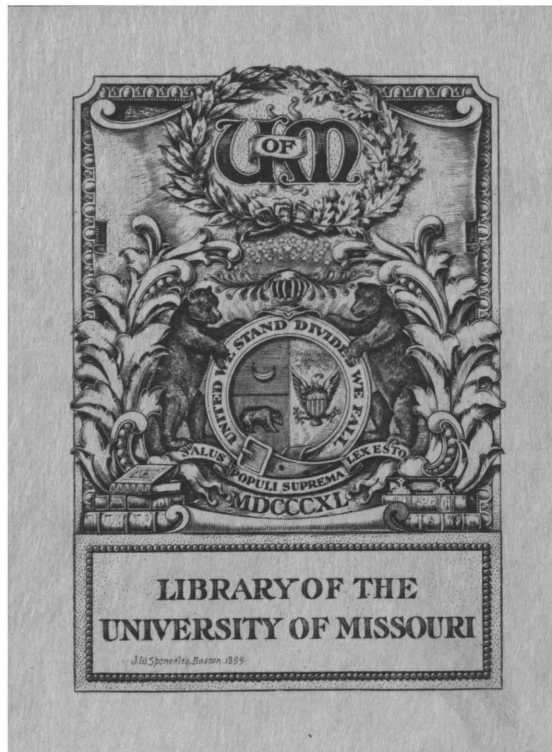


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THE AMOUNT OF EDIBLE MEAT
IN THE VARIOUS CUTS
FROM ANIMALS OF KNOWN LIFE HISTORIES.

A THESIS
PRESENTED TO THE COLLEGE OF AGRICULTURE
OF THE
UNIVERSITY OF MISSOURI
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE

BY

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JUNE, 1909.



378.7 M71
XG 831

B I B L I O G R A P H Y

Chemistry of Cooking	-	W. Mathew Williams.
Food and Feeding	-	Sir Henry Thompson.
The Spirit of Cooking	-	J. L. W. Thudichum.
Food in Health and Disease	-	Birney Zoo.
Virginia Housewife	-	Randolph.
Rumford's Kitchen Leaflets.		
Relation of Food to Health	-	Townsend.
Food and Dietetics	-	Hutchinson.
Gastronomy as a Fine Art	-	Brillat - Savarin.
Influence of Cooking on the Nutritive Value of Meats	-	United States Agricultural Bulletin, No. 162.
Losses in Cooking Meat	-	United States Agricultural Bulletin, No. 102.
Effect of Cooking upon Digestion of Meat	-	United States Agricultural Bulletin, No. 193.
Meat Supply and Surplus	-	United States Agricultural Bulletin, No. 55.
Roasting of Beef	-	Agricultural Experiment Station Circular, No. 71, University of Illi- nois.

HISTORY.

The history of the cooking of meat is almost as old as the history of the race itself. It is so old, indeed, that we have no record of its first appearance. Reference to it occurs in our earliest literature, and at that time it had reached quite a high degree of development. The methods used were in some cases splendid ones but they were in the hands of slaves and menials and consequently inaccurate. Some gastronomes of early times gave thought to the cooking of meat. Apicius, who wrote about the time of the birth of Christ, was an epicurean. Athenacus leaves a record of a dinner given by himself to Ulfian the lawyer, and Galen the physician, and meat furnished the greater part of the menu. During the Renaissance the cooking of meat became more accurate and scientific, because the physicians took it up and began to study the relation between cooking and digestion. Sacchi, who was Superintendent of the Vatican Library in 1457, has left some interesting records. Though Italy was first in the science of cookery at this time, English, French, and Dutch physicians were also writing along this line. In the eighteenth century the French took the

lead in cookery of all kinds and were the first to introduce methods requiring exact measures and methods of procedure.

Since that period, France and England have led in the cooking of meats but by exactly opposite methods. It has not been the custom in France to raise fine mature beef or mutton, but to consume large quantities of an immature product, as veal and poultry, which are naturally lacking in sapid character. Under such conditions it is only natural that the French cuisine should be distinguished by its sauces which adorn and transform material of itself uninviting and insipid.

The English principle has been to present the meat or game at table in the highest state of attainment so far as breeding, feeding, and keeping can accomplish it. Each animal served must be characterized by its own proper flavor and must on no account be masked or disguised by other flavors.

"The Englishman loves the flavor of three or four year old mutton, mature beef, and wildest game. He demands only "gravy" - so that these are in fine condition, sufficiently, not over kept, and simply cooked - for the most part carefully roasted. To lard fine full-flavored tender mutton or venison is, for him, to desecrate them".

The cooking of meat in America can scarcely be said to have a distinct character, unless it be distinctly

bad. In its higher development it has followed the English method of developing the flavor inherent in the meat and probably for the same reasons. The most satisfactory work as to scientific results has been carried on at the University of Illinois.

At that place Professor Grindley with a corps of assistants has been working since 1904 on some of the problems in the cooking of meat. He has investigated the problems of "Losses in Cooking Meat",¹ "The Effect of Different Methods of Cooking upon the thoroughness and ease of Digestion of Meat",² and the "Influence of Cooking upon the Nutritive Value of Meat".³ He has done much valuable work, and obtained some unexpected results and is still at work on Meat Problems.

STATEMENT OF PROBLEM.

The work of Professor Grindley indicates that the digestibility of meat is not dependent upon the cut of meat.⁴ He finds a cut of meat from the shoulder digests

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1. U.S. Department of Agriculture, Bulletin No. 141.
 2. " " " " " " " No. 193.
 3. " " " " " " " No. 162.
 4. "Studies of the effect of different methods of cooking upon the thoroughness and ease of digestion of meat". U.S. Department of Agriculture Bulletin No. 193, p. 100.

about as readily and completely as one from the loin, the differences being too small to be considered. He also finds that the method of cooking has little effect on the nutritive value of meat. He says, "In general the various methods of cooking materially modify the appearance, texture, and flavor of meat and hence its palatability, but have little effect on the total nutritive value".¹

If this be true, then we may choose our cut of meat from any place in the animal we wish, and cook it as we please, and in the end have meat that is equally nutritive and digestible if its composition is the same to begin on.

This series of experiments was undertaken with the thought of studying the composition of the different cuts of meat from the housekeeper's standpoint, to determine what cut of meat will furnish the most edible meat for a given amount of money.

These experiments are based entirely upon results obtained by accurate weighings. The cooked meat has not been chemically analyzed and hence the nutritive value of the meat is not here discussed. So far as I have been able to learn from the literature, no one else has attempted this problem.

The opportunity presented here was an unusual one for, through the courtesy of the Agricultural Department, it

1. "The influence of cooking upon the nutritive value of meats". U.S. Department of Agriculture Bulletin No. 162, p. 230.

was made possible for me to secure exactly similar cuts from a series of animals being studied in the nutrition experiments of the Adams Fund Investigation.

HISTORY OF THE ANIMALS USED.

Number 504 was a high grade Hereford steer, twenty months old when slaughtered. This animal was allowed to eat all that he would of a ration that consisted of six parts of corn, three parts of oats, and one part of linseed meal. He would be classified in market as number one - or "choice". With half as much alfalfa in weight as he had grain.)

Number 48 was a good Shorthorn grade steer. He was about four and a half years old and was fed a scant ration till he was three years old, and then for eighteen months he was given all he could eat of a ration consisting of eight parts of corn, one part linseed meal, and half as much alfalfa as grain. A butcher would class him as choice but rather too fat for anything but the choicest city market.

Number 63 was a full blood Jersey cow, six years old. She had been fed a maintenance milk cow's ration all the time, and had been without milk for three months. She would be classed as a poor cutter.

Jerry was a high grade Hereford steer fed for the show ring. His food was constantly changed so as to tempt him and make him eat as much as possible. He was given all

kinds of food from brown sugar and Egg-o-See, to oats and corn. Every effort was made to make him just as large as possible and keep yet not make him rough. He would be classified in the market as an extra choice, but he was too fat for the ordinary market.

Bobbie was a pure blood Galloway steer fed for the show ring. When slaughtered he was about three years old. His ration had been a varied one, and one planned to make him eat as much as possible. He would sell in the market as choice.

PRICES OF MEAT.

The prices used in this paper are the prices that obtained in the local retail markets in Columbia during the month of March 1909.

Round steak	-	-	15	cents	per	pound.
Porter-house steak	-		25	"	"	"
Porter-house roast cut short	-	-	25	"	"	"
Standing rib roast	-		15	"	"	"
Rolled rib roast	-	-	15	"	"	"
Plate, navel end	-	-	10	"	"	"
Beef loaf	-	-	15	"	"	"

The price per pound of waste fat as here used is 6 cents. This is not the market value, but to the housewife who uses waste fat in different ways in cooking and for soap making, its value has been estimated at 6 cents per pound. To obtain the item called "Value of edible meat"

the value of the waste fat in any pound of meat as purchased from the butcher is deducted from the cost price of every pound of edible meat.

THE CUTS OF MEAT USED.

I. Rib Roast.

The rib roasts used were cut the standing length and included the sixth and seventh ribs and the eleventh and twelfth ribs, counting from the head backward. The cuts were made exactly between the adjoining ribs. The roast was completely boned, rolled, and tied ready for roasting, by the butcher.

II. The Porter-house Steaks were cut thick and were the cut just forward of the porter-house roast.

III. Round Roast or Braize.

This roast was made from the entire large muscle on the outside of the upper end of the round cut. It is what is usually spoken of as the tough side, and was cut about three inches thick.

IV. Boiling Pieces.

These pieces were the plate pieces that are cut from the ends of rib roasts and consequently varied with the rib roasts.

V. Beef Loaf.

The beef loaves were of two kinds, ground meat from the neck and chuck, and ground meat from the flank and plate.

VI. Porter House Roast.

These roasts included the *last two* vertebrae of porter-house cut and were cut short and not boned.

METHODS OF COOKING.

Beef Loaf.

The loaves were made of two cuts, the neck and chuck, and the plate. The meat was ground quite fine and then thoroughly mixed with weighed amounts of different condiments and materials for retaining within the loaf its juice and fat. Egg, cracker crumbs, salt, pepper, sage and cloves were used in the different loaves. An effort was made to retain all the juice of the meat and just as much of the fat as possible and still make the loaf the most palatable. After mixing, the loaf was rubbed smooth over the outside and placed on the support in the roasting pan. The meat was placed in the oven when it registered 250° C. The oven was held at that temperature for fifteen minutes, when the heat was turned off and the oven cooled slowly till it reached 175° C. The fire was then lighted again and the oven was kept at 175° C until the internal temperature of the loaf was 65° C. The loaf was then weighed and served. The fat dripping was weighed; the pan and support carefully washed to remove all extractives which were saved; and this wash water was then analyzed to determine the nitro-

gen content. The weight of added condiments and crackers was deducted from the weight of the cooked loaf, and the result was called edible meat. The dripping was called waste fat. The material left in the pan other than fat dripping was called extractives.

No water was used in roasting any of the meat and no cover was used on the roasting pan.

Boiling Pieces or Stews.

The pieces used in these experiments were from the navel end of the plate, and two methods were used in their preparation. The meat was cut into pieces of a suitable size for stewing, and excessive fat was removed and counted as waste fat. The meat was placed in a granite iron kettle with a closely fitting lid. A small measured amount of boiling water was added and a thermometer was inserted through a small hole in the lid of the kettle. The amount of water varied with the amount of meat and the size of the kettle, but the effort was to use just as little water as possible. The boiling water was added and the meat was kept over the hot flame until the whole mass was boiling, which was 3 to 5 minutes. The kettle was then placed over the "simmerer" and kept at 85° C until the meat was tender. This required from six to ten hours. The meat was then thoroughly drained, and the bone removed and weighed. The excess fat was cut away and all the waste or inedible material removed and weighed. The edible meat was weighed and served as boiled meat,

meat pie, various stews, and as hash, or croquettes. The liquid in the kettle was chilled, and the fat removed. The remaining liquid was analyzed for nitrogen content.

Some of these boiling pieces were cooked until they were very tender and could be easily pulled into bits. The excess fat and wastes of all kinds were removed and the edible meat was shredded. Condiments of various kinds were added and the liquid remaining in the kettle was poured over it and the whole was placed to harden under pressure. The result was a very tasty bit of cold meat, with a larger percent of fat embodied in it than in the boiling pieces cooked by the other method.

Braised Round.

A small bit of fat was cut from the round and tried out in the brass kettle. If the round did not have enough fat for this purpose, 20 grams of fresh lard was added. The round was placed in the kettle and turned over and around until it was well seared all over. A small support was then placed in the bottom of the kettle to allow circulation of water underneath the meat. A weighed amount of boiling water was then added. The weighed water was made just as small as possible to keep the meat from burning. The kettle was then placed over the "simmerer" and kept at 85 C until the meat was tender. The lid was close fitting and had a small hole in it for the thermometer.

For braised meat to be best it should be cooked in

this manner but have vegetables, wine and spices added to the water. These were all omitted in these experiments because they made the determination of actual weight of edible meat more complicated.

This method of cooking meat has been in use for hundreds of years. The earlier and perhaps better method was to have a cup shaped lid for the ~~fat~~^{fat}, and into this lid hot coals were placed, so that the top of the meat was browned while the lower part was kept in water.

Rolled Rib Roast.

The rolled rib roasts were boned out by the butcher and tied and skewered in the usual way. The bones were included in the butcher's weight. The roast was placed on a support that held it above all possible drippings in the bottom of the pan. It was placed so that the part of the outside having most fat should be at the top. This insures a continuous basting of the roast with its own fat and without any further thought from the experimenter.

The roast was placed in the oven when the temperature was 250° C. It was held there for 15 to 20 minutes, depending upon the size of the roast. The fire was then turned off and the oven cooled gradually to 175° C. The fire was lighted again and the temperature kept at 175° C until the internal temperature of the roast was 65° C. This temperature was determined by thrusting a thermometer down through the top of the roast to its center in the thickest portion. When the internal temperature had reached the

desired degree the roast was removed from the oven, and the pan, support, meat, drippings and all were weighed. The roast was then removed from the pan and placed on a platter for serving. The dripping in the pan was carefully weighed and recorded as waste fat. The pan and support were washed with measured amount of hot water. This water was analyzed for nitrogen content. The roast was cut into suitable pieces for serving, all excess fat was weighed as waste fat, and the meat was served. All bits of fat, or connecting tissue left on the plate were collected, assorted and weighed as waste fat or miscellaneous waste. All this waste fat, miscellaneous waste, weight of strings and skewers etc., were deducted from the weight of the meat just from the oven, in order to obtain the amount of edible meat.

No water was used in this roast and it was not basted at all.

Porter House Roast.

The porter house roast and the standing rib roasts were cooked in exactly the same way as the rolled rib roast, barring the fact that the bone was left in the roast. These roasts were placed on the support in the roasting pan with the fat or skin side on top. In a very thin animal the leaf fat was removed from the inside of the cut and placed on top of the roast, and fastened there with tooth-picks. This insured the necessary basting with its own fat.

This roast was weighed, carved and re-weighed in exactly the same manner as the rib roasts.

Porter House Steak.

These steaks were placed on an ordinary grill which was treated from above. When the broiling oven was 280° C the grill was run under the flame and quite close to it. It was allowed to remain here until the meat was well seared, and then the steak was reversed and seared on the other side. This was continued until the internal temperature of the steak registered 60 C. The steaks were weighed and served just as were the roasts. The fat remaining in the dripping pan was weighed as waste fat. This is not considered of great value however, as the amount of fat burned during the broiling unavoidably varied considerably.

Apparatus.

The apparatus used in these experiments is all simple and was selected on the basis of adaptability to the purpose.

The Oven.

The oven was an ordinary Jewel range gas oven, heated by two cylinder burners placed beneath. A wire frame or oven grate was placed on the lowest support in the oven. This raised the bottom of the roasting pan one inch from the bottom of the oven and allowed complete

circulation of heated air around the roast. The temperature of the oven was determined by a centigrade thermometer, which was inserted into the oven through a small hole in the center of one side of the oven. This brought the bulb of the thermometer to the top and side of the roast. It could be read without opening the oven door.

The Roasting Pan.

The pan used for all the roasts was made of granite iron. It was oval in shape, with a concave bottom and was 18 by 15 by 3-1/2 inches in dimension. No cover was used in any of the experiments in roasting, and no water was used with any of the roasts.

The Support.

Several different supports were used in an effort to find one that would hold any roast high enough from the bottom of the pan to escape all drippings, and be easily cleaned of all fat and extractives. I used for the most part a support made from a sheet of brass 2 by 6 inches. The four corners were turned sharply down one inch, and the whole of it polished very smoothly. Such a piece in porcelain would be much better.

The Braising Kettle.

An old fashioned six quart brass kettle was used for the braising. It was found very satisfactory because it could be heated very hot in searing the roast at

the beginning of the experiment, and its thick walls made it easy to keep a constant temperature. A close-fitting tin lid with a hole for the insertion of the thermometer covered it.

The Boiling Kettle.

The boiling kettle was one of ordinary granite iron with a fitted lid. The lid was perforated for the thermometer.

The Thermometer.

The thermometers used were ordinary glass rod centigrades. The one used for internal meat temperature was ruled to read 100 . This gave wide spaces and brought the point to be read above the surface of the thick roasts.

The Balance.

The balance used was an ordinary spring torsion balance, and the weights were of brass and read to one grain.

DISCUSSION OF DATA.

Tables No. 1, 3, 5, 7, 8 and 11 give the data obtained from 41 experiments, and tables 2, 4, 6, 9, 10 and 12 give the percents to be obtained from this data. Table 14 and table 15 represent the two extreme animals in the experiments. Table 14 gives the value of the

TABLE XIV.

Shows percent of edible meat, waste fat, bone and water, and cost per pound of all cuts in 63.

	Butcher's weight. grams.	Edible meat per cent	Waste fat per cent	Waste bone per cent	Water loss per cent	Cost per pound in cents
Beef Loaf	1185	82.7	.42	0.0	16.8	18
Round	1070	59.3	0.0	0.0	16.	25.3
Boiled Rib	1454	57.9	2.76	22.5	17.7	17.3
Rib Roast	4385	38.1	13.0	39.7	7.5	39+
Porter House Roast	1475	51.6	14.9	16.6	9.5	48
Porter House Steak	465	53.8	0.0	21.5	12.3	46.2
Average per unit weight		57.2				30.6

different cuts of the cow 63, in percents of edible meat, waste fat, bone, and water, and the cost per pound of the meat. It is interesting to note that the highest percent of edible meat of all the cuts cooked is found in the beef loaf of 63 (82.7), and it has the actual value of 18 cents per pound. The braised round of 63 furnishes 59 percent of edible meat at 25.3 cents per pound. Boiled rib gives 57.9 percent of edible meat at 17.3 cents per pound. The rib roast gives 38.1 percent of edible meat. This great decrease is caused by the large percent, *39.7* of bone waste. The amount lost by evaporation is very small. This is probably due to the fact that the roast was rolled so as to make the skin fat completely surround the roast, and it was then placed in the pan so that the fattest part was above and the fat in trying out basted the exposed sides and prevented evaporation.

The porter house roast lost less by evaporation. The kidney fat of this roast was removed from beneath the roast and fastened on top the roast with tooth-picks. The percent of edible meat is higher than in the rib roast, and the weight of bone much less. This is an interesting point because in all the cuts except those from the loin, the cow 63 has a proportionately large percent of bone. This may possibly be due to skeletal differences based on breed or sex. The average per unit of weight of edible meat in 63 is 57.2 with an average cost of 30.6 cents per pound. This must not be confused with the actual values of the wholesale cuts.

TABLE XV.

Showing percent of edible meat, waste fat, bone, and water, and price per pound of all the cuts in Jerry

	Butcher's weight grams	Edible meat. per cent	Waste fat. per cent	Waste bone. per cent	Water loss per cent	Cost per pound in cents
* Beef Loaf (rib lean) 1000		75.2	6.5	0.0	13.00	19.9
Round	2110	65.8	0.0	0.0	6.23	22.8
Boiled Rib	3779	29.2	53.0	6.23		34.2
Rib Roast	9161	32.3	41.2	11.75	9.94	46.
Porter House Roast	4862	35.6	50.9	7.3	6.4	70.
Porter House Steak	1845	36.6	50	4.84	7.9	68.3
		<hr/> 45.8				<hr/> 43.7

* Made from rib lean from which all fat had been removed.

Table 15 gives the percents for Jerry. The beef loaf gives 75 percent of edible meat, but this is not a fair comparison because this was made from a rib cut from which all visible fat had been removed. It does show that there was a higher percent of fat included in the muscle of Jerry than in all the fat of neck and chuck of 63.

Jerry gave a higher percent of edible meat in the braised round, 65, than did 63, 59.3. This may be due to the presence of more fat in Jerry ^{and so} ~~or~~ less loss in moisture.

All the remaining cuts of Jerry lost very heavily in waste fat, the least loss being in rib roast ^{41.9} percent, and the greatest being in Porter House roast, 50.9 percent.

The average price per unit of weight of Jerry's meat is 43.7 cents with 45.8 percent of edible meat in each pound.

The grand total per unit of weight of all the animals is 50 percent of edible meat at 39 cents per pound. This brings the price of meat from Jerry 4.7 cents per pound more than the average and 13.1 cents per pound more than 63.

Table 16 gives the percents for Bobbie. This animal is of special interest for the reason that it gives a high grade of meat of fine flavor and texture and it comes at a price below the average of the five animals. It is unfortunate that the beef loaf and Porter House steak were not studied in this animal. Compared with 63 in table 14 it gives 49.9 percent of rib roast to 38.1 percent in 63,

TABLE XVI.

Showing percent of edible meat, waste fat and bone, and
cost per pound of edible meat of Bobbie.

	Butcher's weight grams.	Percent edible meat	Percent waste fat.	Percent waste bone.	Cost of meat, in cents
Round	3164	60.7	0.0	0.0	24.7
Boiled Rib	2920	40.4	38.1	2.82	24.5
Rib Roast	5600	49.9	30.0	9.28	31.
Porter House Roast	5655	43.00	41.2	10.3	58.
Averages	7339	<hr/> 48.5			<hr/> 34.5

with a difference of 8 cents per pound in favor of Bobbie. That is to say in Bobbie is found a better grade of meat from every standpoint, and more of it and at a lower price than in 63.

Comparing Bobbie with Jerry in table 15 we find that the rib roast of Bobbie gave 49.9 percent of edible meat while Jerry gave only 32.3 percent with a difference of 15 cents per pound in favor of Bobbie. The grade of meat as to flavor, tenderness, and texture may be considered the same. It would be interesting to know if this is a question of breed of animal or only an individual peculiarity. If we compare the edible meat of Jerry in exactly the same cuts with Bobbie, we find that Jerry gives 40.6 percent while Bobbie gave 48.5 percent.

A study of table 13 which gives the averages of the five animals, shows that the highest percent of edible meat, 72.9, is found in the beef loaf. The loss in fat is 11.77 percent and the loss in evaporation in cooking 13.22 percent. The cost per pound of edible meat becomes 20.6 cents or 5.6 cents more than the price paid the butcher.

The braised round, table 3, gives 61.4 percent of edible meat, with a water loss of 14.43. There was very little loss in fat and it was all incorporated in the sauce made from the broth. The cost of the edible meat was 24.4 cents which is an increase of 9.4 cents per pound over the butcher's price.

The broiled rib ends averaged 36.5 percent of edible meat, 38.2 percent of waste fat, and ^{9.1}~~20.5~~ percent of bone. This makes the price 27.5 cents for a pound of edible meat that cost only ten cents at the shop.

The five rib roasts averaged 41.6 percent of edible meat, 24.4 percent of fat, 20.5 percent of bone, and 10.16 percent loss in water. The butcher's price of 15 cents per pound is increased to 37.5 cents for every pound of edible meat.

The Porter House roast contained 41.2 percent of edible meat, 34 percent of waste fat, 15.7 percent of bone, and lost 7.8 percent of water in cooking. As compared with the rib roasts, the edible meat is approximately the same. The rib roasts lose much in bone and the porter house loses excessively in waste fat.

The cost of the porter house is increased from 25 cents for the butcher's pound to 61.14 cents for every pound of edible meat.

The value of the porter house steaks follow the porter house roasts very closely. They lose more in water evaporation which may be due to the fact that the broiler was so arranged that the fat which was tried out did not baste the sides, but left two large lean surfaces exposed for evaporation. They lost less in waste fat, which may be due to the fact that the broiled fat is more palatable, hence more of it eaten, than in the roast.

TABLE XIII.

Showing averages of all the animals used.

	Edible meat.	Fat waste	Bone waste	Water loss	Cost of edible meat.
Beef Loaf	72.9	11.77	00	13.2	20.6
Braised Round	61.4	0.0	00	14.4	24.4
Boiled Rib End	36.5	38.2	9.1	0 0	27.5
Rib Roast	41.6	24.4	20.5	10.2	37.5
Porter House Roast	41.2	34.	15.7	7.8	61.1
Porter House Steak	42.2	24.8	13.9	13.1	63.3
Average	<hr/> 50.				<hr/> 39.

This series of experiments is closed with the feeling that there is yet much more to be done on this problem. Many interesting and suggestive side lines of work have been observed during the study. It is hoped that they may be investigated in the future, and that the present problem may be further extended.

S U M M A R Y .

The conclusions here recorded are based on a study of forty-one cuts taken from five different animals.

1. The highest percentage of edible meat is obtained from the beef loaf. Loaf made from neck and chuck is a cent or two cheaper than that made from plate and flank.

2. The amount of waste fat is least in the beef loaf, because a large amount of it was held in the loaf by the added ingredients, making the fat become edible meat. This makes the total cost per pound of edible meat lower than in any other cut even at the same price for the butcher's weight.

3. Braised round is an inexpensive meat with practically no loss except that of evaporation. It costs only a few cents more per pound than beef loaf.

4. Boiled rib end is an expensive meat because a large percent is lost in waste fat. The finished product is not so desirable, from the housekeeper's standpoint, as that of some other cuts. All of its possibilities are found in the round and at less expenditure of money and time.

5. Rib roast gives a fair share of fine meat, at an average price. The indications are that the amount of loss in waste fat increases as the cut approaches the loin. The chuck rib roast will possibly yield the highest percent of edible meat, but the quality of the meat may not be so good. The best rib roasts as to juiciness were those made from the 11th and 12th ribs.

6. Porter House, either as roast or as steak, is the most expensive meat, largely because of its excessive loss in waste fat.

7. The loss by evaporation is greatest in lean meats and least in excessively fat meats. It is also greater in small cuts than in large ones

8. Long cooking increases the loss in evaporation of water and in the loss of fat.

9. The fatter the animal, the lower the percent of loss in bone. An apparent exception to this rule exists in the loin cuts from the lean cow, Number 63, when compared with the fat steers. This is probably due to the skeletal differences based on sex or breed.

10. Bone loses weight in cooking. The percent of bone in the standing rib roasts, roasted with the bone left in, is not so high as in the rolled rib roasts which were boned before roasting. It is not determined whether this is due to water loss only, or whether other substances also are lost to the meat from the bone in cooking.

11. The juiciness of the roast seems to be directly proportioned to the amount of fat it contains.

12. The fat roasts of this series are of higher flavor than the lean roasts.

TABLE I.

Showing the data obtained from all beef loaves.

No. of animal	Cut	Butcher's weight grams	Crackers grams	Eggs grms.	Cond. grms	Weight after cooking. grams	Edible Meat grams	Waste Fat grams
504a	Neck & Chuck	2000	60	48	18	1621	1495	172
504b	"	2000	50	100	10	1548	1388	306
48	"	1983	70	100	20	1575	1385	305
63	"	1185	50	92	17	1116	957	5
504c	Plate	2000	60	100	17	1466	1289	477
63	"	1057	50	90	12	940	788	95
Jerry	Shoulder.	1000	50	50	10	862	752	65

TABLE II.

Showing percent of edible meat, waste fat, loss in cooking, and money value of Beef Loaf.

No. of animal	Cut	Butcher's weight grams	Per cent edible meat	Per cent waste fat	Per cent loss in cooking	Value of edible meat in cents	Value of Waste fat in cents	Actual cost of edible meat in cents
504a	Neck & Chuck	2000	74.5	8.6	14.1	20.1	0.51	19.6
504b	"	2000	69.35	15.3	11.5	21.6	0.9	20.7
48	"	1983	69.9	17.7	10.6	21.4	1.0	20.4
63	"	1185	82.7	.42	16.8	18.1	.02	18.0
504	Plate	2000	64.0	23.85	11.3	23.4	1.4	22.0
63	"	1057	75.	9.00	15.25	20.0	0.5	19.5
Jerry	Rib	1000	75.2	6.5	13.00	19.9	0.3	19.6
Average			72.9	11.77	13.22	20.6		

TABLE III.

Data obtained from braised round.

No. of animal	Butcher's weight grams	Weight after cooking grams	Edible meat grams	Added Boiling H ² O grams	Broth grams	Temperature.	Loss in cooking grams
48	1950	1170	1170	350	679	85° C	451
63	1070	635	635	200	455	85° C	208
Jerry	2410	1550	1550	200	710	85° C	150
Bobbie	3164	1927	1927	200	1150	85° C	277

TABLE IV.

Showing percent of edible meat, loss in water and
cost per pound of the braised round.

Number of Animal	Butcher's weight grams.	Percent edible meat.	Percent loss in water.	Cost per pound edible meat. Cents.
48	1950	60	23.1	25.00
63	1070	59.3	19.4	25.3
Jerry	2410	65.8	6.23	22.8
Bobbie	3164	60.7	9.01	24.7
Averages		61.4	14.43	24.4

TABLE V.

Giving data for boiled rib ends.

No. of rib	No. of animal.	Butcher's weight grams.	Edible meat grams	Waste fat grams	Waste bone grams	Loss in cooking.	Water added grams	Time. Hours.
7th	504a	1293	470	434	153	00.0	425	8
8th	504	1335	870	296	184	419	500	10
7th	48	3180	926	1342	142	430	500	8
8th	48	3047	635	1914	150	185	250	8
12th	Jerry	3684	1125	2197	117	450	450	8
11th	Jerry	3779	1098	2005	235	410	200	10
11th 12th	63	1454	840	40	327	302	150	8
12th	Bobbie	2920	1180	1112	82	446	400	8
11th	Bobbie	1840	605	745	215	175	400	8

TABLE VI.

Giving percents of edible meat, waste fat, bone,
and money value of meat in boiled rib end.

No. of rib.	No. of animal	Butcher's weight. grams.	Percent of edible meat.	Percent of waste fat.	Percent of waste bone.
7th	504	1293	36.4	32.9	12.65
8th	504	1335	51.6	22.8	13.85
7th	48	3180	29.1	42.1	4.49
8th	48	3047	20.9	62.8	4.94
12th	Jerry	3684	30.5	59.5	3.18
11th	Jerry	3779	29.2	53.	6.23
11th 12th	63	1454	57.9	2.76	22.5
12th	Bobbie	2920	40.4	38.1	2.82
11th	Bobbie	1840	32.9	40.5	11.6
Average			36.5	38.2	9.14

TABLE VII.

Data for Porter House Roast.

No. of animal	Butcher's weight grams	Ready for oven. grams	Out of oven. grams	Edible meat. grams	Waste fat. grams	Bones grams
504	1772	1752	1240	677	538	373
48	2665	2665	1945	1007	868	494
63	1475	1475	1115	750	220	335
Jerry	4862	4692	3448	1713	2470	355
Bobbie	5655	5655	3978	2428	2328	585

TABLE VIII.

Data for rib roasts.

No. of rib.	No. of animal	Butcher's weight grams	Ready for oven. grams	Out of oven. grams	Edible meat. grams	Waste fat. grams	Bone grams
7th 8th	504	5298	4100	3258	2993	265	1198
7th 8th	48	9541	7770	5853	3424	2420	1801
11th 12th	63	4385	2645	2214	1672	570	1740
11th* 12th	Jerry	9161	6321	4270	3170	3770	1155
11th* 12th	Bobbie	5600	5600	4406	2799	1687	520

* Standing rib.

TABLE IX.

Showing percents of edible meat, waste
fat and bone and actual value of
Porter House roasts.

No. of animal	Butcher's weight grams	Percent edible meat.	Percent waste fat.	Percent Waste bone	Percent water loss in cooking	Value of fat. in cents	Cost of edible meat, in cents	Value of edible meat, in cents
504	1772	38.2	30.4	21.1	8	1.8	65	63.2
48	2665	37.6	32.6	18.5	9.8	1.92	66	64.1
63	1475	51.6	14.9	16.6	9.5	.84	48	47.16
Jerry	4862	35.6	50.9	7.3	6.4	3.0	70	67
Bobbie	5655	43.0	41.2	10.3	5.5	2.46	58	55.54
Average		41.2	34.	15.7	7.8	2	61.4	59.5

TABLE X.

Showing percents of edible meat, waste fat and bone, Rolled Rib Roast, and actual value of Rib Roasts.

No. of animal	Butcher's weight grams.	Percent edible meat	Percent waste fat	Percent waste bone	Percent water loss in cooking	Value of fat in cents	Cost of edible meat in cents	Value of edible meat, in cents
504	5298	52.4	12.6	22.5	12.0	72	28.6	27.9
48	9541	35.7	25.5	18.8	10.9	150	42	40.5
63	4385	38.1	13.0	39.7	7.5	78	39+	38.3
Jerry*	9161	32.3	41.2	11.75	9.94	246	46	43.6
Bobbie*	5600	49.9	30.0	9.28	10.5	1.8	31	30.2
		41.6	24.4	20.5	10.16	1.55	37.5	35.1

* Standing rib.

TABLE XI.

Porter House Steak Data.

No. of animal.	Butcher's weight grams	Ready for oven grams	Out of oven. grams	Edible meat grams	Fat waste grams	Bone waste grams	Water loss grams	Internal temperature	Time in oven, minutes.
504	680	680	517	359	38	120	163	65	12
48	1500	1135	1055	486	657	177	80	65	15
63	465	465	385	250	00	135	60	65	10
Jerry	1845	1303	937	673	924	89	146	65	20

TABLE XII.

Showing percents of edible meat, waste fat and bone and actual value of Porter House steaks

No. of animal.	Butcher's weight grams	Percent edible meat	Percent waste fat	Percent waste bone	Percent water waste	Cost of meat in cents	Value of fat in cents	Value of edible meat, cents
504	680	52.8	5.58	17.6	23.9	47.3	.3	47.2
48	1500	25.7	43.8	11.8	8.6	91.4	2.58	88.9
63	465	53.8	0.0	12.3	12.3	46.2	00	46.2
Jerry	1845	36.6	50.2	7.9	7.9	68.3	3.00	65.3
Averages		42.2	24.8	13.83	13.1	63.3	1.47	61.4



Photograph No. 1.

Standing Rib,

Jerry.

This photograph shows an ideal rib roast. It is the standing rib roast from Jerry, Table No 12. The flesh is firm and splendidly marbled with fat. The layer of fat on the outside is very thick and will sufficiently baste the roast while it is cooking. The fat waste is excessive but the meat is delicious.

Photograph No. 2.

This photograph shows the Porter House and round from show steer Jerry. The fat is in excess and shows fine marbling in both cuts. The proportion shows itself as greater than in Bobbie, Photograph No. 8, or in 504, Photograph No. 7. It makes a fine contrast with 63, Photographs No. 5 and No. 6, where the meat lacks marbling, outside fat, and the muscle looks loose and stringy and the kidney fat shows a lack of solidity. The marrow in the round of 63, Photograph No. 5, does not fill the bone cavity as it does in Jerry.





Photograph No. 3.

This photograph shows the rib end of Jerry. A part of the fat was removed from the meat in the piece shown at the bottom. This waste fat is shown at the top of the page. The meat was then tied in to the rolled rib end roast shown in the center.

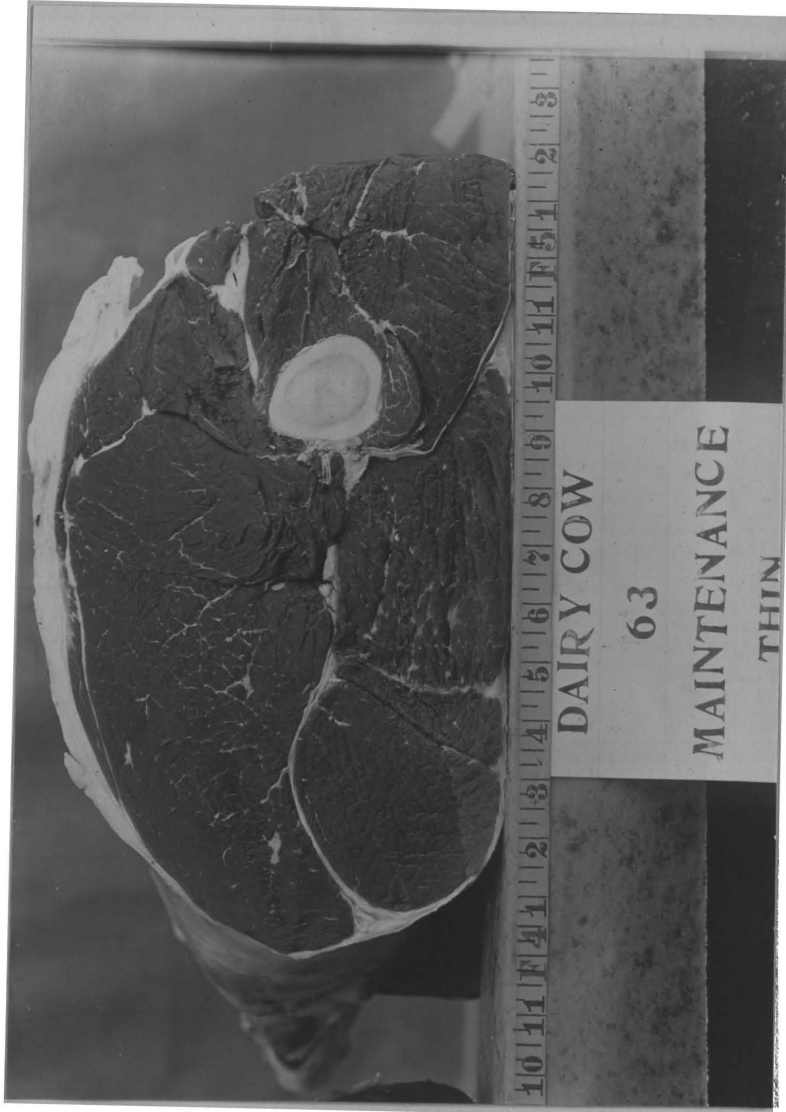


Photograph No. 4.

This photograph gives the rib roast of 63. It lacks fat and made a roast less juicy than any of the others cooked. It lost very little in waste fat, but lost much in moisture.

Photograph No. 5.

This photograph gives the round from 63. The white streaks in the marbling of the muscle are largely connective tissue. There is not enough fat present to cook the meat, and fat from some other animal must be added to secure best results with this meat.



Photograph No. 6.

This photograph gives the Porter House roast from 63. The fat is not firm and the muscle is coarse and loose in texture.

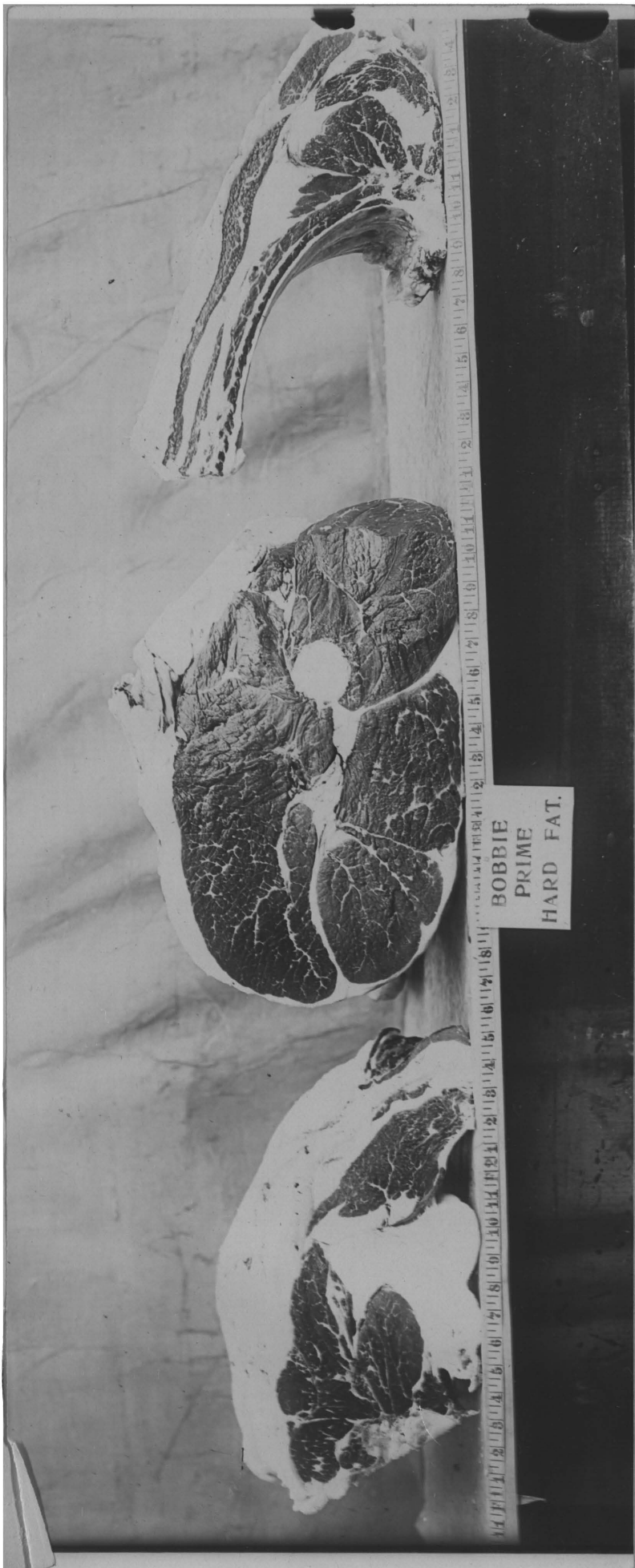


Photograph No. 7.

Porter House Round and
Chuck from
Animal No. 504.

This photograph shows a very good grade of meat. The fat is not very excessive, so the loss would not be exceedingly great and yet there is quite enough to insure juicy meat. The loss in bone and evaporation in cooking would not be excessive.





Photograph No. 8.

This photograph shows three cuts of splendid beef. They are from the Galloway steer Bobbie and show meat with plenty of fat but not a great amount of excess fat. The meat is well marbled, so well indeed that even the round steak may be successfully pan-broiled.



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~~This thesis is never to leave the room.~~

~~Neither is it to be checked out overnight.~~

