuts plus the fat bacon?

MR. HINER: I might give you an idea of our thinking on that line. The five cuts we considered are the cuts that we are looking for in a hog. We fully realize that the bacon is a fat cut and does increase with fat. However, if I remember correctly, on some of the early work that we did with the Danish Landrace hog, we found that, that animal had a higher yield in relation to the American breed hog of the same weight, 225 pounds.

This bacon question is one that will probably be thrown around for quite a while, because bacon is a fat cut and does have a tendency to cloud the picture some. I do not know what to do with it. We all want bacon.

PROF. FARWELL: Perhaps using the fat cut in connection with the lean cuts keep us from basing our judgment on what a lean hog should be from going too high. For instance, we can get a hog cutting very high in percentage of lean cuts, but it would not be desirable from the matter of finish, so maybe having the fat cut in there helps to balance that out. In order to get a high percentage of cuts, we need a little fat along with lean.

One other question I would like to ask Professor Bull: On the basis of the total amount of lean and fat in the belly, what do you mean that we might approach a 50-50 ratio there on the basis of weight? It seems to me, that when we take a prelimer reading on that bacon slice, we are including quite a bit of fat in the reading of the lean. It seems as though it might even be higher than it would be if we had a division there. What basis do you mean, the separable difference, or what, Sleeter?

PROF. BULL: I mean simply dividing the fresh belly into lean, fat, and skin with a knife.

PROF. HENRICKSON: I imagine we could go on for some time discussing this particular subject, but we will have to move along to some of these other topics, so at this time I will turn the meeting back to Mr. Butler.

CHAIRMAN BUTLER: Thank you. I hereby relinquish the powers and privileges of the Section Chairman to Mr. Tomhave.

... Mr. Tomhave resumed the Chair...