

FACTORS INFLUENCING THE
PROCUREMENT OF FOUR OVEN-READY
BEEF ITEMS FOR INSTITUTION USE

Thesis for the Degree of M. S.
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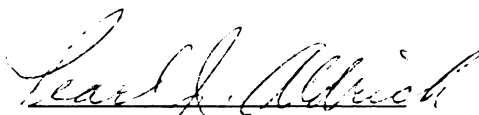
Factors Influencing the Procurement of ^{Four} Oven-ready
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FACTORS INFLUENCING THE PROCUREMENT
OF FOUR OVEN-READY BEEF ITEMS
FOR INSTITUTION USE

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A THESIS

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ABSTRACT

To determine the variations in percentage yield of four oven-ready beef classifications from wholesale sections of carcasses and from designated primal cuts was the first objective of this project. The second objective was to compare the portion costs of four oven-ready beef items purchased and processed from carcass and primal cuts with the corresponding fabricated items. The third objective of this study was to consider factors, other than cost, which influence the decision for buying fabricated beef, carcass, or primal cuts for institution use. In addition to the direct meat and labor costs, the problems in utilization and menu planning and the amount of chilled space required to hold beef were also considered.

For the cutting tests nine half-carcasses, and thirty-six primal cuts including rounds, trimmed loins, ribs, and chucks were obtained from regional wholesalers. Three half-carcasses and three of each of the designated primal cuts of the grades Commercial, Good, and Choice were used.

Those cuts suitable for dry heat roasting, pot roasting, stew meat, and ground beef were prepared for cooking from the carcasses and wholesale cuts of the three grades. The cuts designated for dry

heat roasting included the inside round, the entire tenderloin, the loin strip, the rolled rib, and the sirloin butt. Those pieces suitable for pot roasting were the knuckle and bottom round. Meat to be cut for stew was obtained from the chuck, brisket, and short plate. Beef from the heel and hind shank on the round, the foreshank, the flank, and the trim from the short loin was used for ground beef. Small amounts of trim from the loin end, rib, and chuck were added to the cuts mentioned above to be ground.

From a list prepared for use on the campus, the prices of the four oven-ready items were converted into a relative cost factor. Based on these factors, the actual costs of the four items were calculated from the yield and the market cost for each half-carcass and primal cut.

To compare the costs of fabricated items of the four oven-ready classifications with the costs of similar items prepared in the meat laboratory, quotations were obtained from four regional wholesalers.

From this study it appeared that variations in percentage yield were not large enough to warrant buying a certain grade of carcass or primal cut to obtain a higher yield in any of the oven-ready items prepared in this investigation. A slight trend toward

higher percentage yields of the tender cuts from Choice and Good grades and higher percentage yields of the less tender cuts from Commercial grades was noted.

From the results of the comparison of portion costs among the three methods of purchase, it was found that no single method seemed most advantageous for all beef items. The data indicated that certain items might be most advantageously purchased as fabricated cuts whereas others could be procured and prepared more economically from either carcass or primal cut. The wise buyer, using the basic data on yield, could determine his most economical source according to current market prices. It was apparent that market price per pound was not an accurate index of the raw portion cost.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	2
METHOD OF PROCEDURE	6
Preparation of Carcasses	6
The Hindquarter	8
Round	10
Full loin	12
Flank	12
The Forequarter	13
Chuck	15
Rib	17
Short plate	17
Foreshank	18
Preparation of Primal Cuts	18
Prefabricated Cuts	18
Costing of Oven-Ready Cuts	19
Costing of Fabricated Items	22
Cost of Labor	22

	Page
Factors Other Than Cost	23
Menu Planning	23
Storage Space Requirements	23
RESULTS AND DISCUSSION	24
Costs of Beef	24
Cost per Pound	24
Commercial grade	24
Good grade	30
Choice grade	35
Among grades	40
Total boneless beef from wholesale cuts	42
Cost per Pound with Labor	46
Costs per Serving	51
Commercial grade	51
Good grade	57
Choice grade	58
Yields	59
Actual Weights	59
Percentages of Weight	71
Utilization	90

	Page
Carcass Beef	89
Primal Cuts	97
Storage Space Requirements	104
SUMMARY AND CONCLUSIONS	112
Summary	112
Conclusions	117
LITERATURE CITED	119
ACKNOWLEDGMENTS	120
APPENDICES	121

LIST OF TABLES

Table	Page
1. Conversion of List Prices to Price Factors	19
2. Sample of Half-Carcass Yields	20
3. Method of Obtaining the Total X Values	20
4. Method of Obtaining Values of the Remaining Items .	21
5. Value of Commercial Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment	25
6. Value of Good Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment	31
7. Value of Choice Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment	36
8. Adjusted Cost per Pound of Boneless Meat from Wholesale Sections Comprising the Carcass	43
9. The Adjusted Cost per Pound of Boneless Beef from Designated Primal Cuts	47
10. Raw Food Cost for Designated Portions of Beef Items in Four Oven-Ready Classifications	52
11. Average Cutting Yield for Carcass, Commercial Grade	60
12. Average Cutting Yield for Carcass, Good Grade	62

Table	Page
13. Average Cutting Yield for Carcass, Choice Grade . .	64
14. Cutting Yield for Whole Carcasses	66
15. Average Cutting Yield for Primal Cuts	69
16. Percentage Yield of Commercial Grade Carcasses . .	72
17. Percentage Yield of Good Grade Carcasses	74
18. Percentage Yield of Choice Grade Carcasses	76
19. Percentage Yield of Oven-Ready Classifications from Carcasses	78
20. Percentage Yield of Rounds	82
21. Percentage Yield of Full Loins	83
22. Percentage Yield of Loin Ends	85
23. Percentage Yield of Short Loins	86
24. Percentage Yield of Ribs	87
25. Percentage Yield of Chucks	88
26. Summary of Carcass Utilization, Commercial Grade	90
27. Summary of Carcass Utilization, Good Grade	92
28. Summary of Carcass Utilization, Choice Grade	94
29. Summary of Primal Cut Utilization, Commercial Grade	98
30. Summary of Primal Cut Utilization, Good Grade	100
31. Summary of Primal Cut Utilization, Choice Grade . .	102

Table	Page
32. Comparison of Carcass and Primal Cut Utilization, Commercial Grade	105
33. Comparison of Carcass and Primal Cut Utilization, Good Grade	107
34. Comparison of Carcass and Primal Cut Utilization, Choice Grade	109
35. Preparation Time of Primal Cuts	123
36. Preparation Time of Half-Carcasses	124
37. Boneless Fabricated Beef	126
38. Cutting Yield for Primal Cuts, Commercial Grade . .	128
39. Cutting Yield for Primal Cuts, Good Grade	130
40. Cutting Yield for Primal Cuts, Choice Grade	132
41. Average Cutting Yield for Primal Cuts	134
42. Cutting Yield for Half-Carcass, Animal A, Commercial Grade	136
43. Cutting Yield for Half-Carcass, Animal B, Commercial Grade	138
44. Cutting Yield for Half-Carcass, Animal C, Commercial Grade	140
45. Cutting Yield for Half-Carcass, Animal D, Good Grade	142
46. Cutting Yield for Half-Carcass, Animal E, Good Grade	144
47. Cutting Yield for Half-Carcass, Animal F, Good Grade	146

Table	Page
48. Cutting Yield for Half-Carcass, Animal G, Choice Grade	148
49. Cutting Yield for Half-Carcass, Animal H, Choice Grade	150
50. Cutting Yield for Half-Carcass, Animal I, Choice Grade	152

LIST OF FIGURES

Figure	Page
1. Location and Names of Wholesale Cuts of Beef	7
2. Diagram of Skeletal Parts and Wholesale Cuts of the Hind Quarter	9
3. Location and Names of Bones in the Beef Skeleton	11
4. Diagram of Skeletal Parts and Wholesale Cuts of the Fore Quarter	14
5. Diagram of the Procedure Used to Remove the Clod from the Chuck	16
6. Costs per Pound of Boneless Oven-Ready Items, Commercial Grade	28
7. Costs per Pound of Boneless Oven-Ready Items, Good Grade	34
8. Costs per Pound of Boneless Oven-Ready Items, Choice Grade	39
9. The Adjusted Cost per Pound of Boneless Beef from Wholesale Sections Comprising the Carcass . . .	45
10. The Adjusted Cost per Pound of Boneless Beef from Designated Primal Cuts	48
11. Raw Food Cost for Designated Portions of Beef Items in Four Oven-Ready Classifications	55

INTRODUCTION

Beef is the meat item most often prepared and served in North American homes and food service institutions. Of the total food cost allowance the purchase of beef represents the largest item of expense. Recent developments in the marketing of this meat require the present day food service operator to determine the best method of purchase for his particular needs.

The traditional method of buying carcass beef has been supplemented by procurement of wholesale cuts, and more recently by the purchasing of prefabricated cuts. Very little information exists on comparative costs and the variations in percentage yields of meats for institution use.

This study was developed to compare factors which will influence the decision for buying beef in fabricated, carcass, or in primal cut state. Those cuts suitable for dry heat roasting, pot roasting, stew meat, and ground beef from carcasses and wholesale cuts of three grades will be prepared for cooking. These four oven-ready items will be compared with the corresponding items procured in fabricated form. Some of the factors to be considered are costs of labor and meat, variations in percentage yield, facilities required for storage, and problems in menu planning.

REVIEW OF LITERATURE

To conserve valuable refrigeration space aboard transport ships, the Armed Forces overseas have been purchasing frozen boneless beef (5). This method of distributing meat to the military personnel in the theaters of operation was greatly expanded during World War II.

Early in 1949, research was begun at the United States Naval Supply Research and Development Facility at Bayonne, New Jersey (2). The purpose of the research, Kotschevar related, was to eliminate or reduce the problems of producing good food on submarines during wartime patrols. It was thought that many of the problems of storage space, cooking time, and waste disposal could be reduced if the food were put aboard ship with much of the preliminary preparation already accomplished. Following tests in the research galleys and in shore installations, two submarines sailed for extended patrols into Arctic waters. One submarine was loaded with the experimental provisions and the other, acting as a control, carried normal provisions. Prefabricated meats were among the experimental food which previously had been tested and found to be advantageous. It was found that the acceptability of most of the experimental foods followed closely the acceptability ratings of the shore panels. After

about three weeks a number of the foods declined in acceptability, some to the point of extreme dislike by the crew. Precooked frozen foods were especially well adapted to the adverse conditions of prolonged submersion, when fresh air and electricity are at a minimum. Kotschevar also reported that cooks and scullery helpers worked 25 per cent less hours. Garbage was reduced by approximately 65 per cent. Electrical energy and water used on board the experimental ship for cooking were reduced. The cost of food per man per day was slightly under that of the cost for food on the control submarine.

The purchasing of prefabricated meats for institution use is a comparatively new technique. Among the advantages of buying prefabricated meats are portion size and cost control, lower operating costs, lower inventories, and ease of menu planning (4). Not only may the buying of portion-ready meats be substituted for other methods of buying, but this may also be a supplementary method of purchase. McGinnis cautioned that the buyer must be discriminating because prefabricated meats are being supplied in varying degrees of perfection. Preaging of good quality beef before fabrication is essential for tenderness and full flavor.

At first glance, an advantage of buying beef by the carcass is the price per pound. However, McGinnis (4) stated, there is

little utility in the item at the time of purchase. Other considerations in buying by carcass are the inconvenience and cost of handling and storage, shrinkage, waste, the greater investment necessary, uncertain portion costs, and menu planning difficulties.

The control of portion costs and quality is better when beef is purchased in primal cuts than when it is purchased by the carcass or side. To have better control, McGinnis pointed out, the primal cuts must be bought and received on rigid specification, time studies must be made to reflect true labor costs, and yield tests must be made to calculate the cost of each portion. Only when personnel are trained to do an efficient portion job, and by-products are equalized and utilized does primal cut buying become effective.

From a study on the utility and economy of using prefabricated meats in a New York hospital, Kotschevar, Mosso, and Tugwell (3), reported that the use of prefabricated meats did not greatly reduce meat costs. During the first two weeks of their study, primal cuts were prepared by hospital butchers. Fabricated meats were purchased for the second period in which the menu of the first two weeks was repeated. From the results of this intensive 4-week study, an estimate of the saving which could result from using prefabricated meats for an entire year was made. The actual saving of \$6,922.39

was considerably less than the \$14,000 saving which had been estimated.

A comparison of the net cost per pound of meat favored neither method of purchase. Kotschevar and co-workers (3) showed that a comparison of data on portions indicated that the ability to control the portion size was a significant factor in deciding final portion costs. They also found that it was very difficult to predict costs of final meat portions derived from primal cuts. Labor costs during the second period were reduced 50 per cent. The average inventory in the second period was one-third to one-fourth of that required when the hospital used meats from primal cuts. The cubic feet of storage space required for chilled prefabricated meat was approximately one-fifth the storage needed for a comparable number of oven-ready pounds in primal cuts.

METHOD OF PROCEDURE

For the cutting tests nine half-carcasses were purchased from Armour and Company of Chicago, Illinois. Thirty-six primal cuts including rounds, trimmed loins, ribs, and chucks were obtained from Armour and Company and Plankinton Packing Company of Milwaukee. Three carcasses and three of each of the designated primal cuts of the grades Commercial, Good, and Choice were used in this study. The half-carcasses and primal cuts were held at 35° F for seven days in the Food Stores meat department before cutting tests were made.

Preparation of Carcasses

At the time of delivery to Food Stores, each half-carcass had been cut between the twelfth and thirteenth rib into hind and fore-quarters, with one rib remaining on the hind quarter. The quarters were then cut into wholesale cuts, Chicago Style, as shown in Figure 1. The wholesale cuts derived from the hindquarter were the round, loin end, flank, and short loin. The forequarter was cut into the rib, short plate, chuck, and foreshank. Bones and fat were weighed and later sold as salvage material. Because conditions for the sale of bones and fat are so variable, the monetary value of these

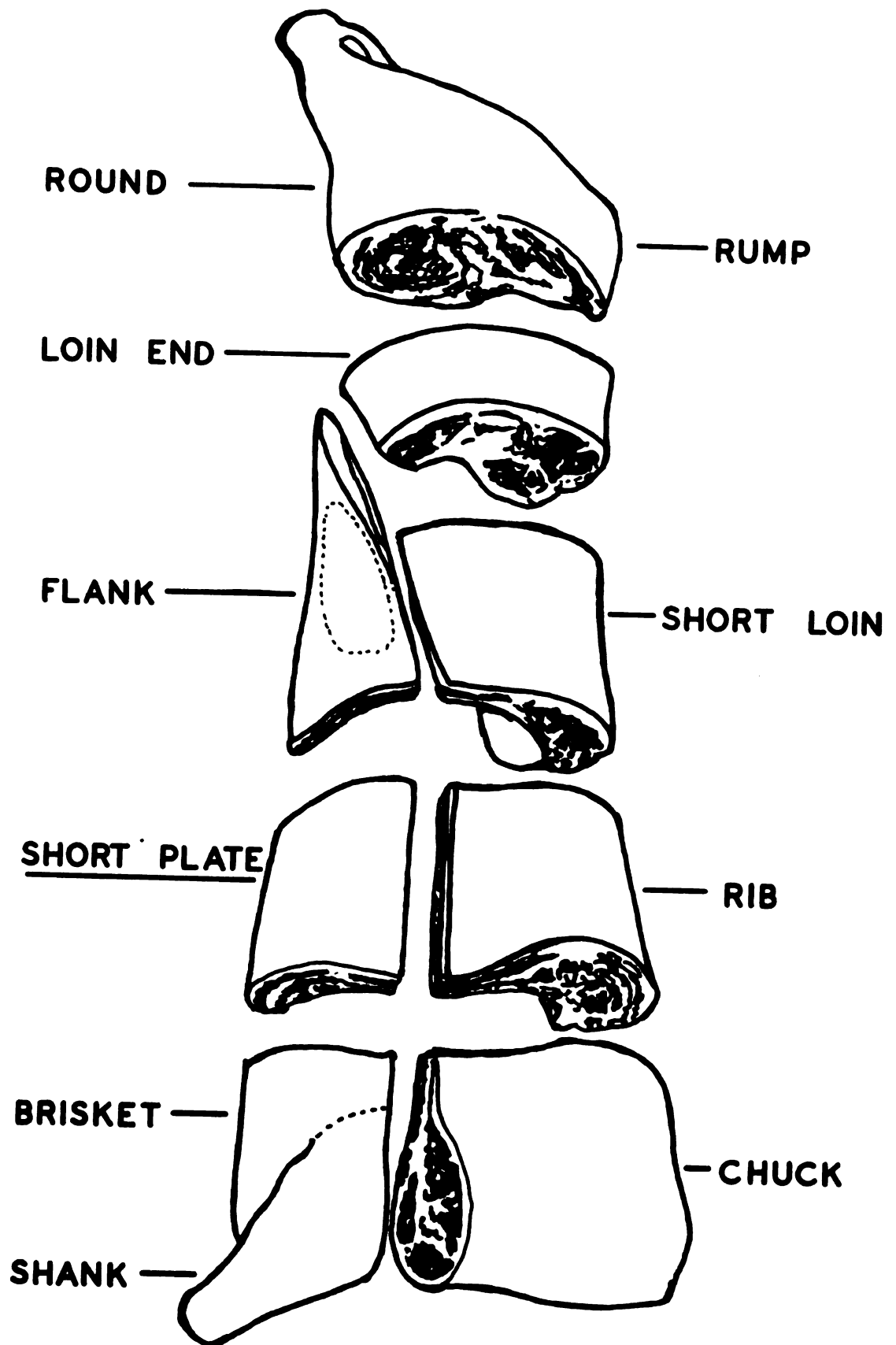


Figure 1. Location and Names of Wholesale Cuts of Beef

materials was not deducted from the adjusted costs per pound of boneless meat. All edible trim was included with the portions of the meats which were to be ground.

The Hindquarter

With the hindquarter hanging from the hook, a line parallel to the thirteenth rib was struck approximately 1 inch from the tip of the aitch bone. The line was cut with the knife straight across the round (Figure 2) from the rump, Point A, to the flank side of the hindquarter, Point B. The tip of the knuckle bone was sawed off. This separation removed the round and rump from the full loin.

With the full loin on the table, the backbone away from the meat cutter, the flank was removed by cutting from the sirloin tip, Point B, to the cartilage end of the thirteenth rib, Point C.

The full loin, with flank removed, was turned to an inside down position. The short loin was separated from the loin end by cutting across the full loin parallel to the rump end of the loin. The knife was drawn through the meat at the tip of the pin bone, Point D, and in front of the last lumbar vertebra to Point H from Point E. The loin end, ABEH, was approximately one-third of the

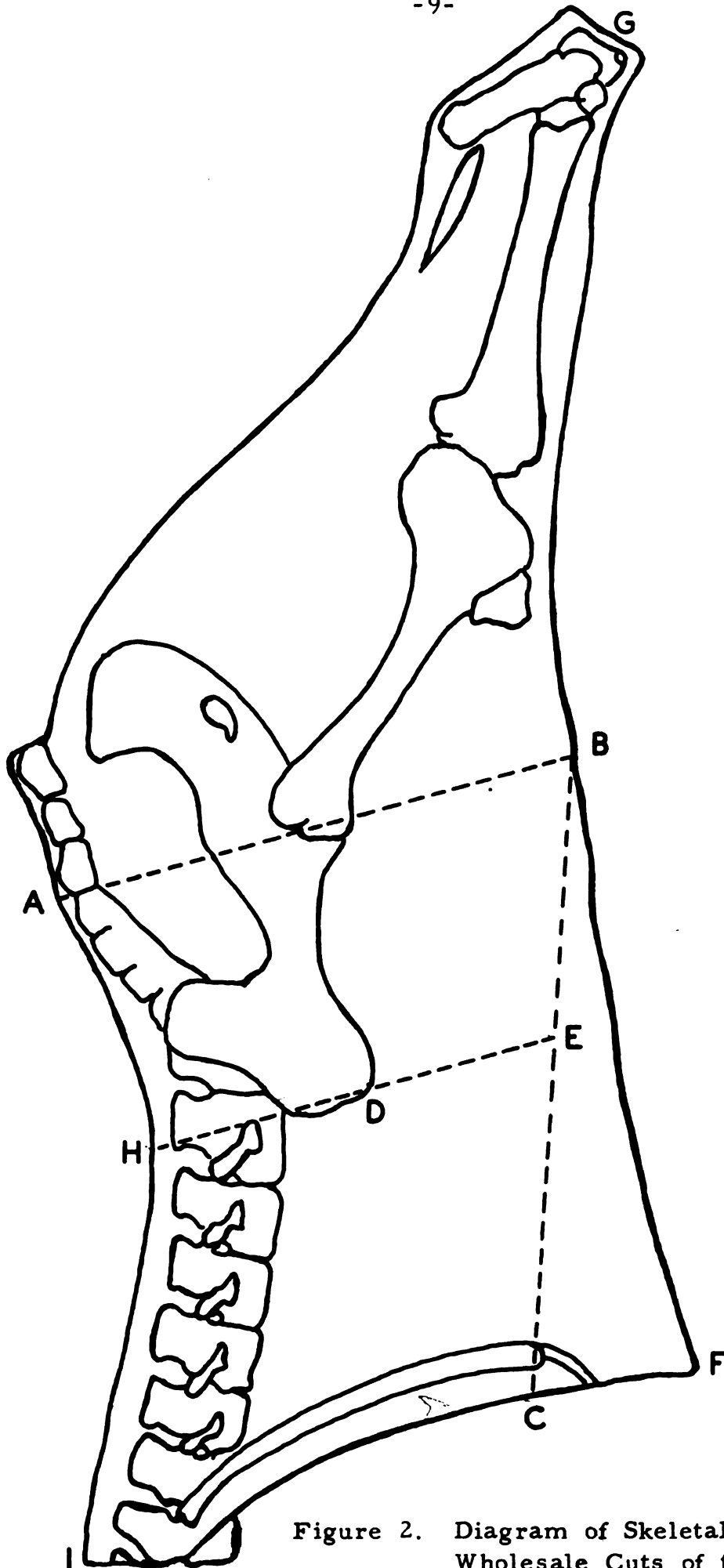


Figure 2. Diagram of Skeletal Parts and Wholesale Cuts of the Hind Quarter

length of the full loin; the short loin; HECI, was the remaining two-thirds of length.

Round. The round, Figure 2, AGB, was removed from the hook and placed on the bench with the outside down. Excess fat was removed. The sacral vertebrae were disjoined; the aitch bone was then removed. The hind shank bone was cut away from the meat by bringing the knife down both sides of the bone from the hock bones and by cutting through the stifle joint (see Figure 3). The heel and shank meat were then cut away and prepared for grinding.

The inside round was grasped with the hook near the rump knuckle bone. While the meat was pulled upward the natural seam was followed with the knife to separate the top round from the bottom round and knuckle. The thin meat from the shank end was trimmed away, and the top round was cut into three approximately equal pieces for dry heat roasting.

The natural seam between the knuckle and bottom round was separated down to the round bone. The knee cap and socket were unjointed and pulled away with the knuckle from the round bone and bottom round. The round bone was then cut away from the bottom round and rump. The rump was cut away from the bottom round;

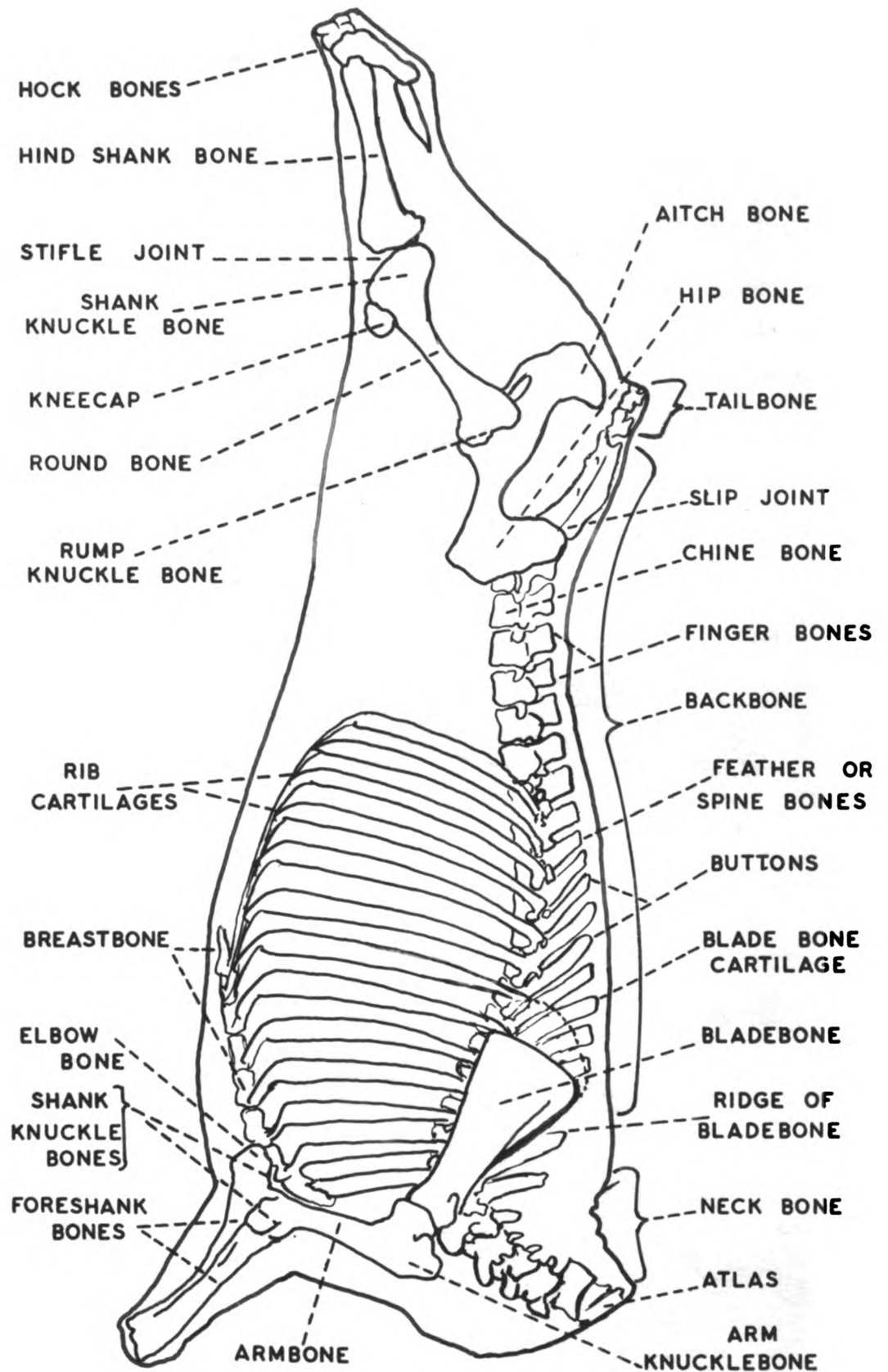


Figure 3. Location and Names of Bones in Beef Skeleton

the loose layer of meat and fat were removed and the piece was trimmed. The outside round was cut in two, lengthwise, after the excess fat and membrane had been removed. The bottom round, the knuckle, and the rump were suitable for moist heat roasting.

Full Loin. The loin end, Figure 2, ABEH, was placed on the table with the inside exposed to the meat cutter. Excess fat was removed. The butt tender was cut away from the pelvic bone and the last lumbar vertebra was removed. The knife was worked around the pelvic bone, which was taken out, leaving the sirloin butt.

The short loin was laid on the table with the outside down. Excess fat was removed. The thirteenth rib was cut out. The knife was drawn underneath the tenderloin to separate it from the short loin. When the chine bones had been cut away, the backbone was trimmed away from the loin strip. The butt tender, tenderloin, sirloin butt and loin strip were then ready for dry heat roasting.

Flank. The excess fat and the cartilage end of the thirteenth rib were removed from the flank. The lean meat was then cut into pieces for grinding.

The Forequarter

The forequarter remained on the hook while the rib section was being removed. To establish a beginning point for cutting, the knife was inserted between the fifth and sixth ribs in the center of the forequarter at Point A, shown in the diagram of the forequarter, Figure 4. From this point, a cut was made through the meat to Point B on the backbone. From Point C, seven inches from the backbone, a line was sawed from the top of the forequarter down to the cut between the fifth and sixth ribs, Point A. This line was parallel to the backbone. To complete the removal of the standing rib, JCAE, from the forequarter, the backbone, from Point B to Point E, was sawed in line with the cut between the ribs (A to B).

Remaining on the hook was the rattle which was composed of the short plate, foreshank, and chuck. The rattle was removed to the cutting bench, inside down. The short plate was separated from the rattle by cutting down between the fifth and sixth ribs from Point A and sawing across the breastbone to Point H.

To remove the foreshank and brisket, the arm bone was sawed just above the elbow joint at Point F. A cut was made with the saw two inches from the cartilage end of the fifth rib at Point

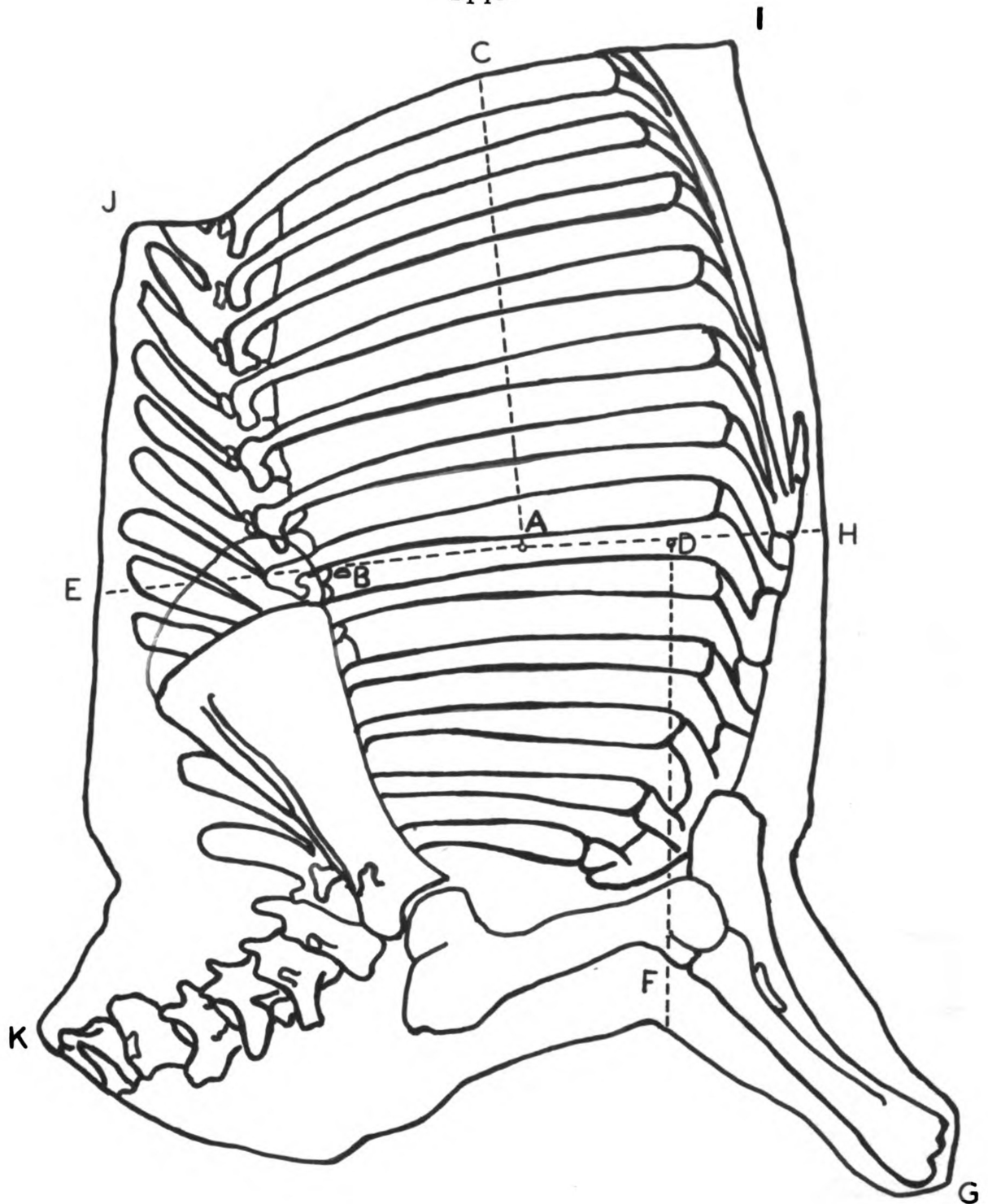


Figure 4. Diagram of Skeletal Parts and Wholesale Cuts of the Fore Quarter

D to the cut across the arm bone at Point F. The brisket and fore-shank, DHGF, were removed in one piece.

Chuck. While the chuck (EDFK, Figure 4) was still turned inside down on the bench, the pin was pulled from the neck and the atlas was removed by cutting between the first and second cervical vertebrae. The knife was pulled along both sides of the arm bone to the socket joint, and the bone was removed. To remove the clod (Figure 5), a cut was made from the socket, Point A, along the ridge of the bladebone to its cartilage end, Point B. The clod was pulled from Point C toward the top or back of the chuck as the knife was cut along the natural seam and through the meat of the inside muscle to the bladebone. The exposed portion of the bladebone was cleaned of trimmings and removed by cutting underneath it with the boning knife.

The chuck was turned over, and the Scotch tender was trimmed from the inside of the chine bones. The strip of meat from the throat side of the neckbone was also removed. With the boning knife, meat was slit along each side of the ribs, and the vertebrae were cut apart. Each of the first five ribs with its attached vertebra and finger bone was removed and trimmed. During this operation

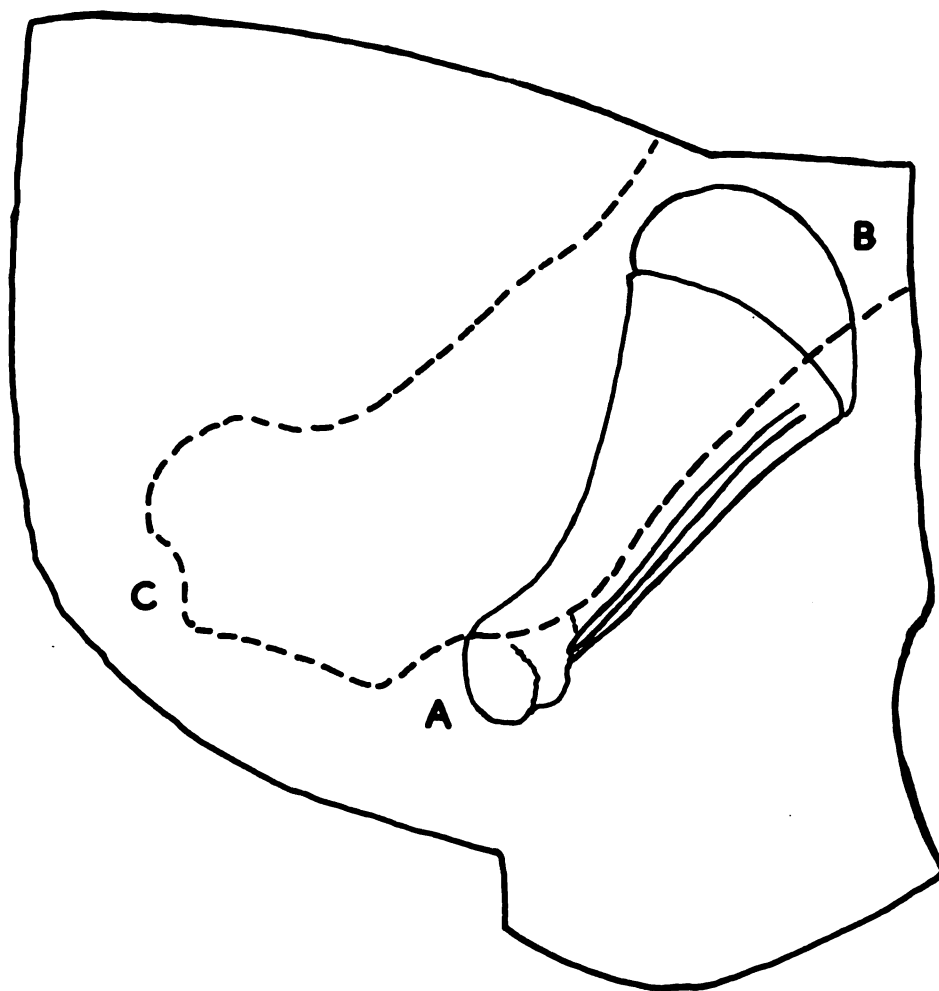


Figure 5. Diagram of Procedure used to Remove the Clod from the Chuck

the top of the animal was toward the meat cutter. The ends or buttons of the feather bones were removed. The knife was used to cut back under the feather bones to loosen and remove them from the meat. Each neck bone was separated from the meat and trimmed. The back strap was pulled out, starting at the rib end of the chuck. All portions of the chuck were cut into squares for stewing. A small amount of trim from the bones was included with meat to be ground.

Rib. When the end of the bladebone had been separated from the rib, the feather bones were loosened and removed. Each rib with its attached vertebra was stripped and separated from the meat. After all bones were removed, the backstrap was pulled from the length of the rib. The boneless meat was rolled, and with the use of a beef needle the rib was tied securely. The rib was then ready for dry heat roasting.

Short Plate. Excess fat was peeled from the short plate, and the skirt was removed. The end piece of the breast bone was removed and the rib cartilages were broken off at the soft joints at the ends of the rib bones, which were then stripped out. The short plate was cut into squares for stewing.

Foreshank. The forearm was detached from the brisket. The muscles on each side of the foreshank were laid open and the elbow and foreshank bones were removed. Cartilage and breast bones were removed from the brisket. The shank meat was ground and the brisket meat was cut into stew meat.

Preparation of Primal Cuts

The rounds, loins, ribs, and chucks which were purchased as primal cuts were prepared for the cutting tests in the same manner as the corresponding carcass items. Cuts designated for dry heat roasting were the inside round, the entire tenderloin, the loin strip, the rolled rib, and the sirloin butt. Those pieces suitable for pot roasting were the knuckle and bottom round. Meat to be cut for stew was obtained from the chuck. Beef for grinding was from the heel and hind shank on the round and the trim from the short loin. Small amounts of trim from the loin end, rib, and chuck were added to the beef to be ground.

Prefabricated Cuts

Prefabricated beef was not actually purchased by the Food Stores Department. To compare the costs of prefabricated items

of the four oven-ready classifications with the costs of items prepared in the meat laboratory, quotations were obtained from four regional wholesalers.

Costing of Oven-Ready Cuts

A price list prepared for use on the campus was selected arbitrarily as a costing basis for this study. Prices on this basic list included wholesale costs of the meat plus an 8 per cent service and processing charge.

The listed prices of the four oven-ready items were converted into a relative cost factor. This factor was established by dividing the price of each item by the cost of ground beef. The prices selected and their conversion into the cost factor are presented in Table 1.

Table 1. Conversion of List Prices to Price Factors

Item	List Price	Factor Value
Ground Beef	.36	1.00 X
Stew Meat	.46	1.28 X
Pot Roast	.52	1.44 X
Dry Heat Roast	.60	1.67 X

A total of X values for each carcass or primal cut was obtained by multiplying the total poundage of each of the four oven-ready classifications by its respective factor. The total poundage and the method of obtaining the total X values may be found in Tables 2 and 3.

Table 2. Sample of Half-Carcass Yields (pounds)

Wholesale Cut	Oven-Ready Classification			
	Dry Heat	Pot Roast	Stew	Ground
Round	14.69	25.25		10.44
Loin End				
Butt tender	2.00			
Sirbutt	15.06			1.50
Flank				8.69
Short Loin				
Tenderloin	1.50			
Strip Loin	7.00			5.56
Rib	17.87			.75
Short Plate			9.69	4.93
Chuck			61.00	2.00
Fore shank			5.43	6.69
Total Pounds	58.12	25.25	76.12	40.56

Table 3. Method of Obtaining the Total X Values

Classification	Poundage Yield	Factor	X Values
Dry Roast	58.12	1.67 X	97.07
Pot Roast	25.25	1.44 X	36.36
Stew Meat	76.12	1.28 X	97.44
Ground Beef	40.56	1.00 X	40.56
Total X Values			271.43

The dollar value of the carcass or primal cut was then divided by the total X values to produce the value of X, the basic cost per pound of ground beef, for the particular animal. For example: Cost per pound of ground beef = $\$86.125 \div 271.43 = \$.3173$.

The values of the three remaining oven-ready items were obtained by multiplication of the established value of X by their respective factors, as shown in Table 4.

Table 4. Method of Obtaining Values of the Remaining Items

Classification	Established X Value	Factor	Calculated Cost
Stew Meat	.3173	1.28	.4061
Pot Roast	.3173	1.44	.4569
Dry Heat Roast	.3173	1.67	.5299

Based on these factors, the actual costs of the four items were calculated from the yield and the market cost for each half-carcass and primal cut.

Costing of Fabricated Items

The quotations on prefabricated items were obtained from Armour and Company of Chicago, Plankinton Packing Company of Milwaukee, Kingan and Company of Indianapolis, and Stanny-Morris Livingston of Detroit. The prices used were quoted June 2, 1954. The cost per pound of fabricated cuts used for comparison with the cost of carcass and primal cuts was an average of the quotations listed by the four companies. The actual quotations may be found in Appendix B.

Cost of Labor

The amount of time required to complete the cutting tests for the carcass and primal cuts was recorded. The breaking time for the carcasses and the preparation time of all cuts was included. To arrive at the adjusted cost per pound of boneless meat, an average of the total preparation cost was added to the billed price per pound. The total preparation time included grinding, breaking, and handling times in addition to the actual cutting time. The wage of the butcher who did the cutting tests was figured at \$1.90 per hour.

Factors Other Than Cost

It is impossible to measure objectively all of the factors which will influence the decision of the method of buying beef. Factors other than direct meat and labor costs which must be considered are the problems in menu planning, storage and working area requirements, replacement and upkeep of equipment, and availability of a reliable purveyor of meats for institution use.

Menu Planning

To review some of the problems encountered in menu planning, the number of pounds of each oven-ready classification necessary to serve 1000 portions was calculated. The amount of carcass beef which remained to be served subsequent to the basic meal was also calculated and reviewed in terms of menu planning.

Storage Space Requirements

The amount of chilled space required to hold beef was determined. The approximate number of square feet needed was figured for each method of purchase: carcass, primal cuts, and prefabricated items.

RESULTS AND DISCUSSION

Costs of Beef

Cost per pound

In order to present a clear-cut comparison of the influence of methods of procurement on the differences in cost per pound of the four oven-ready classifications, the three grades of beef have been considered separately in the following discussion.

Commercial grade. The cuts suitable for dry heat roasting showed price variations from \$.3609 to \$.8483 per pound among the three methods for purchasing beef.

The rolled rib at \$.3609 per pound was least expensive when prepared from the primal cut. The cost per pound of rolled rib from carcass beef was \$.5501 and from fabricated sources was \$.5783, as shown in Table 5 and Figure 6. The price of \$.4450 per pound quoted for fabricated top round was \$.1030 less per pound than the cost of top round from carcass beef and \$.1263 less than top round from the primal cut. The prices of the rolled rib from the primal cut and the fabricated top round may have been unusually low because the market was over-supplied with Commercial grade

Table 5. Value of Commercial Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment

Data on Menu Item					
Source		A.P. Weight /1000 Por- tions	Cost per Pound		
			A.P.	Bone- less, Oven- Ready	Plus Labor (\$1.90 /hour)
Rib, Rolled	Carcass	6215	.3233	.5501	.5776
	Primal cut	547	.2575	.3609	.3766
	Fabricated	375	.5783	.5783	.5783
Top Round	Carcass	5037	.3233	.5480	.5553
	Primal cut	1249	.3600	.5713	.5789
	Fabricated	281	.4450	.4450	.4450
Sirloin Butt	Carcass	4094	.3233	.5519	.5676
	Primal cut	770	.4800	.7407	.7459
	Fabricated	281	.5150	.5150	.5150
Short Loin	Carcass	10347	.3233	.5509	.5733
	Primal cut	1705	.4800	.7406	.7576
	Fabricated	375	.8483	.8483	.8483
Total Dry Heat Roasting Sections	Carcass	1416	.3233	.5502	.5685
	Primal cut				
	Fabricated				
Pot Roast	Carcass	3188	.3233	.4752	.4815
	Primal cut (round)	785	.3600	.4927	.4993
	Fabricated	281	.4500	.4500	.4500
Stew Meat	Carcass	888	.3233	.4225	.4423
	Primal cut (chuck)	352	.2700	.3737	.3908
	Fabricated	250	.4733	.4733	.4733
Ground Beef	Carcass	1921	.3233	.3297	.3341
	Primal cut (round)	1544	.3600	.3421	.3466
	Fabricated	250	.3388	.3388	.3388

¹ The first number within parentheses represents the cost per pound of carcass boneless oven-ready beef; the second represents the cost per pound of primal cut boneless oven-ready beef.

Table 5 (continued)

Total Value of Cuts Remaining After Removal of 1000 Portions of Item							Pounds of Salvage Material Remaining	
Rib (.5501 ..3609) 1	Top Round (.5480 .5713)	Sirloin Butt Roast (.5519 .7407)	Short Loin Roast (.5509 .7406)	Pot Roast (.4752 .4927)	Stew Cut (.4225 .3737)	Ground Beef (.3297 .3421)	Fat	Bone
	190.16 0	235.66 0	123.95 0	260.41 0	739.38 0	266.73 9.58	564 36	1170 108
167.23 0		190.96 0	100.26 0	210.99 220.24	599.11 0	215.95 69.10	458 79	949 240
135.87 0	124.94 0		82.08 125.16	171.54 0	486.72 0	175.73 28.74	771 134	372 102
343.26 0	316.20 0	392.40 460.72		433.86 0	1230.74 0	443.78 63.63	939 296	1949 226
				59.90	168.58	60.66	128	267
105.62 0	97.54 101.12	120.86 0	63.90 0		379.41 0	136.83 43.45	289 49	600 151
29.16 0	27.40 0	33.67 0	17.63 0	37.07 0		38.25 2.74	81 38	167 56
63.81 0	58.64 198.24	72.85 0	38.56 0	80.31 272.46	228.57 0		174 98	362 296

Identification of Coding Used
In the Figures

B	Bone
BRd	Bottom Round
C	Chuck
F	Fat
F1	Flank
FL	Full Loin
Fs	Foreshank
GB	Ground Beef
LE	Loin End
PR	Pot Roast
Rd	Round
RR	Rolled Rib
SB	Sirloin Butt
Sh	Shrinkage
SL	Short Loin
SM	Stew Meat
SP	Short Plate
TBM	Total Boneless Meat
TDHR	Total Dry Heat Roasts of Carcass
TRd	Top Round

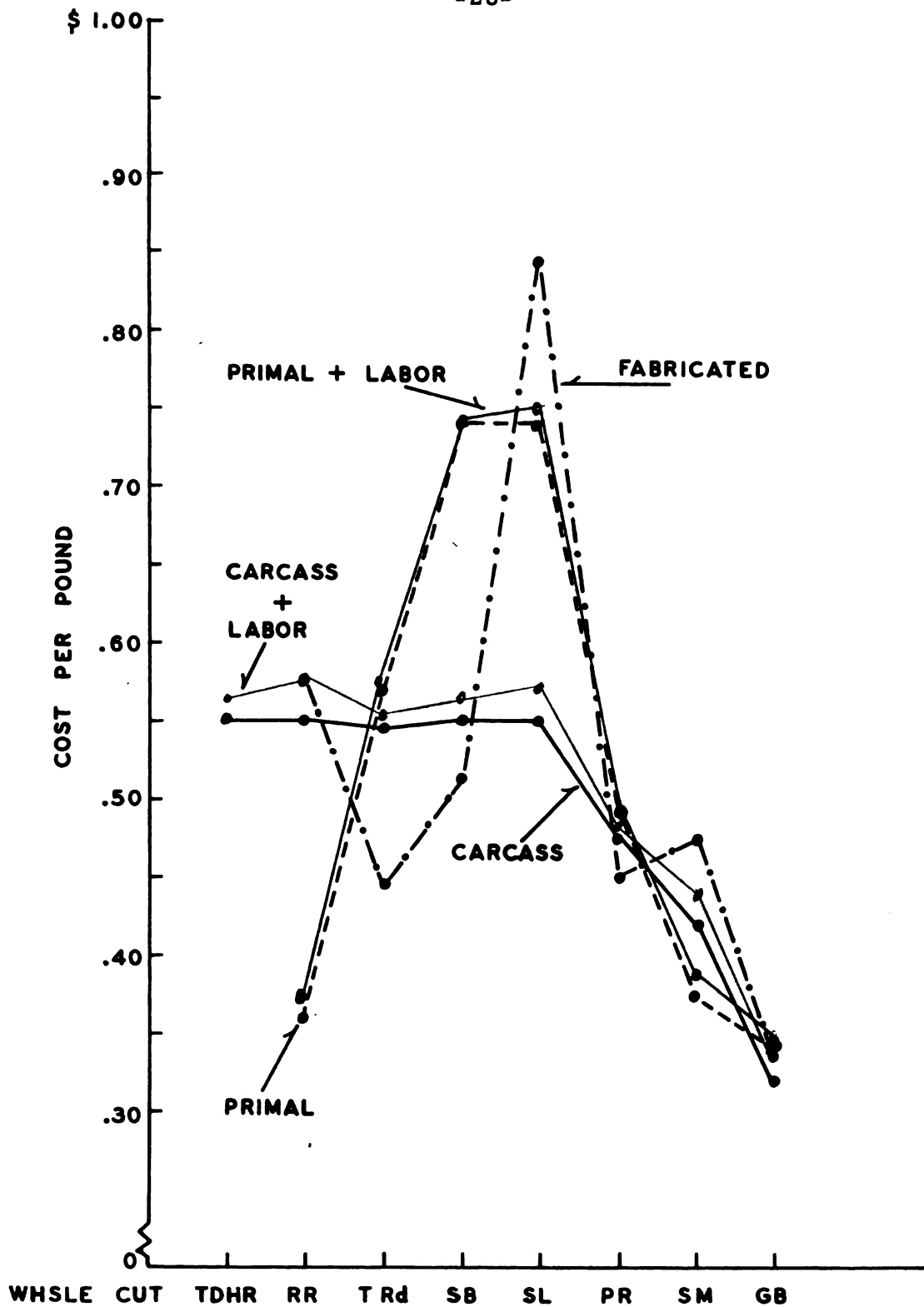


Figure 6. Costs per Pound of Boneless Oven-Ready Items, Commercial Grade

rib sections and rounds at the time the tests were made. Variation in market quotations for these items might be expected to influence considerably the cost per pound of boneless meat from these cuts. Regional demand for certain beef items might also cause the cost-per-pound relationship of the various items to fluctuate markedly in different parts of the country.

An appreciable difference in price per pound was found between the fabricated sirloin butt (\$.5150) and the sirloin butt obtained from a primal cut (\$.7407). Sirloin butt cut from the carcass cost almost 4 cents per pound more than the fabricated item. Short loin prepared from carcass beef cost \$.5509 per pound. This price was \$.2974 less per pound than a fabricated short loin and \$.1897 less than short loin from the primal cut.

The average cost of all dry heat roasts obtained from the Commercial grade carcasses, including rolled rib, sirloin butt, short loin, and top round, was \$.5502 per pound. This average cost was less than that of all other dry heat roasts of this grade with the exception of the fabricated sirloin butt and the rolled rib prepared from the primal cut.

The less tender cuts of Commercial oven-ready items showed smaller price variations than did the dry heat roasts. Bottom round,

satisfactory for braising, was more expensive when obtained from the primal cuts or from carcass beef than when procured in fabricated form. The cost of fabricated bottom round was \$.4500, which was \$.0427 less than round from primal cuts and \$.0252 less than round from carcass sources.

Stew meat from chucks purchased as primal cuts cost \$.0996 less per pound than the fabricated stew meat, and \$.0488 less than stew meat obtained from carcass beef. The differences in the costs of ground beef were negligible. The beef obtained from carcass for grinding cost only \$.0134 less per pound than ground beef from comparable trim from a round obtained as a primal cut and was approximately equal in cost to fabricated ground beef.

Good grade. A price variation of \$.7013 per pound occurred among the Good grade cuts suitable for dry heat roasting (Table 6). This extreme variation was found predominately within roasts purchased as fabricated beef.

The rolled rib was least expensive in this grade when purchased as a primal cut. At \$.5635 per pound, the rib from this source was \$.0966 less than a rib roast from carcass sources, and \$.1282 less per pound than a prefabricated roast. Top round, when purchased already fabricated, cost \$.2287 less than top round obtained

Table 6. Value of Good Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment

Data on Menu Item					
Source		A.P. Weight /1000 Por- tions	Cost per Pound		
			A.P.	Bone- less, Oven- Ready	Plus Labor (\$1.90 /hour)
Rib, Rolled	Carcass	6025	.3197	.6601	.6854
	Primal cut	527	.4199	.5635	.5831
	Fabricated	375	.6917	.6917	.6917
Top Round	Carcass	4641	.3197	.6704	.6772
	Primal cut	1312	.4650	.7487	.7561
	Fabricated	281	.5200	.5200	.5200
Sirloin Butt	Carcass	4548	.3197	.6616	.6738
	Primal cut	699	.5650	.7690	.7749
	Fabricated	281	.6763	.6763	.6763
Short Loin	Carcass	8615	.3197	.6608	.6794
	Primal cut	1329	.5650	.7696	.7860
	Fabricated	375	1.2213	1.2213	1.2213
Total Dry Heat Roasting Sections	Carcass	1372	.3197	.6632	.6790
	Primal cut				
	Fabricated				
Pot Roast	Carcass	3040	.3197	.5698	.5756
	Primal cut (round)	783	.4650	.6456	.6520
	Fabricated	281	.6500	.6500	.6500
Stew Meat	Carcass	910	.3197	.5068	.5270
	Primal cut (chuck)	344	.3700	.5007	.5190
	Fabricated	250	.4650	.4650	.4650
Ground Beef	Carcass	1844	.3197	.3964	.4004
	Primal cut (round)	1453	.4650	.4484	.4528
	Fabricated	250	.4000	.4000	.4000

¹ The first number within parentheses represents the cost per pound of carcass boneless oven-ready beef; the second represents the cost per pound of primal cut boneless oven-ready beef.

Table 6 (continued)

Total Value of Cuts Remaining After Removal of 1000 Portions of Item							Pounds of Salvage Material Remaining	
Rib (.6601 .5635) ¹	Top Round (.6704 .7487)	Sirloin Butt Roast (.7690 .7690)	Short Loin Roast (.6608 .7696)	Pot Roast (.5698 .6456)	Stew Cut (.5068 .5007)	Ground Beef (.3964 .4484)	Fat	Bone
	244.69 0	246.12 0	173.79 0	317.38 0	838.75 0	323.86 14.80	631 22	990 97
190.77 0		189.88 0	133.48 0	244.44 304.08	646.17 0	249.34 101.34	486 100	763 234
186.81 0	185.03 0		130.84 151.61	239.32 0	633.50 0	244.58 31.39	476 59	747 92
353.81 0	349.95 0	351.97 410.65		453.56 0	1200.10 0	463.00 59.64	902 112	1416 175
				72.36	191.06	73.73	144	225
124.76 0	123.35 125.78	124.38 0	87.88 0		423.18 0	163.32 60.09	318 60	500 140
37.63 0	36.87 0	37.05 0	26.43 0	47.86 0		48.76 3.59	95 29	150 57
75.91 0	75.08 232.85	75.42 0	52.86 0	96.87 337.00	256.95 0		193 111	303 259

1

from the primal cut, which cost \$.7487 per pound. The \$.5200 quotation of the fabricated roast was \$.1504 less than top round obtained from carcass beef. The prices of rolled rib from the primal cut and the fabricated top round may have been unusually low because the market was over-supplied with rib sections and rounds of Good grade at the time the tests were made.

The prices of fabricated sirloin butt and similar cuts obtained from carcass sources varied only \$.0147 per pound. Carcass sirloin butt, calculated to cost \$.6616 per pound, was \$.1074 less than sirloin butt from the primal cuts. The cost of fabricated short loin, \$1.2213 per pound, was almost double the cost of short loin from carcass source (Figure 7). A short loin from primal cuts cost \$.1088 more than the short loin cut from a carcass. The extremely high price quotations of fabricated short loins may be due to a sharp increase in the demand for these items by food service institutions specializing in loin steaks.

Among the cuts suitable for dry heat roasting, two were found to cost less than \$.6632 per pound, the average cost of the total dry heat roasts from sources of Good grade. These two less expensive cuts were the rolled rib from a primal cut, costing \$.5635 per pound, and the fabricated top round, quoted at \$.5200 per pound.

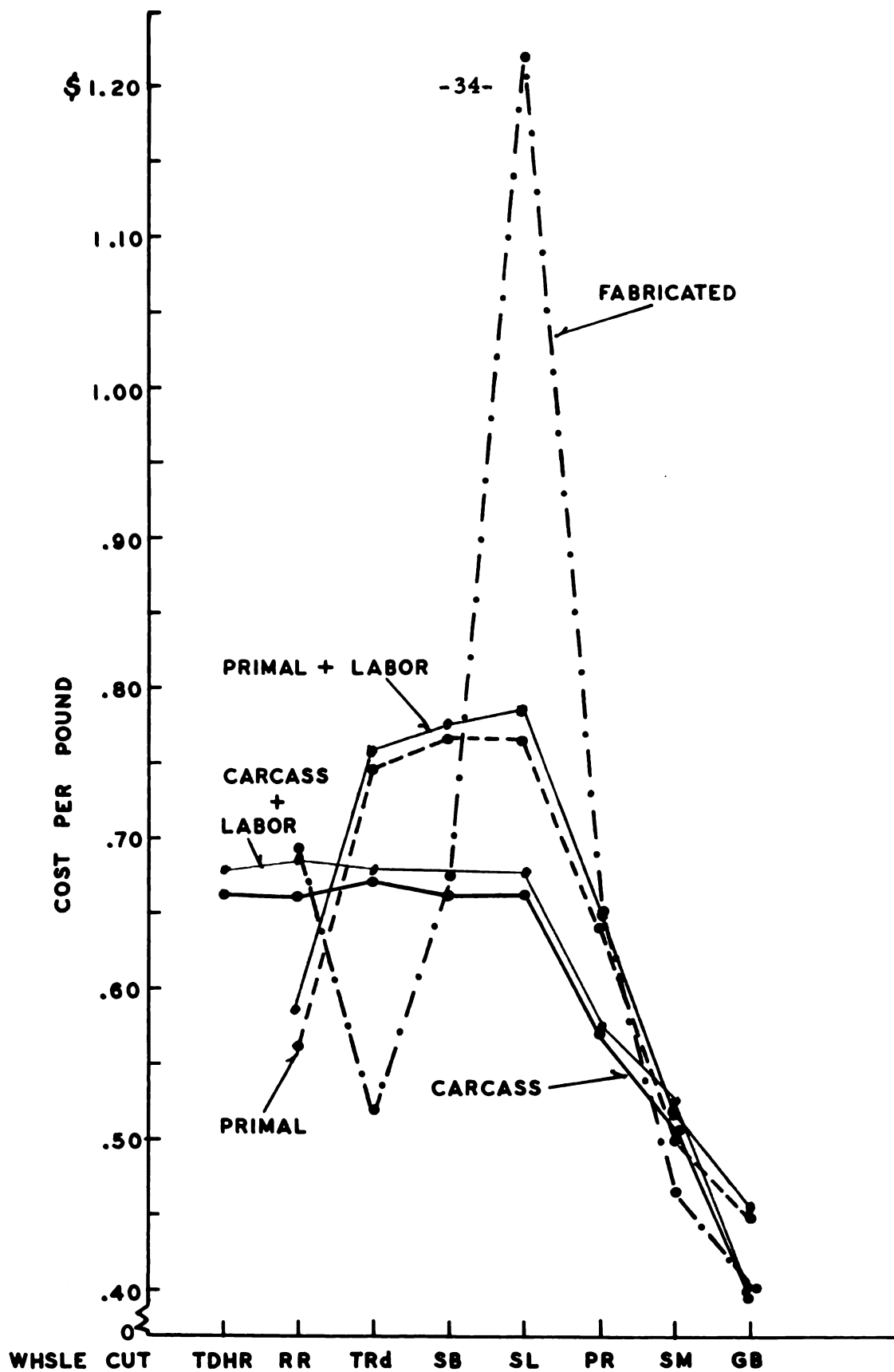


Figure 7. Cost per Pound of Boneless Oven-Ready Items, Good Grade

Among the three sources of procurement, the cuts suitable for moist heat cooking showed variations of less than \$.1000 per pound in cost. Bottom round, when prepared from carcass beef, was the least expensive, and from fabricated source was the most expensive.

The costs of stew meat showed differences of only \$.0418 per pound among the various sources. Fabricated stew meat was quoted at \$.4650, the lowest price of the three sources. A difference of \$.0520 was found between the highest and lowest prices of ground beef. The carcass source of ground beef was least costly at \$.3964; however, the fabricated ground beef was only slightly more expensive at \$.4000 per pound.

Choice grade. The greatest variation of prices among all of the dry heat roasts was found between fabricated top round and fabricated short loin. The difference in costs between these two items of Choice grade was \$.8738 per pound.

The variation in prices among the three methods of purchasing rolled rib, shown in Table 7, was not more than \$.0535 per pound. The rib roast was least expensive when obtained from primal cuts. An appreciable difference of \$.3242 per pound was found between the \$.4450 quoted for fabricated top round and the cost

Table 7. Value of Choice Grade Oven-Ready Items Remaining After Removal of 1000 Portions from Shipment

Data on Menu Item					
Source		A.P. Weight /1000 Por- tions	Cost per Pound		
			A.P.	Bone- less, Oven- Ready	Plus Labor (\$1.90 /hour)
Rib, Rolled	Carcass	5563	.4225	.7160	.7406
	Primal cut	522	.5100	.6948	.7164
	Fabricated	375	.7483	.7483	.7483
Top Round	Carcass	5305	.4225	.7164	.7237
	Primal cut	1327	.4700	.7692	.7769
	Fabricated	281	.4450	.4450	.4450
Sirloin Butt	Carcass	4476	.4225	.7156	.7275
	Primal cut	757	.7350	1.0857	1.0917
	Fabricated	281	.7313	.7313	.7313
Short Loin	Carcass	8466	.4225	.7163	.7347
	Primal cut	1530	.7350	1.0823	1.0993
	Fabricated	375	1.3188	1.3188	1.3188
Total Dry Heat Roasting Sections	Carcass	1376	.4225	.7161	.7316
	Primal cut				
	Fabricated				
Pot Roast	Carcass	3254	.4225	.6172	.6235
	Primal cut (round)	782	.4700	.6634	.6701
	Fabricated	281	.7000	.7000	.7000
Stew Meat	Carcass	915	.4225	.5491	.5693
	Primal cut (chuck)	364	.3750	.5334	.5557
	Fabricated	250	.4770	.4770	.4770
Ground Beef	Carcass	1810	.4225	.4284	.4328
	Primal cut (round)	1599	.4700	.4604	.4650
	Fabricated	250	.3775	.3775	.3775

¹ The first number within parentheses represents the cost per pound of carcass boneless oven-ready beef; the second represents the cost per pound of primal cut boneless oven-ready beef.

Table 7 (continued)

Total Value of Cuts Remaining After Removal of 1000 Portions of Item							Pounds of Salvage Material Remaining	
Rib (.7160 .6948) ¹	Top Round (.7164 .7692)	Sirloin Butt Roast (.7156 1.0857)	Short Loin Roast (.7163 1.0823)	Pot Roast (.6172 .6634)	Stew Cut (.5491 .4334)	Ground Beef (.4284 .4604)	Fat	Bone
	211.34 0	249.74 0	176.93 0	296.87 0	834.63 0	329.01 8.75	668 33	860 95
256.33 0		238.29 0	168.33 0	282.68 316.44	796.20 0	314.02 95.30	636 127	821 235
216.23 0	169.79 0		141.83 200.23	238.86 0	671.55 0	264.75 39.59	537 121	693 84
408.12 0	321.66 0	380.70 616.68		451.17 0	1270.62 0	500.80 80.11	1016 244	1310 169
				73.45	206.46	81.40	165	213
156.89 0	123.94 127.69	145.98 0	103.15 0		488.15 0	192.35 56.17	391 75	504 138
44.39 0	34.39 0	40.79 0	29.37 0	48.76 0		53.98 3.68	110 53	142 53
87.35 0	68.77 260.76	81.58 0	57.30 0	96.28 380.79	271.80 0		217 153	280 283

of top round obtained from the primal cuts. The price of top round from carcass was also \$.2714 more per pound than that of comparable roasts from fabricated sources.

The costs per pound of sirloin butt from carcass and fabricated sources varied only \$.0157 but were considerably less than the cost of sirloin butt from the primal cut, which was found to be \$1.0857 per pound. Figure 8 shows clearly the wide variation in costs of short loin purchased by each of the three methods. The short loin from carcass sources cost \$.3660 less per pound than the roasts from primal cuts and \$.6025 less than comparable fabricated roasts.

Only the fabricated top round and the rolled rib prepared from the primal cut were less expensive than \$.7161 per pound which was the average cost of all dry heat roasts, including rolled rib, top round, sirloin butt, and short loin, from Choice grade of carcass beef.

The variation in price per pound of the less tender cuts of beef was approximately 8 cents. Bottom round, obtained from carcass at \$.6172 per pound, was \$.0828 less than fabricated pot roast and \$.0366 less than bottom round obtained from the primal cuts. Stew meat, quoted at \$.4770 per pound, and ground beef, quoted at \$.3775, were least expensive obtained in the fabricated form.

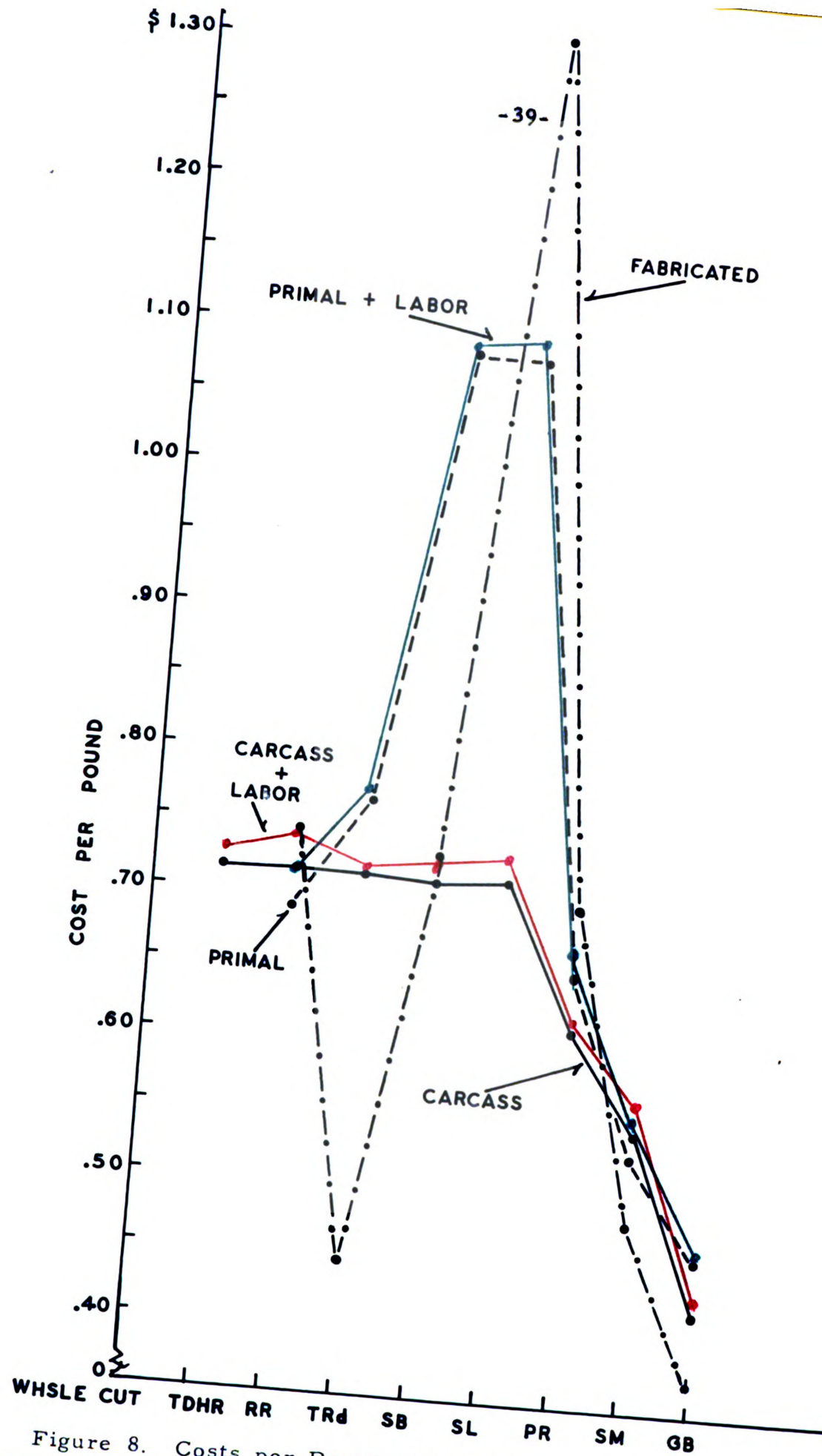


Figure 8. Costs per Pound of Boneless Oven-Ready Items.
Choice Grade

Among grades. Several unusual relationships were noted when the costs per pound of the oven-ready classifications were compared between grades.

Rolled rib from primal cuts was consistently lowest in cost for each of the three grades. Not only was rolled rib from primal cuts less expensive in each grade, but the rolled rib from primal cuts of Commercial grade was lower in cost per pound than all other dry heat roasts and also lower than all of the less tender classifications except Commercial grade of ground beef from the three sources.

Top round was less expensive in each grade when purchased as fabricated roast. An unusual finding was noted in the cost per pound of fabricated top round of Choice grade, which was equal to or less than the cost of top round in any other grade or purchase method.

Sirloin butt in the Commercial grade was least expensive when purchased in fabricated form; in Good and Choice grades, sirloin butt cost slightly less per pound when prepared from carcass sources. Choice grade sirloin butt from the carcass source was even less expensive than sirloin butt of Commercial grade from primal cuts. Short loin was least expensive in each grade when

obtained from carcass beef. Choice grade of short loin from carcass was even less expensive than short loin of Commercial grade which had been prepared from either primal cuts or had been purchased fabricated.

These differences may be partially explained by the great demand for loin roasts and steaks. Many restaurants and clubs have had to abandon the use of carcass beef because they were unable to utilize all of the less desirable cuts or to sell the salvage materials to reduce costs of handling.

Short loin, costing \$.5509 per pound from Commercial grade carcass, was found to be less expensive than the pot roasts from all sources of purchase in Good and Choice grades.

Stew meat was least expensive per pound in Commercial grade when obtained from chucks purchased as primal cuts. Fabricated stew meat was less expensive than that prepared from carcass or primal cut in the Good and Choice grades. The fabricated stew meat in Good grade was quoted \$.0083 per pound below the fabricated stew meat price of Commercial grade. This was an insignificant difference, which might have resulted from purveyors selling meat in a lower grade group because the demand for the item in the lower grade was greater than in the higher grades.

This situation might be expected to occur more often in the marketing of the moist heat classifications than in the tender cuts.

Prefabricated ground beef of Choice grade could be purchased for less than Good grade ground beef which had been obtained by any of the three methods of purchase. The Choice grade ground beef was only \$.0478 higher in cost per pound than the least expensive ground beef in the Commercial grade.

Total boneless beef from wholesale cuts. Calculated costs per pound, including labor, of all boneless meat within each wholesale section comprising the carcass are shown in Table 8. The variations between grades in the costs of the boneless meat in each wholesale section were very similar. Between Commercial grade and Good grade rounds, loin ends, short loins, and ribs, and total dry heat roasts, the variation in cost was approximately 10 cents per pound. Variations of prices between Commercial and Good grade flank, short plate, chuck, and foreshank were from \$.0650 to \$.0900 per pound.

The differences between the prices of Good and Choice grade boneless meat in all of the sections were from \$.0300 to \$.0500 per pound. Figure 9 shows the uniformity between grades of variations in prices of the wholesale sections.

Table 8. Adjusted Cost per Pound of Boneless Meat from Wholesale Sections Comprising the Carcass

Grade	Animal	Total	Round	Loin End
Commercial	A	.4456	.4492	.5262
	B	.4752	.4827	.5595
	C	.4874	.4928	.5768
	Avg.	.4683	.4733	.5536
Good	D	.5884	.5995	.6971
	E	.5434	.5517	.6444
	F	.5440	.5511	.6370
	Avg.	.5585	.5671	.6596
Choice	G	.6192	.6297	.7315
	H	.6013	.6102	.7102
	I	.5876	.5931	.6957
	Avg.	.6028	.6109	.7123

Table 8 (continued)

Flank	Short Loin	Rib	Short Plate	Chuck	Fore- shank
.3322	.4601	.5333	.4218	.4185	.3779
.3505	.4840	.5760	.4473	.4441	.4027
.3621	.5038	.5927	.4585	.4581	.4112
.3481	.4814	.5644	.4432	.4392	.3955
.4357	.5992	.7022	.5518	.5536	.4953
.4002	.5707	.6473	.5103	.5090	.4625
.4040	.5587	.6437	.5110	.5068	.4588
.4136	.5764	.6633	.5265	.5225	.4719
.4585	.6429	.7389	.5834	.5797	.5175
.4445	.6250	.7172	.5607	.5629	.5049
.4324	.6083	.6945	.5586	.5535	.4975
.4440	.6257	.7168	.5676	.5657	.5067

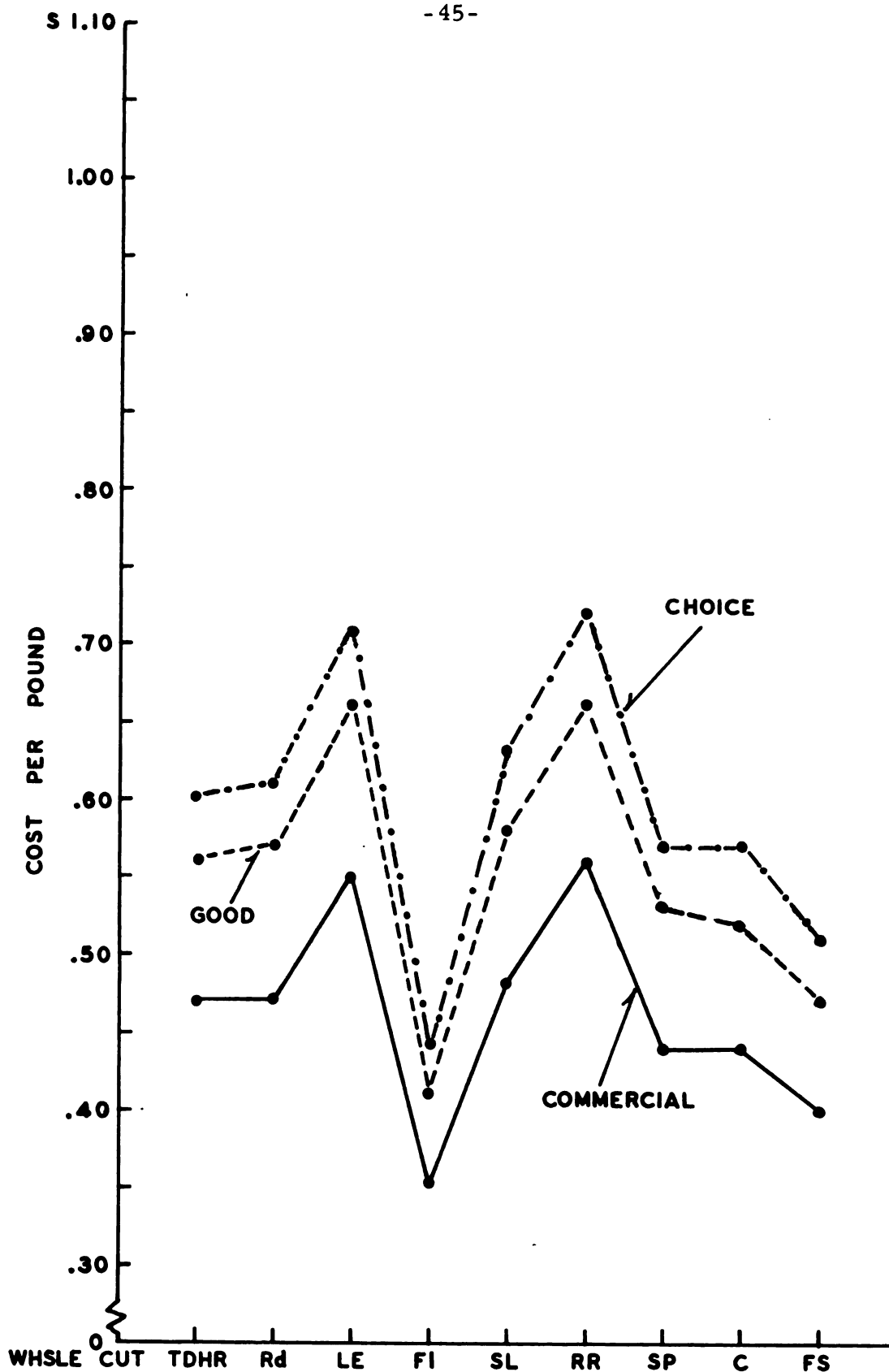


Figure 9. The Adjusted Cost per Pound of Boneless Beef from Wholesale Sections Comprising the Carcass

The costs per pound of all boneless meat within each primal cut are shown in Table 9. In striking contrast to the differences in cost of the carcass cuts, Figure 10 shows the irregular variance of the costs between grades of primal cuts.

The boneless meat from the rounds showed a \$.1670 difference per pound between Commercial and Choice grades. Boneless meat from full loins cost \$.7042 per pound in Commercial grade, \$.7408 in Good Grade, and \$1.0060 in Choice grade. The loin end boneless meat cost per pound was \$1.0716 for Choice grade and \$.7607 for Good grade.

The cost of the boneless meat of the rib section from primal cut was comparatively low, \$.3660 per pound in Commercial grade; this was \$.1984 less per pound than rib prepared from Commercial grade carcass.

Cost per pound with labor

The increases in the costs of the dry heat roasts when the cost of preparation was added varied from \$.0052 per pound to \$.0275 per pound.

The labor cost for rolled rib from carcass sources was greatest in the Commercial grade, \$.0275 per pound. To prepare the rib roast from Good grade carcass cost \$.0253 and from Choice grade

Table 9. The Adjusted Cost per Pound of Boneless Beef from Designated Primal Cuts

No. Rounds	No. Loins (full)	No. Ribs	No. Chucks	No. Loin Ends	Short Loins
<u>Commercial</u>					
1 .4850	10 .7130	19 .3768	28 .3784	10 .7296	.6885
2 .4897	11 .7008	20 .3561	29 .3891	11 .7204	.6737
3 .4955	12 .6986	21 .3658	30 .3980	12 .7132	.6770
Avg..4901	.7042	.3660	.3883	.7212	.6797
<u>Good</u>					
4 .6364	13 .7518	22 .5669	31 .5183	13 .7795	.7219
5 .6431	14 .7215	23 .5662	32 .5164	14 .7465	.6909
6 .6291	15 .7517	24 .5583	33 .5121	15 .7615	.7355
Avg..6359	.7408	.5637	.5156	.7607	.7154
<u>Choice</u>					
7 .6476	16 .9973	25 .7127	34 .5489	16 1.0394	.9499
8 .6601	17 1.0019	26 .6954	35 .5541	17 1.0424	.9550
9 .6634	18 1.1020	27 .6997	36 .5534	18 1.1375	1.0316
Avg..6571	1.0060	.7023	.5520	1.0716	.9757

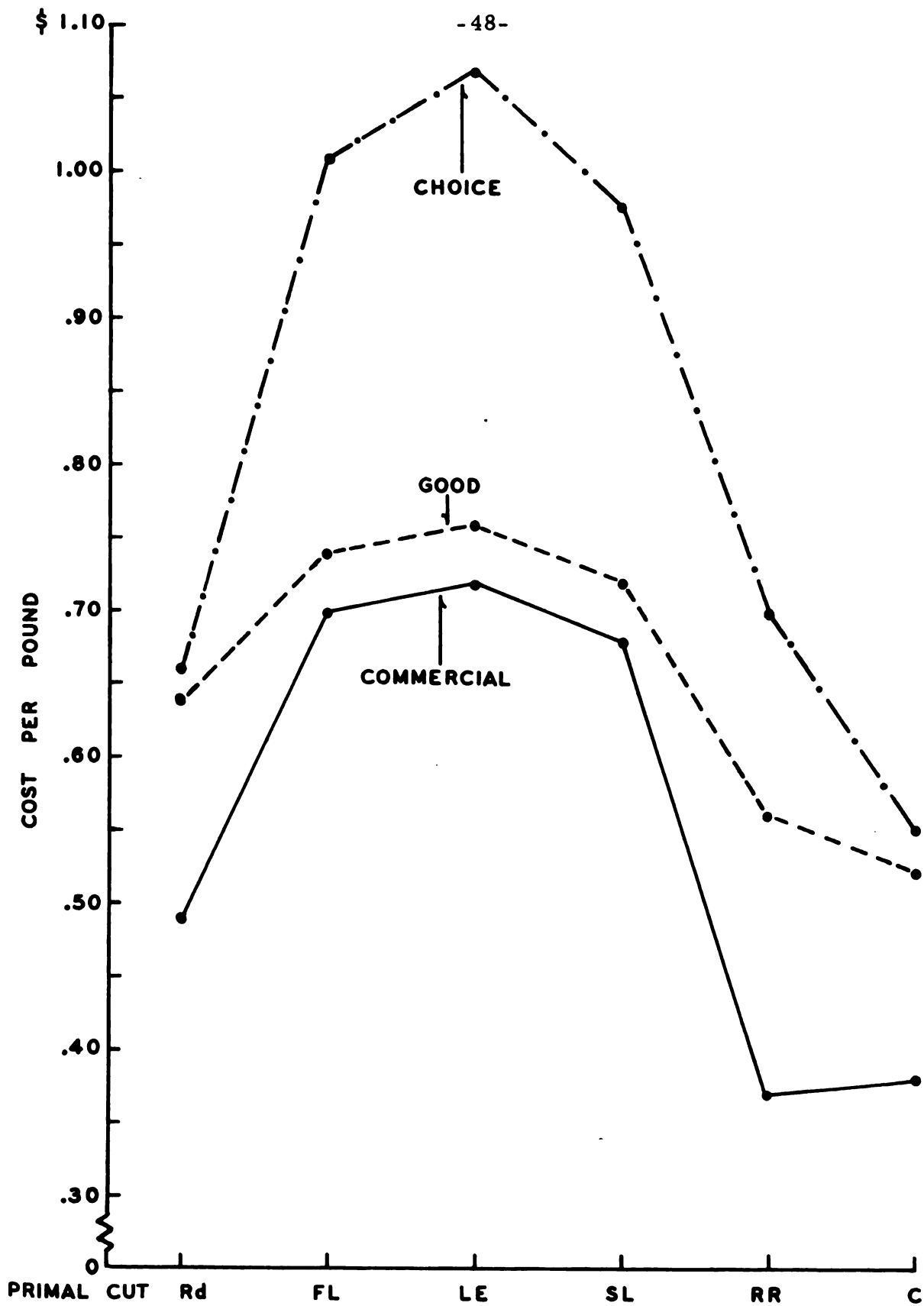


Figure 10. The Adjusted Cost per Pound of Boneless Beef from Designated Primal Cuts

carcass cost \$.0246 per pound. Rolled rib from primal cuts cost \$.0118 less per pound to prepare than did Commercial grade carcass rib. The labor cost for preparation of Good grade rib from primal cut was \$.0057 per pound less than for preparation of rolled rib from carcass; preparation cost of primal Choice grade rib was \$.0030 less than that for rolled rib from carcass.

The labor costs of preparing top round varied only \$.0009 per pound among the grades and methods of purchase. Good grade top round prepared from carcass beef was the least expensive to prepare at \$.0068 per pound for labor; Choice grade top round from primal cuts required the most labor for preparation, costing \$.0077 per pound.

To prepare sirloin butt from carcass sources cost \$.0157 per pound in Commercial grade, \$.0122 in Good grade, and \$.0119 in Choice grade. The labor cost of the sirloin butt prepared from primal cuts was one-third of the cost for preparing Commercial sirloin butt from carcass sources. The Good and Choice grade sirloin butts from primal cuts were each prepared at one-half of the cost required in preparation of sirloin butt from carcass beef.

The differences in labor costs of short loin were found to be due to grade rather than to method of purchase. Labor cost for

Commercial short loin was \$.0224 per pound from carcass source and \$.0270 from primal cut. Cost of preparation of short loin from Good grade carcass was \$.0186 and from primal cut was \$.0164 per pound. Differences in the labor cost due to method of purchase were even less, \$.0014 per pound, in the Choice grade.

The labor costs of the total dry heat roasts from carcass beef decreased as the value of the grade increased. Average labor cost for all tender cuts of Commercial grade was \$.0183 per pound; for Good grade, labor costs for tender cuts were \$.0158; and for Choice grade, labor costs were \$.0155 per pound.

The labor required to prepare pot roast, bottom round, from carcass sources cost \$.0063 for Commercial and Choice grades. The Good grade pot roast from carcass cost \$.0058 per pound for labor. Preparation of bottom round from primal cuts was more expensive in each grade than the corresponding preparation cost of pot roast from carcass sources.

Labor costs per pound for the preparation of stew meat did not vary consistently with either the grade or the method of purchase. The stew meat was more expensive to prepare in Choice grade than in Commercial grade.

The variations in cost of labor for the preparation of ground beef were from \$.0040 to \$.0046 per pound. The ground beef labor cost from carcass sources was slightly less than that for ground beef from primal cuts in each grade.

The costs per pound, including labor, of the four oven-ready classifications are shown in Tables 5, 6, and 7.

Costs per serving

To obtain a clear cut picture of all phases of food service costs, consideration of portion costs of all food items is necessary. The portion sizes used for the comparison of costs in this study are noted on the page facing Figure 11.

Commercial grade. The portion cost of rolled rib from carcass beef was \$.2166 and from fabricated roasts was \$.2169 (Table 10, Figure 11). The cost of rolled rib roast prepared from the primal cut of Commercial grade, however, was only \$.1412 per 6-ounce portion.

Top round portions from fabricated beef, at \$.1252 per portion, were \$.0310 less than portions of round from carcass source and \$.0376 less than round from the primal cut.

Portions of sirloin butt were most economical when prepared from fabricated meat. Carcass sirloin butt, costing \$.1596 per

Table 10. Raw Food Cost for Designated Portions of Beef Items
in Four Oven-Ready Classifications

Item	Size of Por- tion (oz.)	Commercial Cost per Serving		
		Boneless Oven-Ready with Labor		Fabri- cated
		Car- cass	Primal	
Rib, Rolled	6	.2166	.1412	.2169
Top Round	4½	.1562	.1628	.1252
Sirloin Butt	4½	.1596	.2098	.1448
Short Loin	6	.2150	.2841	.3181
Pot Roast	4½	.1354	.1404	.1266
Stew Meat	4	.1106	.0977	.1183
Ground Beef	4	.0835	.0867	.0847
Total Dry Heat Roasting Sections	5	.1777		

Table 10 (continued)

Good Cost per Serving			Choice Cost per Serving		
Boneless Oven-Ready with Labor		Fabri- cated	Boneless Oven-Ready with Labor		Fabri- cated
Car- cass	Primal		Car- cass	Primal	
.2570	.2187	.2595	.2777	.2687	.2806
.1905	.2127	.1463	.2035	.2185	.1252
.1895	.2179	.1902	.2046	.3070	.2057
.2548	.2948	.4580	.2755	.4122	.4946
.1619	.1834	.1828	.1754	.1885	.1969
.1318	.1298	.1163	.1423	.1389	.1193
.1001	.1132	.1000	.1082	.1163	.0944
.2122			.2286		

OVEN-READY CLASSIFICATION

SIZE OF PORTION
RAW WEIGHT
(ounces)

Roasts

TDHR (Total Dry Heat Roasts)	5
RR (Rolled Rib)	6
TR (Top Round)	4½
SB (Sirloin Butt)	4½
SL (Short Loin)	6

Total Pot Roasts

PR (Pot Roasts)	4½
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Total Stew Meat

SM (Stew Meat)	4
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Total Ground Beef

GB (Ground Beef)	4
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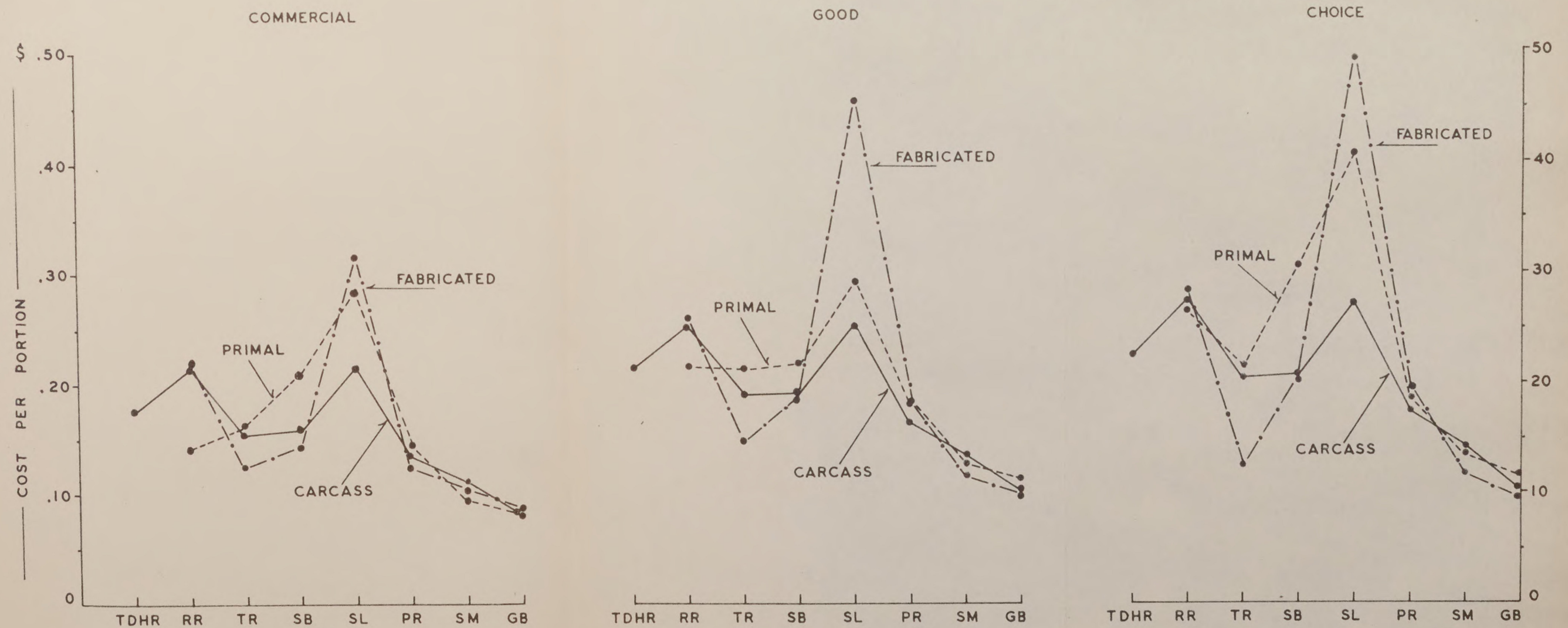


Figure II. Raw Food Cost for Designated Portions of Beef Items in Four Oven-ready Classifications.

portion, was \$.0148 more than the fabricated item; portions of sirloin butt from the primal cut cost \$.0650 more than those from the fabricated item. The short loin from fabricated source cost \$.1030 more per portion than did short loin from carcass beef, which was \$.2150 per portion. An average cost for all the dry heat items from Commercial grade carcass was \$.1777 per portion.

Portion costs of rolled rib from primal cut and of top round and sirloin butt from fabricated sources were found to be below this average figure for all tender cuts from carcass.

The differences in cost per portion of the less tender cuts were less marked among the three methods of procurement than the differences among the dry heat roasts. Pot roast, purchased as a fabricated cut, cost \$.1266 per portion and was less expensive than the item prepared from carcass and primal cut sources. Stew meat from chuck, purchased as a primal cut, was \$.0977 per portion which was \$.0129 less than the portion cost of stew meat from carcass sections and \$.0206 less than that from fabricated source. Portion costs of ground beef purchased by any of the three methods were almost identical. The ground beef from carcass beef, at \$.0835 per portion, cost slightly less than it did from the other two sources.

Good grade. The cost of the rolled rib from primal cuts was \$.0383 less per portion than the cost of rib prepared from carcass beef and \$.0408 less than the cost of fabricated rolled rib.

A variation of \$.0664 was found in the costs per serving of top round from each of the three sources. The fabricated round was the least expensive, costing \$.1463 per portion.

The variations in portion costs of sirloin butt of this grade were not large. Sirloin butt from carcass beef cost \$.1895 per portion, which was \$.0284 less than sirloin butt from the primal cut and only \$.0007 less than fabricated sirloin butt. The cost of short loin from carcass beef was \$.2032 less per portion than from fabricated short loin, which cost \$.4580 per portion. Short loin from the primal cut cost \$.0400 more per serving than did short loin from carcass beef.

The average cost of all dry heat roasts, including rolled rib, top round, sirloin butt, and short loin from the Good grade carcass was \$.2122 per portion.

The costs per serving of pot roast from primal cut and from fabricated sources were almost identical and exceeded the cost of pot roast from the carcass by approximately 2 cents per portion.

Stew meat could be procured at \$.1163 per serving from fabricated sources, at \$.1318 from carcass beef, and at \$.1298 per portion from primal cut.

There was practically no difference in the portion costs of ground beef obtained from carcass beef or from fabricated meat. Portions from each of these sources cost 10 cents each which was \$.0132 less per serving than the cost of ground beef from a primal cut (round).

Choice grade. The variation in costs of rolled rib among the three methods of purchase for this grade was only \$.0119 per portion. Rib roast obtained from the primal cut, costing \$.2687 per portion, was the least expensive.

The cost of top round from fabricated beef, \$.1252 per portion, was appreciably less than that of top round from carcass beef, which cost \$.2035, and from primal cuts, costing \$.2185 per portion.

Sirloin butt from carcass beef cost \$.2046 per serving, and from fabricated meat cost \$.2057 per portion. The primal cut source of this item cost \$.3070 per portion, almost 10 cents per portion more than the carcass and fabricated sources. Short loin was much less expensive when procured from carcass sources. A

portion of short loin from the carcass cost \$.2755; this was \$.2191 less per portion than the cost of this item obtained from fabricated loin.

The average cost per portion of all dry heat roasts from carcass in this grade was \$.2286. Both the top round and the sirloin butt, purchased as fabricated cuts, were found to cost less than this average figure.

Pot roast from the carcass sections cost \$.1754 per portion; the cost of fabricated pot roast was \$.1916 per portion.

Fabricated stew meat, costing \$.1193 per portion, was \$.0230 less than carcass stew meat and \$.0196 less than stew meat from the primal cuts. Based on the quoted price of fabricated ground beef, the cost per serving was calculated at \$.0944, which was slightly less than the portion cost of ground beef from carcass and primal cut sources.

Yields

Actual weights

The averages of cutting yields of the Commercial, Good, and Choice animals are presented in Tables 11, 12, and 13. Table 14 summarizes the total weights of each oven-ready classification, and

Table 11. Average Cutting Yield for Carcass, Commercial Grade

Item	Round	Loin End
Total Weight	139.83	54.00
Bone	29.80	7.54
Waste Fat	7.67	6.34
Ready to Cook Cuts		
Roasts		
rib, rolled		
top round	31.25	
sirloin butt		33.45
short loin		
butt tender		5.00
tenderloin		
Pot roast		
round	49.38	
Stew cut		
Ground beef	21.75	1.75

Table 11 (continued)

Short Loin	Rib	Chuck	Fore- shank	Plate	Flank	Total
58.50	47.59	160.16	40.63	38.25	21.16	560.12
6.55	11.13	29.95	13.88	6.66	-	105.50
18.20	.71	7.41	2.83	1.00	6.79	50.88
	33.80					33.80
						31.25
						33.45
16.55						16.55
						5.00
3.75						3.75
						49.38
		119.25	10.41	28.04		157.70
13.45	1.96	3.55	13.59	2.54	14.38	72.88

Table 12. Average Cutting Yield for Carcass, Good Grade

Item	Round	Loin End
Total Weight	144.67	48.92
Bone	26.16	6.16
Waste Fat	7.38	5.58
Ready to Cook Cuts		
Roasts		
rib, rolled		
top round	34.67	
sirloin butt		30.54
short loin		
butt tender		4.83
tenderloin		
Pot Roast		
round	52.91	
Stew cut		
Ground beef	23.54	1.79

Table 12 (continued)

Short Loin	Rib	Chuck	Fore- shank	Plate	Flank	Total
64.41	50.33	159.33	40.67	42.00	22.16	572.50
5.33	10.41	26.58	12.41	7.00		94.08
18.92	1.16	12.92	5.33	1.33	7.33	59.95
	35.63					35.63
						34.67
						30.54
20.58						20.58
						4.83
4.33						4.33
						52.91
		115.75	10.08	31.50		157.33
15.25	3.12	4.08	12.83	2.16	14.83	77.63

Table 13. Average Cutting Yield for Carcass, Choice Grade

Item	Round	Loin End
Total Weight	137.16	51.04
Bone	24.58	6.12
Waste Fat	9.83	6.87
Ready to Cook Cuts		
Roasts		
rib, rolled		
top round	30.41	
sirloin butt		31.87
short loin		
butt tender		4.16
tenderloin		
Pot Roasts		
round	49.58	
Stew cut		
Ground beef	22.73	2.00

Table 13 (continued)

Short Loin	Rib	Chuck	Fore- shank	Plate	Flank	Total
64.79	54.25	158.41	44.58	38.16	25.66	574.08
5.16	10.87	25.91	11.33	4.83		88.83
19.29	1.50	12.75	5.58	3.00	10.04	68.87
	38.70					38.70
						30.41
						31.87
20.62						20.62
						4.16
4.79						4.79
						49.58
		116.08	12.70	28.12		156.91
14.91	3.16	3.66	14.95	2.20	15.62	79.29

Table 14. Cutting Yield for Whole Carcasses

Item	Commercial			Avg. (lbs.)
	A (lbs.- oz.)	B (lbs.- oz.)	C (lbs.- oz.)	
Roasts				
rib, rolled	38-4	33-10	29-8	33.80
top round	35-8	29-0	29-4	31.25
sirloin butt	34-0	34-0	32-6	33.45
short loin	18-0	16-4	15-6	16.55
butt tender	5-8	4-4	5-4	5.00
tenderloin	4-8	3-0	3-12	3.75
Pot roast				
round	53-0	48-14	46-4	49.38
Stew cut	170-12	148-6	154-0	157.70
Ground beef	82-4	67-8	68-14	72.88
Fat	29-12	62-4	60-10	50.88
Bone	120-8	90-14	105-2	105.50
Total Weight	592-0	538-0	550-6	560.13

Table 14 (continued)

Good				Choice			
D (lbs.- oz.)	E (lbs.- oz.)	F (lbs.- oz.)	Avg. (lbs.)	G (lbs.- oz.)	H (lbs.- oz.)	I (lbs.- oz.)	Avg. (lbs.)
33-6	35-8	38-0	35.63	37-6	42-4	36-8	38.70
33-8	35-8	35-0	34.66	31-12	29-8	30-0	30.41
31-0	28-8	32-2	30.54	30-14	32-4	32-8	31.88
20-0	21-8	20-4	20.59	21-2	20-12	20-0	20.63
4-8	5-4	4-12	4.83	4-8	4-0	4-0	4.16
4-0	4-8	4-8	4.33	5-2	4-12	4-8	4.80
51-8	53-8	53-12	52.91	49-4	49-0	50-8	49.58
157-0	160-8	154-8	157.33	160-0	165-12	145-0	156.91
80-6	76-12	75-12	77.63	77-4	77-2	83-8	79.30
72-0	59-4	48-10	59.95	81-14	69-4	55-8	68.88
96-4	84-4	101-12	94.08	89-6	87-10	89-8	88.83
583-8	565-0	569-0	572.5	588-8	582-4	551-8	574.08

weights of bones and fat for each animal. Actual cutting yields of each of the nine half-carcasses may be found in Appendix C.

Variations in yield of the beef carcasses within grades were greater than variations between grades. This was true of the total weights of the carcasses and of the individual oven-ready classifications.

The averages of yields for the Commercial, Good, and Choice primal cuts are shown in Table 15. The yields of individual primal cuts may be found in Appendix C.

Variations in yields of the primal cuts within grades were greater than the variations between grades.

The lack of uniformity of weight within grades for carcasses and primal cuts may be partially explained by changes in the government grading regulations for beef. Because government grading of beef is not mandatory, the large meat packing companies may use their own trade names to indicate grades. The grading stamp to be placed on the beef is determined by a packer grader instead of a government grader (1). Market demand could have a considerable influence on the grading of beef under these conditions.

Table 15. Average Cutting Yield for Primal Cuts

No.	Cuts	Bone	Fat
Rounds			
1-3	Commercial	15.20	5.00
4-6	Good	14.63	6.25
7-9	Choice	14.05	7.63
Full Loins			
10-12	Commercial	8.38	11.66
13-15	Good	6.95	4.50
16-18	Choice	6.20	8.95
Loin Ends			
10-12	Commercial	4.96	4.46
13-15	Good	3.63	2.30
16-18	Choice	3.30	2.95
Short Loins			
10-12	Commercial	3.41	6.50
13-15	Good	3.33	2.20
16-18	Choice	2.91	6.00
Ribs			
19-21	Commercial	7.20	2.41
22-24	Good	5.16	1.16
25-27	Choice	4.75	1.63
Chucks			
28-30	Commercial	16.41	11.33
31-33	Good	15.70	7.95
34-36	Choice	12.20	12.20

Table 15 (continued)

Rolled Rib	Top Round	Sirloin Butt & Butt Tender	Short Loin & Ten- derloin	Pot Roast	Stew	Ground
	17.83			28.38		12.83
	17.55			29.41		14.09
	16.83			28.55		12.41
		23.04	13.88			6.88
		21.30	14.95			5.30
		20.83	13.75			6.38
		23.04				2.08
		21.30				1.00
		20.83				1.00
			13.88			4.79
			14.95			4.30
			13.75			5.38
25.05						1.88
20.00						1.80
18.75						.95
					73.80	2.33
					69.00	2.16
					56.75	1.75

Percentages of weight

The average percentage yields of each wholesale section of carcass beef are presented in Tables 16, 17, and 18 for Commercial, Good, and Choice grades.

The percentage yield of total dry heat cuts was highest in the Choice grade and lowest in the Commercial grade. In the Choice grade animals, 22.60 per cent of the total billed weight was suitable for dry heat roasting, as shown in Table 19. In the Good grade animals, 22.56 per cent of the billed weight was suitable for dry heat roasting. The tender cuts suitable for roasting in Commercial grade animals comprised 21.93 per cent of the billed weight.

Pot roast percentage yield was highest in Good grade animals, being 9.14 per cent of the billed weight. The Commercial and Choice grade yields of this item were slightly less, 8.75 per cent and 8.59 per cent respectively.

Stew meat variations of percentage yield were also less than 1 per cent among grades of carcass. The Commercial grade animals yielded 27.94 per cent stew meat. Good grade yielded 27.17 per cent and Choice grade yielded 27.13 per cent stew meat, based on the billed weight. The highest percentage yield of ground beef among carcasses of the three grades was found in the Choice grade

Table 16. Percentage Yield of Commercial Grade Carcasses

Cut		Bone	Fat	Rolled Rib	Top Round	Sirloin Butt
Round	A	21.57	3.27		23.20	
	B	20.09	6.35		22.31	
	C	22.16	7.14		21.43	
	Avg.	21.27	5.58		22.31	
Loin End	A	17.62	3.33			64.76
	B	11.11	18.22			60.44
	C	13.38	13.15			60.80
	Avg.	14.03	11.56			62.00
Flank	A		27.50			
	B		31.40			
	C		36.93			
	Avg.		31.94			
Short Loin	A	14.68	17.43			
	B	8.63	38.76			
	C	10.64	35.74			
	Avg.	11.31	30.64			
Rib	A	25.00	1.34	68.30		
	B	22.68	1.09	73.50		
	C	21.96	2.13	71.95		
	Avg.	23.21	1.52	71.25		
Short Plate	A	17.81	1.37			
	B	16.31	2.13			
	C	18.02	4.07			
	Avg.	17.38	2.52			
Chuck	A	19.71	2.32			
	B	16.91	6.16			
	C	19.34	5.70			
	Avg.	18.65	4.72			
Fore- shank	A	33.51	5.86			
	B	32.37	6.48			
	C	36.45	8.10			
	Avg.	34.11	6.81			

Table 16 (continued)

Butt Tender	Strip Loin	Ten- derloin	Bottom Round	Stew	Ground	Total Bone- less
			34.64		17.32	75.16
			37.60		13.65	73.56
			33.88		15.39	70.70
			35.37		15.46	73.14
10.48					3.81	79.05
7.56					2.67	70.67
9.85					2.82	73.47
9.29					3.10	74.39
					72.50	72.50
					68.60	68.60
					63.07	63.07
					68.05	68.05
	33.03	8.26			26.60	67.89
	26.10	4.82			21.69	52.61
	26.17	6.39			21.06	53.62
	28.43	6.49			23.11	58.04
					5.36	73.66
					2.73	76.23
					3.96	75.91
					4.01	75.26
				72.60	8.22	80.82
				74.47	7.09	81.56
				72.97	4.94	77.91
				73.34	6.75	80.09
				75.94	2.03	77.97
				74.30	2.63	76.93
				72.95	2.01	74.96
				74.39	2.22	76.62
				28.19	32.44	60.63
				25.90	35.25	61.15
				22.43	33.02	55.45
				25.50	33.57	59.07

Table 17. Percentage Yield of Good Grade Carcasses

		Cut	Bone	Fat	Rolled Rib	Top Round	Sirloin Butt
Round	D	.....	18.60	5.26		23.51	
	E	.....	16.26	5.54		24.57	
	F	.....	19.39	4.51		23.81	
	Avg.	.....	18.08	5.10		23.96	
Loin End	D	.....	13.86	11.88			61.39
	E	.....	9.84	13.11			62.30
	F	.....	13.86	9.41			63.61
	Avg.	.....	12.52	11.46			62.43
Flank	D	.....		38.00			
	E	.....		26.67			
	F	.....		34.21			
	Avg.	.....		32.96			
Short Loin	D	.....	7.14	37.08			
	E	.....	7.35	28.16			
	F	.....	10.68	20.94			
	Avg.	.....	8.39	28.72			
Rib	D	.....	21.65	3.09	68.82		
	E	.....	18.56	2.06	73.20		
	F	.....	21.76	1.85	70.37		
	Avg.	.....	20.65	2.33	70.79		
Short Plate	D	.....	17.53	2.06			
	E	.....	15.85	4.88			
	F	.....	16.44	2.74			
	Avg.	.....	16.60	3.22			
Chuck	D	.....	17.21	8.12			
	E	.....	15.43	8.95			
	F	.....	17.44	7.25			
	Avg.	.....	16.69	8.10			
Fore- shank	D	.....	29.27	16.46			
	E	.....	28.48	11.39			
	F	.....	33.73	11.45			
	Avg.	.....	30.49	13.10			

Table 17 (continued)

Butt Tender	Strip Loin	Ten- derloin	Bottom Round	Stew	Ground	Total Bone- less
			36.14		16.49	76.14
			37.02		16.61	78.20
			36.56		15.73	76.10
			36.57		16.27	76.81
8.91					3.96	74.26
11.48					3.27	77.05
9.41					3.71	76.73
9.93					3.64	76.01
					62.00	62.00
					73.33	73.33
					65.79	65.79
					67.04	67.04
	27.21	5.44			23.13	55.78
	35.10	7.35			22.04	64.49
	34.62	7.69			26.07	68.38
	32.31	6.82			23.74	62.88
					6.44	75.26
					6.18	79.38
					6.02	76.39
					6.21	77.01
				76.29	4.12	80.41
				73.78	5.49	79.27
				74.66	6.16	80.82
				74.91	5.25	80.16
				72.08	2.59	74.67
				73.46	2.16	75.62
				72.38	2.93	75.31
				72.64	2.56	75.20
				21.95	32.32	54.27
				28.48	31.65	60.13
				24.10	30.72	54.82
				24.84	31.56	56.40

Table 18. Percentage Yield of Choice Grade Carcasses

	Cut	Bone	Fat	Rolled Rib	Top Round	Sirloin Butt
Round	G	17.45	8.27		22.84	
	H	18.11	6.42		22.26	
	I	18.21	6.79		21.43	
	Avg.	17.92	7.16		22.17	
Loin	G	12.83	16.15			58.67
End	H	11.89	13.84			62.62
	I	11.23	10.20			66.33
	Avg.	11.98	13.39			62.54
Flank	G		41.97			
	H		40.20			
	I		35.71			
	Avg.		39.29			
Short	G	7.51	36.01			
Loin	H	8.51	29.40			
	I	7.97	22.12			
	Avg.	7.99	29.17			
Rib	G	20.89	3.76	70.19		
	H	18.42	2.63	74.12		
	I	20.95	1.91	69.52		
	Avg.	20.08	2.76	71.27		
Short	G	13.16	7.89			
Plate	H	12.09	9.89			
	I	12.90	4.84			
	Avg.	12.71	7.54			
Chuck	G	16.08	8.73			
	H	15.34	7.98			
	I	17.97	7.38			
	Avg.	16.46	8.03			
Fore-shank	G	23.33	13.61			
	H	25.43	13.01			
	I	27.47	10.99			
	Avg.	25.41	12.53			

Table 18 (continued)

Butt Tender	Strip Loin	Ten- derloin	Bottom Round	Stew	Ground	Total Bone- less
			35.43		16.01	74.28
			36.98		16.23	75.47
			36.07		17.50	75.00
			36.16		16.58	74.91
8.55					3.80	71.02
7.77					3.88	74.27
8.16					4.08	78.57
8.16					3.92	74.62
					58.03	58.03
					59.80	59.80
					64.29	64.29
					60.70	60.70
	28.84	7.00			20.64	56.48
	32.11	7.35			22.63	62.09
	35.40	7.96			26.55	69.91
	32.11	7.43			23.27	62.82
					5.16	75.35
					4.83	78.95
					7.62	77.14
					5.87	77.14
				74.01	4.94	78.95
				71.98	6.04	78.02
				75.81	6.45	82.26
				73.93	5.81	79.74
				73.05	2.14	75.19
				74.23	2.45	76.68
				72.48	2.35	74.83
				73.25	2.31	75.56
				28.06	35.00	63.06
				27.75	33.81	61.56
				29.67	31.87	61.54
				28.49	33.56	62.05

Table 19. Percentage Yield of Oven-Ready Classifications from Carcasses

Animals	Total (billed) Carcass Weight	Shrink- age	Bone
A	297	.33	20.29
B	271	.74	16.77
C	278	1.01	18.91
Average		.69	18.65
D	297	1.77	16.20
E	285	.88	14.78
F	287	.87	17.73
Average		1.17	16.23
G	296	.59	15.10
H	293	.64	14.95
I	278	.81	16.10
Average		.68	15.38

Table 19 (continued)

Fat	Total Bone- less Meat	Total Dry Heat Roasting Sections	Pot Roast	Stew Meat	Ground Beef
5.01	74.37	22.85	8.92	28.75	13.85
11.48	71.01	22.16	9.02	27.38	12.45
10.90	69.18	20.77	8.32	27.70	12.39
9.13	71.52	21.93	8.75	27.94	12.90
12.12	69.91	21.28	8.67	26.43	13.53
10.39	73.95	22.94	9.39	28.16	13.46
8.47	72.93	23.45	9.36	26.92	13.20
10.32	72.26	22.56	9.14	27.17	13.40
13.83	70.48	22.09	8.32	27.03	13.04
11.83	72.58	22.78	8.36	28.28	13.16
9.98	73.11	22.93	9.08	26.08	15.02
11.88	72.05	22.60	8.59	27.13	13.74

animals, which showed a yield of 13.74 per cent. The yield of ground beef in the Commercial grade, which was 12.90 per cent, was the lowest of the three grades.

The percentage yield of total boneless meat was highest in Good grade animals, 72.26 per cent, and lowest in the Commercial grade animals, 71.52 per cent.

The variation in percentage yield of bones in the three grades was greater than any of the other components of the carcass. Commercial grade animals had 18.65 per cent bone; Good grade animals had 16.23 per cent bone; the Choice grade animals had 15.38 per cent bone.

Fat composition among the three grades was inversely proportional to the bone composition so that the combined percentages of the bone and fat were very similar in all grades. The Commercial animals had 9.13 per cent fat; the Good grade animals had 10.32 per cent fat; and the Choice grade animals had 11.88 per cent fat. More shrinkage, a total of 1.17 per cent of the billed weight, occurred in the Good grade than in Commercial or Choice grades, which showed shrinkage of 0.69 per cent and 0.68 per cent, respectively.

The average percentage yield of each designated primal cut, including rounds, loins, rib, and chucks, is shown in Tables 20, 21, 24, and 25 for each grade. The loin end and short loin average percentage yields are presented in Tables 22 and 23, immediately following the percentage yields of the full loin.

The percentage yield of rolled rib was 3.34 per cent greater in Choice grade (71.89 per cent) than in Commercial grade. The percentage yield of the rolled rib in Good grade was 71.14 per cent. Top round constituted a higher percentage of the total round in Commercial grade (22.50 per cent) than in Good (21.42 per cent) or in Choice grades (21.18 per cent).

Good grade loins yielded 3.69 per cent more sirloin butt than loins from Commercial grade. The variation in the percentage yields of short loins is greater than that of any of the other cuts or classifications. The yield of boneless meat from short loin, purchased as primal cut, was 28.21 per cent in Good grade, 24.50 per cent in Choice grade, and 21.99 per cent in Commercial grade.

The variation of percentage yields of pot roast from primal cut rounds of the three grades was insignificant. The yield of bottom round in each grade was slightly less than 36 per cent.

Table 20. Percentage Yield of Rounds

No.	Cut	Bone	Fat	Top Round	Bottom Round	Ground	Shrink- age	Total Bone- less
1	Rounds, Commer- cial	20.39	4.25	23.28	35.69	16.31	.08	75.28
2		19.03	6.44	21.89	35.91	16.59	.14	74.39
3		18.17	8.11	22.38	35.69	15.57	.08	73.64
Avg.		19.19	6.26	22.51	35.76	16.15	.10	74.43
4	Rounds, Good	17.27	8.15	20.79	36.52	16.43	.84	73.74
5		18.60	7.31	21.43	34.22	17.44	1.00	73.09
6		17.31	7.16	21.49	35.82	17.32	.90	74.63
Avg.		17.72	7.54	21.23	35.52	17.06	.91	73.82
7	Rounds, Choice	18.21	7.81	21.63	34.79	16.91	.65	73.33
8		17.21	10.20	20.26	37.02	14.62	.69	71.90
9		17.27	10.49	21.28	35.16	15.11	.69	71.55
Avg.		17.56	9.5	21.05	35.65	15.54	.67	72.26

Table 21. Percentage Yield of Full Loins

No.	Cut	Bone	Fat
10	Full Loins, Commercial	13.04	18.41
11		14.87	15.27
12		11.69	18.26
Avg.		13.20	17.31
13	Full Loins, Good	11.63	10.53
14		12.79	6.62
15		14.15	8.45
Avg.		12.85	8.53
16	Full Loins, Choice	11.25	13.20
17		11.17	13.90
18		10.44	20.43
Avg.		10.95	15.84

Table 21 (continued)

Sirloin Butt	Butt Tender	Strip Loin	Ten- derloin	Ground	Shrink- age	Total Bone- less
30.69	4.98	18.02	3.07	11.50	.29	68.26
31.90	3.91	17.81	3.91	11.94	.39	69.47
32.82	4.92	18.05	4.92	9.03	.31	69.74
31.80	4.60	17.96	3.96	10.82	.33	69.15
32.41	4.43	22.43	5.82	11.36	1.39	76.45
35.72	5.29	22.49	4.85	11.03	1.21	79.38
35.90	4.65	23.44	4.65	7.60	1.16	76.24
34.67	4.79	22.78	5.10	9.99	1.25	77.35
33.25	3.91	20.78	5.38	11.25	.98	74.57
33.30	4.11	21.16	4.31	11.17	.88	74.05
32.01	3.63	17.03	4.09	11.35	1.02	68.11
32.85	3.88	19.65	4.59	11.25	.96	72.24

Table 22. Percentage Yield of Loin Ends

No.	Cut	Bone	Fat	Sirloin Butt, Butt Tender	Ground	Total Bone- less
10	Loin Ends, Com- mercial	8.05	6.14	35.69	3.83	39.50
11		8.22	4.70	35.81	3.52	39.33
12		7.18	10.46	37.74	2.47	40.21
Avg.		7.82	7.10	36.41	3.27	39.68
13	Loin Ends, Good	6.09	4.71	36.84	1.66	38.50
14		7.05	3.09	41.01	1.76	42.77
15		6.97	5.06	40.55	2.11	42.66
Avg.		6.70	4.29	39.47	1.84	41.31
16	Loin Ends, Choice	6.35	5.87	37.16	1.47	38.63
17		5.68	4.31	37.41	1.77	39.18
18		5.44	5.90	35.64	2.04	37.68
Avg.		5.82	5.36	36.74	1.76	38.50

Table 23. Percentage Yield of Short Loins

No.	Cut	Bone	Fat	Strip Loin, Ten- derloin	Ground	Total Bone- less
10	Short Loins, Com- mercial	4.98	12.27	21.09	7.67	28.76
11		6.65	10.57	21.72	8.42	30.14
12		4.51	7.79	22.97	6.57	29.54
Avg.		5.38	10.21	21.93	7.55	29.48
13	Short Loins, Good	5.54	5.82	28.25	9.70	37.95
14		5.74	3.52	27.34	9.26	36.60
15		7.18	3.38	28.09	5.49	33.58
Avg.		6.15	4.24	27.89	8.15	36.04
16	Short Loins, Choice	4.89	7.33	26.16	9.78	35.94
17		5.48	9.79	25.47	9.40	34.87
18		4.99	14.52	21.12	9.30	30.42
Avg.		5.12	10.55	24.25	9.49	33.74

Table 24. Percentage Yield of Ribs

No.	Cut	Bone	Fat	Rolled Rib	Ground	Shrink-age	Total Bone-less
19	Ribs, Commer- cial	18.92	9.46	66.89	4.39	.34	71.28
20		18.85	5.39	70.03	5.39	.34	75.42
21		21.25	4.88	67.94	5.58	.35	73.52
Avg.		19.67	6.57	68.28	5.12	.34	73.40
22	Ribs, Good	19.46	2.92	71.05	5.84	.73	76.89
23		16.20	6.88	71.26	5.26	.40	76.52
24		19.34	2.20	69.89	7.91	.66	77.80
Avg.		18.33	4.00	70.73	6.33	.59	77.07
25	Ribs, Choice	19.79	5.21	67.71	6.25	1.04	73.96
26		17.53	5.67	74.23	1.54	1.03	75.77
27		17.07	7.32	71.54	3.26	.81	74.80
Avg.		18.13	6.06	71.16	3.68	.96	74.84

Table 25. Percentage Yield of Chucks

No.	Cut	Bone	Fat	Stew	Ground	Shrink- age	Total Bone- less
28	Chucks, Commer- cial	14.33	10.34	71.99	2.58	.76	74.57
29		15.84	10.73	70.44	2.20	.79	72.64
30		16.91	11.43	69.05	1.90	.71	70.95
Avg.		15.69	10.83	70.49	2.22	.75	72.72
31	Chucks, Good	15.93	9.31	71.64	2.29	.83	73.93
32		17.57	7.14	72.07	2.33	.89	74.40
33		15.84	8.43	72.67	2.17	.89	74.84
Avg.		16.44	8.29	72.12	2.26	.87	74.39
34	Chucks, Choice	14.95	13.80	69.02	2.01	.22	71.03
35		14.86	15.02	68.43	2.23	.24	70.66
36		14.48	14.78	68.47	2.12	.15	70.59
Avg.		14.76	14.53	68.64	2.12	.20	70.76

The yield of stew meat in Good grade chucks was 72.76 per cent, which was 4.14 per cent more than the yield in Choice grade. Ground beef, for which round was considered the primal cut source, was found to be 17.20 per cent of the round in Good grade, 16.19 per cent in Commercial grade, and 15.63 per cent in Choice grade.

Utilization

Carcass beef

From the total carcass weight required to serve 1000 portions of any of the four oven-ready classifications, the buyer of carcass beef will have substantial amounts of meat remaining to use in subsequent meals. Based on the percentages of weight at cutting time, the calculated poundages of each menu item remaining to be used in each case are shown in Tables 26, 27, and 28.

To illustrate the problem of complete utilization of carcass items, an example is cited in this study. A dinner menu, including a roast of Good grade sirloin butt, is planned for 1000 men. The raw weight portion size is designated as $4\frac{1}{2}$ ounces. To serve 1000 portions of sirloin butt, 281 pounds of boneless uncooked meat would be required. The percentage yield of sirloin butt from the carcass weight of the Good grade carcass was found to be 6.18 per cent.

Table 26. Summary of Carcass Utilization, Commercial Grade

Item	Total Yield per Car- cass (lbs.)	Size of Por- tion Raw Wt. (oz.)	Lbs. Req. to Serve 1000 Por- tions	Pct. of Car- cass Wt.	Car- cass Wt. Req. to Yield 1000 Por- tions
Roasts					
rib, rolled	33.80	6½	375	0.0603	6,215
top round	31.25	4½	281	0.0558	5,037
sirloin butt (including butt tender)	38.45	4½	281	0.0687	4,094
short loin (including tenderloin)	20.30	6	375	0.0362	10,347
Total	123.80	5	313	0.2210	1,416
Pot roast					
round	49.38	4½	281	0.0882	3,188
Stew cut	157.70	4	250	0.2815	888
Ground beef	72.88	4	250	0.1301	1,921
Bone	105.50			0.1884	
Fat	50.88			0.0908	

¹ This column represents the total dry heat roasts.

Table 26 (Continued)

Remaining Weight to be Utilized from Poundage of Carcass Required to Serve Item									
Roast ¹	Rib	Top Round	Sirloin Butt	Short Loin	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
999		347	427	225	548	1,750	809	564	1,170
832	304		346	182	444	1,418	655	458	949
624	247	228		149	361	1,152	533	771	372
1,912	624	577	711		913	2,913	1,346	939	1,949
					125	399	184	128	267
705	192	178	219	116		898	415	289	600
196	53	50	61	32	78		116	81	167
425	116	107	132	70	169	541		174	362

Table 27. Summary of Carcass Utilization, Good Grade

Item	Total Yield per Car- cass (lbs.)	Size of Por- tion Raw Wt. (oz.)	Lbs. Req. to Serve 1000 Por- tions	Pct. of Car- cass Wt.	Car- cass Wt. Req. to Yield 1000 Por- tions
Roasts					
rib, rolled	35.63	6	375	0.0622	6,025
top round	34.66	4½	281	0.0606	4,641
sirloin butt (including butt tender)	35.37	4½	281	0.0618	4,548
short loin (including tenderloin)	24.92	6	375	0.0436	8,615
Total	130.58	5	313	0.2282	1,372
Pot roast					
round	52.91	4½	281	0.0924	3,040
Stew cut	157.33	4	250	0.2748	910
Ground beef	77.63	4	250	0.1356	1,844
Bone	94.08			0.1643	
Fat	59.95			0.1047	

¹ This column represents the total dry heat roasts.

Table 27 (Continued)

Remaining Weight to be Utilized from Poundage of Carcass Required to Serve Item									
Roast ¹	Rib	Top Round	Sirloin Butt	Short Loin	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
1,000		365	372	263	557	1,655	817	631	990
778	289		287	202	429	1,275	629	486	763
757	283	276		198	420	1,250	617	476	747
1,590	536	522	532		796	2,368	1,168	902	1,416
					127	377	186	144	225
694	189	184	188	133		835	412	318	500
208	57	55	56	40	84		123	95	150
421	115	112	114	80	170	507		193	303

Table 28. Summary of Carcass Utilization, Choice Grade

Item	Total Yield per Car- cass (lbs.)	Size of Por- tion Raw Wt. (oz.)	Lbs. Req. to Serve 1000 Por- tions	Pct. of Car- cass Wt.	Car- cass Wt. Req. to Yield 1000 Por- tions
Roasts					
rib, rolled	38.70	6	375	0.0674	5,563
top round	30.41	4½	281	0.0530	5,305
sirloin butt (including butt tender)	36.04	4½	281	0.0628	4,476
short loin (including tenderloin)	25.43	6	375	0.0443	8,466
Total	130.58	5	313	0.2275	1,376
Pot roast					
round	49.58	4½	281	0.0864	3,254
Stew cut	156.91	4	250	0.2733	915
Ground beef	79.30	4	250	0.1381	1,810
Bone	88.83			0.1547	
Fat	68.88			0.1200	

¹ This column represents the total dry heat roasts.

Table 28 (Continued)

Remaining Weight to be Utilized from Poundage of Carcass Required to Serve Item									
Roast ¹	Rib	Top Round	Sirloin Butt	Short Loin	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
891		295	349	247	481	1,520	768	668	860
926	358		333	235	458	1,450	733	636	821
737	302	237		198	387	1,223	618	537	693
1,551	570	449	532		731	2,314	1,169	1,016	1,310
					119	376	190	165	213
740	219	173	204	144		889	449	391	504
208	62	48	57	41	79		126	110	142
412	122	96	114	80	156	495		217	280

Based on this percentage, a total of 4,548 pounds of carcass beef would be needed to obtain the 281 pounds of sirloin butt for the dinner. From the total carcass weight required to obtain 281 pounds of sirloin butt, the following amounts of other items remain to be used: 757 pounds of dry heat roast, including 283 pounds of rib, 276 pounds of top round, and 198 pounds of short loin; 420 pounds of pot roast; 1,250 pounds of stew meat; and 617 pounds of ground beef. The buyer of this amount of meat would also have 476 pounds of excess fat and 747 pounds of bone to use or handle as salvage materials.

To serve just one of the types of dry heat roasts from a full carcass would be unusual in the operation of most food service institutions except for special occasions. A more reasonable procedure would be to plan to use all of the dry heat roasts, including rolled rib, top round, sirloin butt, and short loin, for the roast beef dinner menu. A total of 1,372 pounds of carcass beef would be required to obtain the 313 pounds of boneless uncooked dry heat roasts required for 1000 portions of roast beef from these combined sources. The following items would be left from 1,372 pounds of carcass after all sections suitable for roasting had been removed: 127 pounds of pot roast, 377 pounds of stew meat, and 186 pounds of ground beef.

The buyer of this amount of carcass beef would also have 144 pounds of excess fat and 225 pounds of bone to store and utilize or to sell as salvage material.

Primal cuts

From the total purchase weight of primal cuts required to serve 1000 portions of an oven-ready classification, the buyer would have fewer problems in complete utilization of meat items remaining than would the buyer of carcass beef. Based on the percentages of weight at cutting time, the remaining poundages of each dry heat roast and the other oven-ready classifications are presented in Tables 29, 30, and 31.

For comparison of the problems of utilizing leftover items from carcass and primal cut sources, an example of purchasing sirloin butt from the appropriate primal cut of Good grade is shown. The selected primal cut would be full loins which had been trimmed of the flank and cod fat. To obtain the 281 pounds of boneless uncooked meat required for 1000 portions, 699 pounds of full loins would be needed. Poundage of items remaining to be utilized subsequent to the dinner of roast sirloin butt would be: 197 pounds of short loin and 70 pounds of ground beef. In addition, there would be 59 pounds of fat and 92 pounds of bones to be stored and used

Table 29. Summary of Primal Cut Utilization, Commercial Grade

Classification	Weight	Size of Por- tion Raw Wt.	Boneless Uncooked Lbs. to Serve 1000 Portions	Pct. of Primal Cut	Recom- mended Primal Cut
Dry roasts					
rolled rib	25.05	6	375	68.55	rib
top round	17.83	4½	281	22.50	round
sirloin butt	23.04	4½	281	36.50	full loin
short loin	13.88	6	375	21.99	full loin
Pot roasts					
bottom round	28.38	4½	281	35.81	round
Stew					
chuck	73.80	4	250	71.05	chuck
Ground					
round	12.83	4	250	16.19	round
loin end	2.08			3.30	
short end	4.79	4	250	7.59	full loin
rib	1.88			5.15	
chuck	2.33			2.24	
Bone					
round	15.20			19.18	
loin end	4.96			7.86	
short loin	3.42			5.42	
rib	7.20			19.70	
chuck	16.41			15.80	
Fat					
round	5.00			6.31	
loin end	4.46			7.07	
short loin	6.50			10.30	
rib	2.41			6.60	
chuck	11.33			10.91	

Table 29 (Continued)

A.P. Wt. Req. to Yield 1000 Portions	Remaining Weight to be Utilized from Poundage of Primal Cut Required to Serve Item					
	Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
547		0	0	28	36	108
1,249		447	0	202	79	240
770	169	0	0	84	134	102
1,705	622	0	0	186	296	226
785	177		0	127	49	151
352	0	0		8	38	56
1,544	347	553	0		98	296
3,295	1,927	0	0	109	572	437

Table 30. Summary of Primal Cut Utilization, Good Grade

Classification	Weight	Size of Por- tion Raw Wt.	Boneless Uncooked Lbs. to Serve 1000 Portions	Pct. of Primal Cut	Recom- mended Primal Cut
Dry roasts					
rolled rib	20.04	6	375	71.14	rib
top round	17.55	4½	281	21.42	round
sirloin butt	21.30	4½	281	40.19	full loin
short loin	14.95	6	375	28.21	full loin
Pot roast					
bottom round . . .	29.41	4½	281	35.90	round
Stew					
chuck	69.00	4	250	72.76	chuck
Ground					
round	14.09	4	250	17.20	round
loin end	1.00			1.89	
short loin	4.30	4	250	8.12	full loin
rib	1.80			6.39	
chuck	2.16			2.28	
Bone					
round	14.63			17.86	
loin end	3.63			6.85	
short loin	3.33			6.28	
rib	5.17			18.35	
chuck	15.70			16.56	
Fat					
round	6.25			7.63	
loin end	2.30			4.34	
short loin	2.20			4.15	
rib	1.16			4.12	
chuck	7.95			8.38	

Table 30 (Continued)

A.P. Wt. Req. to Yield 1000 Portions	Remaining Weight to be Utilized from Poundage of Primal Cut Required to Serve Item					
	Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
527		0	0	33	22	97
1,312		471	0	226	100	234
699	197	0	0	70	59	92
1,329	534	0	0	133	112	175
783	168		0	134	60	140
344	0	0		8	29	57
1,453	311	522	0		111	259
3,081	2,107	0	0	58	261	405

Table 31. Summary of Primal Cut Utilization, Choice Grade

Classification	Weight	Size of Por- tion Raw Wt.	Boneless Uncooked Lbs. to Serve 1000 Portions	Pct. of Primal Cut	Recom- mended Primal Cut
Dry roasts					
rolled rib	18.75	6	375	71.89	rib
top round	16.83	4½	281	21.18	round
sirloin butt . . .	20.83	4½	281	37.12	full loin
short loin	13.75	6	375	24.50	full loin
Pot roast					
bottom round . .	28.54	4½	281	35.92	round
Stew					
chuck	56.75	4	250	68.62	chuck
Ground					
round	12.42	4	250	15.63	round
loin end	1.00			1.78	
short loin	5.38	4	250	9.59	full loin
rib	0.95			3.64	
chuck	1.75			2.12	
Bone					
round	14.04			17.67	
loin end	3.30			5.88	
short loin	2.91			5.19	
rib	4.75			18.21	
chuck	12.20			14.75	
Fat					
round	7.63			9.60	
loin end	2.95			5.26	
short loin	6.00			10.69	
rib	1.63			6.25	
chuck	12.00			14.51	

Table 31 (Continued)

A.P. Wt. Req. to Yield 1000 Portions	Remaining Weight to be Utilized from Poundage of Primal Cut Required to Serve Item					
	Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
522		0	0	19	33	95
1,327		477	0	207	127	235
757	185	0	0	86	121	84
1,530	568	0	0	174	244	169
782	166		0	122	75	138
364	0	0		8	53	53
1,599	339	574	0		153	283
2,608	1,607	0	0	46	416	289

later or to be sold as salvage materials. No pot roast or stew meat would remain to be utilized when sirloin butt is obtained from the full loin primal cut.

A comparison of the poundage necessary to serve 1000 portions of various items from carcass and from primal cut methods of purchase is provided in Tables 32, 33, and 34, for each grade. Also indicated are the weights of additional items to be utilized after the removal of 1000 portions of the specific item from the original shipment of beef. The weights remaining from carcass and primal cut shipments may be compared both within each grade and between grades.

Storage Space Requirements

The cubic feet of chilled storage space required to hold half-carasses and primal cuts was calculated. The space was calculated on the basis of the dimensions and layout of the central Food Stores refrigerator located on this campus. The system of rails in this refrigerator was installed for hanging quarters of beef. To obtain maximum storage of primal cuts, a double-layer or triple-layer system of rails in an equal amount of floor space would be necessary. The cubic feet of storage required for the same amounts

Table 32. Comparison of Carcass and Primal Cut Utilization, Commercial Grade

Item	Source	Por- tion Wt. (oz.)	Required for 1000 Portions	
			Bone- less Meat	A.P. Order
Roasts				
rib, rolled	carcass		375	6,215
	primal cut, rib	6	375	547
top round	carcass		281	5,037
	primal cut, round	4½	281	1,249
sirloin butt	carcass		281	4,094
	primal cut, loin	4½	281	770
short loin	carcass		375	10,347
	primal cut, loin	6	375	1,705
Total dry heat roasts	carcass		313	1,416
		5		
Pot roasts				
bottom round	carcass	4½	281	3,188
	primal cut, round		281	785
Stew meat	carcass	4	250	888
	primal cut, chuck		250	352
Ground beef	carcass	4	250	1,921
	primal cut, round		250	1,544

Table 32 (Continued)

Weight Remaining After Removal of Menu Item					
Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
999	548	1,750	809	564	1,170
			28	36	108
832	444	1,418	655	458	949
	447		202	79	240
624	361	1,152	533	771	372
169			84	134	102
1,912	913	2,913	1,346	939	1,949
622			186	296	226
	125	399	184	128	267
705		898	415	289	600
177			127	49	151
196	78		116	81	167
			8	38	56
425	169	541		174	362
347	553			98	296

Table 33. Comparison of Carcass and Primal Cut Utilization, Good Grade

Item	Source	Por- tion Wt. (oz.)	Required for 1000 Portions	
			Bone- less Meat	A.P. Order
Roasts				
rib, rolled	carcass		375	6,025
	primal cut, rib	6	375	527
top round	carcass		281	4,641
	primal cut, round	4½	281	1,312
sirloin butt	carcass		281	4,548
	primal cut, loin	4½	281	699
short loin	carcass		375	8,615
	primal cut, loin	6	375	1,329
Total dry heat roasts	carcass		313	1,372
		5		
Pot roast				
bottom round	carcass	4½	281	3,040
	primal cut, round		281	783
Stew meat	carcass	4	250	910
	primal cut, chuck		250	344
Ground beef	carcass	4	250	1,844
	primal cut, round		250	1,453

Table 33 (Continued)

Weight Remaining After Removal of Menu Item					
Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
1,000	557	1,655	817 33	631 22	990 97
778	429 471	1,275	629 226	486 100	763 234
757 197	420	1,250	617 70	476 59	747 92
1,590 534	796	2,368	1,168 133	902 112	1,416 175
	127	377	186	144	225
694 168		835	412 134	318 60	500 140
208	84		123 8	95 29	150 57
421 311	170 522	507		193 111	303 259

Table 34. Comparison of Carcass and Primal Cut Utilization, Choice Grade

Item	Source	Por- tion Wt. (oz.)	Required for 1000 Portions	
			Bone- less Meat	A.P. Order
Roasts				
rib, rolled	carcass		375	5,563
	primal cut, rib	6	375	522
top round	carcass		281	5,305
	primal cut, round	4½	281	1,327
sirloin butt	carcass		281	4,476
	primal cut, loin	4½	281	757
short loin	carcass		375	8,466
	primal cut, loin	6	375	1,530
Total dry heat roasts	carcass		313	1,376
		5		
Pot roast				
bottom round	carcass	4½	281	3,254
	primal cut, round		281	782
Stew meat	carcass	4	250	915
	primal cut, chuck		250	364
Ground beef	carcass	4	250	1,810
	primal cut, round		250	1,599

Table 34 (Continued)

Weight Remaining After Removal of Menu Item					
Dry Heat Roast	Pot Roast	Stew Cuts	Ground Beef	Fat	Bone
891	481	1,520	768	668	860
			19	33	95
926	458	1,450	733	636	821
	477		207	127	235
737	387	1,223	618	537	693
185			86	121	84
1,551	731	2,314	1,169	1,016	1,310
568			174	244	169
	119	376	190	165	213
740		889	449	391	504
166			122	75	138
208	79		126	110	142
			8	53	53
412	156	495		217	280
339	574			153	283

of meat would then be one-half or one-third of the space indicated.

The average weight of the hindquarters used in this study was 140 pounds. The cubic feet of space necessary to hold 1000 pounds of chilled hindquarters was 340 cubic feet. Forequarters, which averaged 146 pounds each, required 327 cubic feet of space for each 1000 pounds of beef.

The primal cut rounds, chucks, and loins were hung on individual hooks. Rib sections were hung on multihook rods. Six rods of 12 ribs were placed on each of the rails in the refrigerator. The rounds, which averaged 80 pounds each, required 593 cubic feet of space for 1000 pounds of beef. For 1000 pounds of rib sections, which weighed 30 pounds each, 265 cubic feet of storage space was required. One thousand pounds of chucks, weighing 93 pounds each, were held in 513 cubic feet of space. Loins weighing 57 pounds required 842 cubic feet of space for 1000 pounds of the primal cut.

Kotschevar and coworkers (3) reported that approximately 130 cubic feet of space was necessary for 1000 pounds of chilled primal cuts. The same authors indicated that only 40 cubic feet of chilled storage space was required for 1000 pounds of chilled fabricated meat.

SUMMARY AND CONCLUSIONS

Summary

To determine the variations in percentage yield of four oven-ready classifications from wholesale sections of carcasses and from designated primal cuts was the first objective of this project. The results of the comparison of percentage yields of carcass items follow.

1. The percentage yield of total dry heat cuts was highest in the Choice grade and lowest in the Commercial grade of carcass beef.
2. Pot roast percentage yield was highest in Good grade animals. However, the Commercial and Choice grade yields of this item were only slightly less.
3. Variations of percentage yield of stew meat were also less than 1 per cent among the three grades of carcass.
4. The highest percentage yield of ground beef among the three grades of carcass was found in the Choice grade animals.
5. The percentage yield of total boneless meat was highest in Good grade animals, 72.26 per cent, and lowest in the Commercial grade animals, 71.52 per cent.

6. The variation in percentage yield of bones in the three grades was greater than any of the other components of the carcass. Fat composition among the three grades was inversely proportional to the bone composition so that the combined percentages of the bone and fat were very similar in all grades.

The results of the comparison of percentage yields of primal cut items follow.

1. The percentage yield of rolled rib was 3.34 per cent greater in Choice grade than in Commercial grade.
2. Top round constituted a higher percentage of the total round in Commercial grade than in Good or Choice grades.
3. The variation in the percentage yield of short loins is greater than that of any of the other cuts or classifications. The yield of boneless meat from short loin in Good grade was 28.21 per cent, Choice grade 24.50 per cent, and in Commercial grade, 21.99 per cent.
4. The variations of percentage yield of pot roast from primal cut rounds of the three grades was insignificant.
5. Good grade chucks yielded the highest percentage of stew meat, 4.14 per cent more than the yield in Choice grade.

6. Ground beef, for which round was considered to be the primal cut source, was found to be 17.20 per cent of the round in Good grade, 16.19 per cent in Commercial grade, and 15.63 per cent in Choice grade.

The second objective of this study was to compare the portion costs of four oven-ready beef items purchased and processed from carcass and primal cuts with the corresponding fabricated items. The results of the comparison of Commercial grade portion costs among the three methods of purchase follow.

1. The portion costs of rolled rib from carcass beef was \$.2166, and from fabricated roasts of Commercial grade was \$.2169. The cost of rolled rib roast prepared from the primal cut, however, was only \$.1412 per 6-ounce uncooked portion.
2. Portions of sirloin butt were most economical when prepared from fabricated meat. The short loin from fabricated source cost \$.1030 more per portion than did short loin from carcass beef.
3. The differences in cost per portion of the less tender cuts were less marked among the three methods of procurement than the differences among the dry heat roasts.

The results of the comparison of Good grade portion costs among the three methods of purchase follow.

1. The cost of the rolled rib from primal cuts was \$.0383 less per portion than the cost of rib prepared from carcass beef and \$.0408 less than the cost of fabricated rolled rib.
2. A variation of \$.0664 was found in the costs per serving of top round from each of the three sources.
3. The variations in portion costs of sirloin butt of this grade were not large. The cost of short loin from carcass beef was \$.2032 less per portion than from fabricated short loin which cost \$.4580 per portion.
4. Variations in costs per serving of the less tender cuts in Good grade were very small among the three methods of purchase.

The results of the comparison of Choice grade portion costs among the three methods of purchase follow.

1. The variations in costs of rolled rib for this grade were only \$.0119 per portion.
2. The cost of top round from fabricated beef was appreciably less than that of top round from carcass beef and from primal cuts.

3. The primal cut source of sirloin butt cost almost 10 cents per portion more than the carcass and fabricated sources.

A portion of short loin from carcass cost \$.2191 less than a comparable portion obtained from fabricated loin.

The third objective of this study was to consider factors, other than cost, which influence the decision for buying fabricated beef, carcass, or primal cuts for institution use. In choosing the method of purchase, a food service operator is faced with the major consideration of utilizing the items from carcass and primal cuts remaining to be served in subsequent meals. This problem of utilization has been pointed up in this study by a comparison of the items which remain to be incorporated in subsequent menus when sirloin butt was selected as a menu item. Carcass and primal cut, in the form of trimmed full loin, were used as a basis for comparing leftover meat items.

A buyer purchasing all fabricated meats has no remaining items which will have to be used within a short time. However, he may find a greater fluctuation of prices in certain fabricated items because of variation in demand for the items. Because there is a greater year-round demand for fabricated loin roasts and steaks by food service institutions specializing in these items, the buyer of

fabricated meats may find that the prices he must pay for loin cuts are far more than the prices of similar items prepared from carcass and primal cut sources.

The cubic feet of chilled storage space required for holding each of the three forms of beef, including quarters, primal cuts, and fabricated roasts and portion-ready items, was found to depend on the dimensions and the layout of the refrigerator. A refrigerator planned for holding carcass beef would seem to be unsuitable for efficient storage of primal cuts and fabricated items.

Conclusions

The following conclusions have been made from the findings of this project.

1. From the findings of this study it appeared that variations in percentage yield were not large enough to warrant buying a certain grade of carcass or primal cut to obtain a higher actual yield of any of the oven-ready items designated in this investigation. A slight trend toward higher percentage yields of the tender cuts from Choice and Good grades and higher percentage yields of the less tender cuts from Commercial grades was noted.

2. From the results of the comparison of portion costs among the three methods of purchase, it was found that no one method was most advantageous to the buyer of meats for institution use. It was noted, however, that the purchase price per pound was not an accurate index of the cost per portion. Results different from the findings of this study could be obtained from a similar project which was based on prices of a fluctuating market. The buyer of meats for institution use should plan his buying to take advantage of these fluctuations, which may be partially due to seasonal changes.
3. Not only must the food service operator consider the costs per portion of beef, but he must also consider the facilities available for the storage of left-over items and their use in his operation.

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APPENDICES

The primal cut number designations and the half-carcass letter designations have been retained to facilitate cross-checking between the preparation time and the yield tables.

Appendix A. Preparation Time

Table 35. Preparation Time of Primal Cuts (minutes)

Primal Cut	No.	Preparation Time		
<u>Commercial</u>				
Rounds	1-3	7	10	12
Full loins	10-12	15	15	15
Loin ends		4	5	6
Short loins		9	8	9
Ribs	19-21	13	15	15
Chucks	28-30	45	47	46
<u>Good</u>				
Rounds	4-6	12	10	10
Full loins	13-15	12	12	12
Loin ends		2	4	3
Short loins		8	7	7
Ribs	22-24	14	13	12
Chucks	31-33	43	40	41
<u>Choice</u>				
Rounds	7-9	12	10	11
Full loins	16-18	12	12	13
Loin ends		3	4	3
Short loins		8	6	8
Ribs	25-27	12	11	12
Chucks	34-36	36	36	36

Table 36. Preparation Time of Half Carcasses (minutes)

Animal	Round	Loin End	Flank	Short Loin	Rib	Short Plate
A	9	5	1	6	12	9
B	7	4	1	9	11	11
C	11	7	2	6	9	9
D	10	3	2	9	12	10
E	10	4	2	7	11	11
F	9	5	1	8	11	9
G	10	5	2	9	10	11
H	8	2	1	8	12	9
I	9	4	1	6	10	5
Total	83	39	13	68	98	84
Avg.	9.222	4.333	1.444	7.533	10.888	9.333
Avg. preparation	0.509	2.546	2.182	2.546	4.218	3.637
Total	9.731	6.879	3.626	10.079	15.106	12.970
	10	7	4	10	15	13

Table 36 (Continued)

Chuck	Fore-shank	Sub-total	Grind-ing	Other		Total
				Break.	Han-dling	
38	7	87	5	5	15	112
32	5	80	5	10	18	113
30	11	85	5	8	10	108
30	3	79	5	5	14	103
35	6	86	5	5	8	104
40	7	90	5	5	8	108
42	7	96	5	4	9	114
35	8	83	5	5	12	105
34	7	76	5	5	10	96
316	61	762	45	52	104	963
35.111	6.777	84.666	5	5.77	11.555	107
3.492	3.200	22.330				
38.603	9.977	106.971				
38	10	107				

Appendix B. Price Quotations

Table 37. Boneless Fabricated Beef (per pound)

Item	Purveyor			
	1	2	3	4
<u>Commercial</u>				
Beef, ground			.35	.3275
Stew meat	.49	.59	.34	
Bottom round			.45	
Top round		.44	.45	
Sirloin butt		.51	.50	.535
Short loin		.72	.95	.875
Rolled rib	.52		.69	.525
<u>Good</u>				
Beef, ground			.40	
Stew meat		.59	.34	
Bottom round			.65	
Top round		.44	.60	
Sirloin butt	.68	.74	.65	.635
Short loin	1.37	1.28	1.00	1.235
Rolled rib		.78	.69	.605
<u>Choice</u>				
Beef, ground	.305		.45	
Stew meat		.59	.35	
Bottom round			.70	
Top round		.44	.45	
Sirloin butt	.78	.76	.70	.685
Short loin	1.27	1.43	1.15	1.425
Rolled rib		.85	.69	.705

Appendix C. Yields

Table 38. Cutting Yield for Primal Cuts, Commercial Grade
(pounds-ounces)

Cut and Primal Cut Designation	Bone	Fat	Rolled Rib	Top Round
Rounds				
1	15- 0	3- 2		17- 2
2	16-10	5-10		19- 2
3	14- 0	6- 4		17- 4
Avg. pounds & ounces . . .	15- 3	5- 0		17-13
Avg. pounds	15.20	5.00		17.83
Full loins				
10	8- 8	12- 0		
11	9- 8	9-12		
12	7- 2	11- 2		
Avg. pounds & ounces . . .	8- 6	10-15		
Avg. pounds	8.375	10.96		
Loin ends				
10	5- 4	4- 0		
11	5- 4	3- 0		
12	4- 6	6- 6		
Avg. pounds & ounces . . .	4-15	4- 7		
Avg. pounds	4.96	4.46		
Short loins				
10	3- 4	8- 0		
11	4- 4	6-12		
12	2-12	4-12		
Avg. pounds & ounces . . .	3- 7	6- 8		
Avg. pounds	3.42	6.50		
Ribs				
19	7- 0	3- 8	24-12	
20	7- 0	2- 0	26- 0	
21	7-10	1-12	24- 6	
Avg. pounds & ounces . . .	7- 3	2- 7	25- 1	
Avg. pounds	7.20	2.41	25.05	
Chucks				
28	15- 4	11- 0		
29	16- 4	11- 0		
30	17-12	12- 0		
Avg. pounds & ounces . . .	16- 7	11- 5		
Avg. pounds	16.41	11.33		

Table 38 (Continued)

Sirloin Butt, Butt Tender	Short Loin, Tenderloin	Pot Roast	Stew	Ground	Total
		26- 4		12- 0	73- 8
		31- 6		14- 8	87- 4
		27- 8		12- 0	77- 0
		28- 6		12-13	79- 4
		28.38		12.83	79.25
23- 4	13-12			7- 8	65- 0
22-14	13-14			7-10	63-10
23- 0	14- 0			5- 8	60-12
23- 1	13-14			6-14	63- 2
23.04	13.88			6.88	63.13
23- 4				2- 8	35- 0
22-14				2- 4	33- 6
23- 0				1- 8	35- 4
23-.1				2- 1	34- 9
23.04				2.08	34.54
	13-12			5- 0	30- 0
	13-14			5- 6	30- 4
	14- 0			4- 0	25- 8
	13-14			4-13	28-9
	13.88			4.79	28.58
				1-10	36-14
				2- 0	37- 0
				2- 0	35-12
				1-14	36- 9
				1.88	36.54
			76-10	2-12	105-10
			72- 4	2- 4	101-12
			72- 8	2- 0	104- 4
			73-13	2- 5	103-14
			73.80	2.33	103.88

Table 39. Cutting Yield for Primal Cuts, Good Grade
(pounds-ounces)

Cut and Primal Cut Designation	Bone	Fat	Rolled Rib	Top Round
Rounds				
4	15- 6	7- 4		18- 8
5	14- 0	5- 8		16- 2
6	14- 8	6- 0		18- 0
Avg. pounds & ounces . . .	14-10	6- 4		17- 9
Avg. pounds	14.63	6.25		17.55
Full loins				
13	5- 4	4-12		
14	7- 4	3-12		
15	8- 6	5- 0		
Avg. pounds & ounces . . .	6-15	4- 8		
Avg. pounds	6.95	4.50		
Loin ends				
13	2-12	2- 2		
14	4- 0	1-12		
15	4- 2	3- 0		
Avg. pounds & ounces . . .	3-10	2- 5		
Avg. pounds	3.63	2.30		
Short loins				
13	2- 8	2-10		
14	3- 4	2- 0		
15	4- 4	2- 0		
Avg. pounds & ounces . . .	3- 5	2- 3		
Avg. pounds	3.33	2.20		
Ribs				
22	5- 0	0-12	18- 4	
23	5- 0	2- 2	22- 0	
24	5- 8	0-10	19-14	
Avg. pounds & ounces . . .	5- 3	1- 3	20- 0	
Avg. pounds	5.17	1.16	20.04	
Chucks				
31	15-10	9- 2		
32	16- 0	6- 8		
33	15- 8	8- 4		
Avg. pounds & ounces . . .	15-11	7-15		
Avg. pounds	15.70	7.95		

Table 39 (Continued)

Sirloin Butt, Butt Tender	Short Loin, Tenderloin	Pot Roast	Stew	Ground	Total
		32- 8		14-10	88- 4
		25-12		13- 2	74- 8
		30- 0		14- 8	83- 0
		29- 7		14- 1	81-15
		29.41		14.09	81.92
16-10	12-12			5- 2	44- 8
23- 4	15- 8			6- 4	56- 0
24- 0	16-10			4- 8	58- 8
21- 5	14-15			5- 5	53- 0
21.30	14.95			5.30	53.00
16-10				0-12	22- 4
23- 4				1- 0	30- 0
24- 0				1- 4	32- 6
21- 5				1- 0	28- 3
21.30				1.00	28.21
	12-12			4- 6	22- 4
	15- 8			5- 4	26- 0
	16-10			3- 4	26- 2
	14-15			4- 5	24-13
	14.95			4.30	24.79
				1- 8	25- 8
				1-10	30-12
				2- 4	28- 4
				1-13	28- 3
				1.80	28.17
			70- 4	2- 4	97- 4
			65-10	2- 2	90- 4
			71- 2	2- 2	97- 0
			69- 0	2- 3	94-13
			69.00	2.16	94.83

Table 40. Cutting Yield for Primal Cuts, Choice Grade
(pounds-ounces)

Cut and Primal Cut Designation	Bone	Fat	Rolled Rib	Top Round
Rounds				
7	14- 0	6- 0		16-10
8	14- 2	8- 6		16-10
9	14- 0	8- 8		17- 4
Avg. pounds & ounces . . .	14- 1	7-10		16-13
Avg. pounds	14.04	7.63		16.83
Full loins				
16	5-12	6-12		
17	7- 2	8-14		
18	5-12	11- 4		
Avg. pounds & ounces . . .	6- 3	8-15		
Avg. pounds	6.20	8.95		
Loin ends				
16	3- 4	3- 0		
17	3-10	2-10		
18	3- 0	3- 4		
Avg. pounds & ounces . . .	3- 5	2-15		
Avg. pounds	3.30	2.95		
Short loins				
16	2- 8	3-12		
17	3- 8	6- 4		
18	2-12	8- 0		
Avg. pounds & ounces . . .	2-15	6- 0		
Avg. pounds	2.91	6.00		
Ribs				
25	4-12	1- 4	16- 4	
26	4- 4	1- 6	18- 0	
27	5- 4	2- 4	22- 0	
Avg. pounds & ounces . . .	4-12	1-10	18-12	
Avg. pounds	4.75	1.63	18.75	
Chucks				
34	13- 0	12- 0		
35	11-10	11-12		
36	12- 0	12- 4		
Avg. pounds & ounces . . .	12- 3	12- 0		
Avg. pounds	12.20	12.00		

Table 40 (Continued)

Sirloin Butt, Butt Tender	Short Loin, Tenderloin	Pot Roast	Stew	Ground	Total
		26-12		13- 0	76- 6
		30- 6		12- 0	81- 8
		28- 8		12- 4	80- 8
		28- 9		12- 7	79- 7
		28.54		12.42	79.46
19- 0	13- 6			5-12	50-10
23-14	16- 4			7- 2	63- 4
19-10	11-10			6- 4	54- 8
20-13	13-12			6- 6	56- 2
20.83	13.75			6.38	56.13
19- 0				0-12	26- 0
23-14				1- 2	31- 4
19-10				1- 2	27- 0
20-13				1- 0	28- 2
20.83				1.00	28.08
	13- 6			5- 0	24-10
	16- 4			6- 0	32- 0
	11-10			5- 2	27- 8
	13-12			5- 6	28- 1
	13.75			5.38	28.04
				1- 8	23-12
				0- 6	24- 0
				1- 0	30- 8
				0-15	26- 2
				0.95	26.08
			60- 0	1-12	86-12
			53- 8	1-12	78-10
			56-12	1-12	82-12
			56-12	1-12	82- 8
			56.75	1.75	82.70

Table 41. Average Cutting Yield for Primal Cuts (pounds-ounces)

Primal Cut Designation	Cuts	Bone	Fat	Rolled Rib
Rounds				
1-3	Commercial	15- 3	5- 0	
4-6	Good	14-10	6- 4	
7-9	Choice	14- 1	7-10	
Full loins				
10-12	Commercial	8- 6	11-11	
13-15	Good	6-15	4- 8	
16-18	Choice	6- 3	8-15	
Loin ends				
10-12	Commercial	4-15	4- 7	
13-15	Good	3-10	2- 5	
16-18	Choice	3- 5	2-15	
Short loins				
10-12	Commercial	3- 7	6- 8	
13-15	Good	3- 5	2- 3	
16-18	Choice	2-15	6- 0	
Ribs				
19-21	Commercial	7- 3	2- 7	25- 1
22-24	Good	5- 3	1- 3	20- 0
25-27	Choice	4-12	1-10	18-12
Chucks				
28-30	Commercial	16- 7	11- 5	
31-33	Good	15-11	7-15	
34-36	Choice	12- 3	12- 0	

Table 41 (Continued)

Top Round	Sirloin Butt, Butt Tender	Short Loin, Tenderloin	Pot Roast	Stew	Ground
17-13			28- 6		12-13
17- 9			29- 7		14- 1
16-13			28- 9		12- 7
	23- 1	13-14			6-14
	21- 5	14-15			5- 5
	20-13	13-12			6- 6
	23- 1				2- 1
	21- 5				1- 0
	20-13				1- 0
		13-14			4-13
		14-15			4- 5
		13-12			5- 6
					1-14
					1-13
					0-15
				73-13	2- 5
				69- 0	2- 3
				56-12	1-12

Table 42. Cutting Yield for Half-Carcass, Animal A, Commercial Grade (pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	76- 8	26- 4	27- 4
Bone	16- 8	4-10	4- 0
Waste fat	2- 8	0-14	4-12
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	17-12		
sirloin butt		17- 0	
short loin			9- 0
butt tender		2-12	
tenderloin			2- 4
Pot roasts			
round	26- 8		
Stew cut			
Ground beef	13- 4	1- 0	7- 4

Table 42 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
28- 0	86- 4	23- 8	18- 4	10- 0	296- 0
7- 0	17- 0	7-14	3- 4		60- 4
0- 6	2- 0	1- 6	0- 4	2-12	14-14
19- 2					19- 2
					17-12
					17- 0 .
					9- 0
					2-12
					2- 4
					26- 8
	65- 8	6-10	13- 4		85- 6
1- 8	1-12	7-10	1- 8	7- 4	41- 2

Table 43. Cutting Yield for Half-Carcass, Animal B, Commercial Grade (pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	65- 0	28- 2	31- 2
Bone	13- 1	3- 2	2-11
Waste fat	4- 2	5- 2	12- 1
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	14- 8		
sirloin butt		17- 0	
short loin			8- 2
butt tender		2- 2	
tenderloin			1- 8
Pot roasts			
round	24- 7		
Stew cut			
Ground beef	8-14	0-12	6-12

Table 43 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
22-14	76- 2	17- 6	17-10	10-12	269- 0
5- 3	12-14	5-10	2-14		45- 7
0- 4	4-11	1- 2	0- 6	3- 6	31- 2
16-13					16-13
					14- 8
					17- 0
					8- 2
					2- 2
					1- 8
					24- 7
	56- 9	4- 8	13- 2		74- 3
0-10	2- 0	6- 2	1- 4	7- 6	33-12

Table 44. Cutting Yield for Half-Carcass, Animal C, Commercial Grade (pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	68- 4	26-10	29- 6
Bone	15- 2	3- 9	3- 2
Waste fat	4-14	3- 8	10- 8
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	14-10		
sirloin butt		16- 3	
short loin			7-11
butt tender		2-10	
tenderloin			1-14
Pot roasts			
round	23- 2		
Stew cut			
Ground beef	10- 8	0-12	6- 3

Table 44 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
20- 8	77-14	20- 1	21- 8	11- 0	275- 3
4- 8	15- 1	7- 5	3-14		52- 9
0- 7	4- 7	1-10	0-14	4- 1	30- 5
14-12					14-12
					14-10
					16- 3
					7-11
					2-10
					1-14
					23- 2
	56-13	4- 8	15-11		77- 0
0-13	1- 9	6-10	1- 1	6-15	34- 7

Table 45. Cutting Yield for Half-Carcass, Animal D, Good Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	71- 4	25- 4	36-12
Bone	13- 4	3- 8	2-10
Waste fat	3-12	3- 0	13-10
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	16-12		
sirloin butt		15- 8	
short loin			10- 0
butt tender		2- 4	
tenderloin			2- 0
Pot roasts			
round	25-12		
Stew cut			
Ground beef	11-12	1- 0	8- 8

Table 45 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
24- 4	77- 0	20- 8	24- 4	12- 8	291-12
5- 4	13- 4	6- 0	4- 4		48- 2
0-12	6- 4	3- 6	0- 8	4-12	36- 0
16-11					16-11
					16-12
					15- 8
					10- 0
					2- 4
					2- 0
					25-12
	55- 8	4- 8	18- 8		78- 8
1- 9	2- 0	6-10	1- 0	7-12	40- 3

Table 46. Cutting Yield for Half-Carcass, Animal E, Good Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	72- 4	22-14	30-10
Bone	11-12	2- 4	2- 4
Waste fat	4- 0	3- 0	8-10
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	17-12		
sirloin butt		14- 4	
short loin			10-12
butt tender		2-10	
tenderloin			2- 4
Pot roasts			
round	26-12		
Stew cut			
Ground beef	12- 0	0-12	6-12

Table 46 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
24- 4	81- 0	19-12	20- 8	11- 4	282- 8
4- 8	12- 8	5-10	3- 4		42- 2
0- 8	7- 4	2- 4	1- 0	3- 0	29-10
17-12					17-12
					17-12
					14- 4
					10-12
					2-10
					2- 4
					26-12
	59- 8	5-10	15- 2		80- 4
1- 8	1-12	6- 4	1- 2	8- 4	38- 6

Table 47. Cutting Yield for Half-Carcass, Animal F, Good Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	73- 8	25- 4	29- 4
Bone	14- 4	3- 8	3- 2
Waste fat	3- 5	2- 6	6- 2
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	17- 8		
sirloin butt		16- 1	
short loin			10- 2
butt tender		2- 6	
tenderloin			2- 4
Pot roasts			
round	26-14		
Stew cut			
Ground beef	11- 9	0-15	7-10

Table 47 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
27- 0	81- 0	20-12	18- 4	9- 8	284- 8
5-14	14- 2	7- 0	3- 0		50-14
0- 8	5-14	2- 6	0- 8	3- 4	24- 5
19- 0					19- 0
					17- 8
					16- 1
					10- 2
					2- 6
					2- 4
					26-14
	58-10	5- 0	13-10		77- 4
1-10	2- 6	6- 6	1- 2	6- 4	37-14

Table 48. Cutting Yield for Half-Carcass, Animal G, Choice Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	69- 8	26- 5	36-10
Bone	12- 2	3- 6	2-12
Waste fat	5-12	4- 4	13- 3
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	15-14		
sirloin butt		15- 7	
short loin			10- 9
butt tender		2- 4	
tenderloin			2- 9
Pot roasts			
round	24-10		
Stew cut			
Ground beef	11- 2	1- 0	7- 9

Table 48 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
26-10	81-10	22- 8	19- 0	12- 1	294- 4
5- 9	13- 2	5- 4	2- 8		44-11
1- 0	7- 2	3- 1	1- 8	5- 1	40-15
18-11					18-11
					15-14
					15- 7
					10- 9
					2- 4
					2- 9
					24-10
	59-10	6- 5	14- 1		80- 0
1- 6	1-12	7-14	0-15	7- 0	38-10

Table 49. Cutting Yield for Half-Carcass, Animal H, Choice Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	66- 4	25-12	32- 5
Bone	12- 0	3- 1	2-12
Waste fat	4- 4	3- 9	9- 8
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	14-12		
sirloin butt		16- 2	
short loin			10- 6
butt tender		2- 0	
tenderloin			2- 6
Pot roasts			
round	24- 8		
Stew cut			
Ground beef	10-12	1- 0	7- 5

Table 49 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
28- 8	81- 8	21-10	22-12	12- 7	291- 2
5- 4	12- 8	5- 8	2-12		43-13
0-12	6- 8	2-13	2- 4	5- 0	34-10
21- 2					21- 2
					14-12
					16- 2
					10- 6
					2- 0
					2- 6
					24- 8
	60- 8	6- 0	16- 6		82-14
1- 6	2- 0	7- 5	1- 6	7- 7	38- 9

Table 50. Cutting Yield for Half-Carcass, Animal I, Choice Grade
(pounds-ounces)

Item	Round (rump on)	Loin End (sir- loin)	Short Loin
Total weight	70- 0	24- 8	28- 4
Bone	12-12	2-12	2- 4
Waste fat	4-12	2- 8	6- 4
Ready-to-cook cuts			
Roasts			
rib (rolled)			
top round	15- 0		
sirloin butt		16- 4	
short loin			10- 0
butt tender		2- 0	
tenderloin			2- 4
Pot roasts			
round	25- 4		
Stew cut			
Ground beef	12- 4	1- 0	7- 8

Table 50 (Continued)

Rib	Chuck	Fore-shank	Plate	Flank	Total
26- 4	74- 8	22-12	15- 8	14- 0	275-12
5- 8	13- 4	6- 4	2- 0		44-12
0- 8	5- 8	2- 8	0-12	5- 0	27-12
18- 4					18- 4
					15- 0
					16- 4
					10- 0
					2- 0
					2- 4
					25- 4
	54- 0	6-12	11-12		72- 8
2- 0	1-12	7- 4	1- 0	9- 0	41-12

APPENDIX D

ILLUSTRATIONS OF SPECIFIC CUTTING PROCEDURES



Figure 12. Pulling knuckle from leg bone.

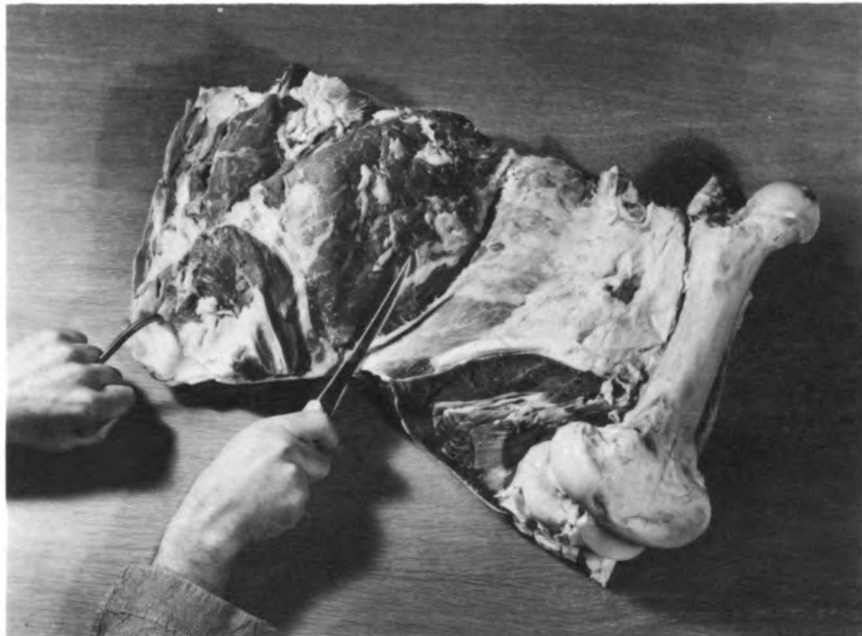


Figure 13. Separating top (inside) round from bottom round and leg bone.



Figure 14. Top (inside) round.

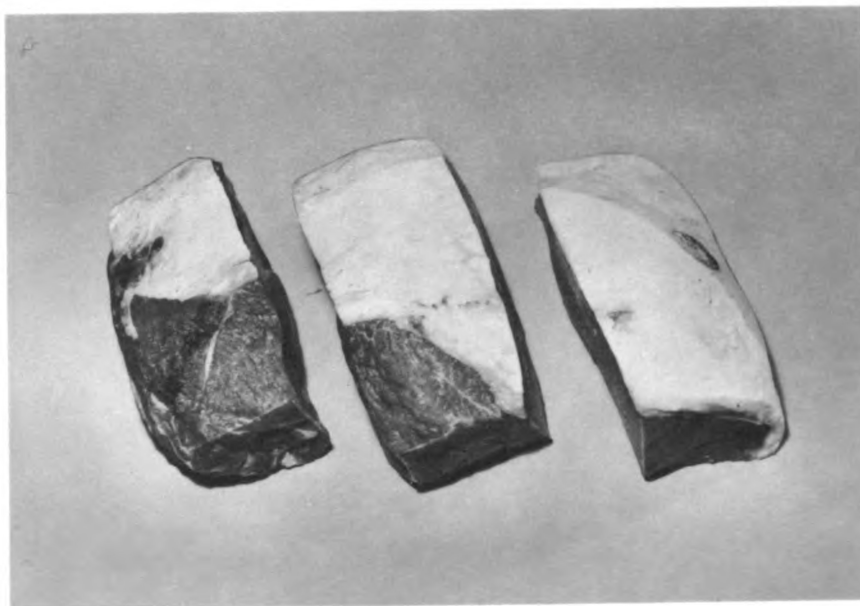


Figure 15. Top round cut into three pieces.

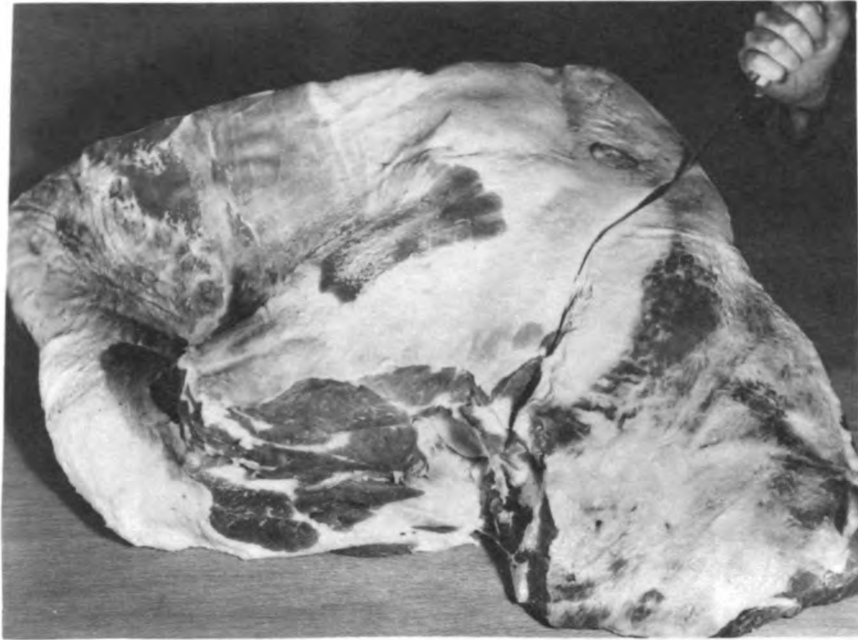


Figure 16. Cutting along ridge of bladebone in the chuck.

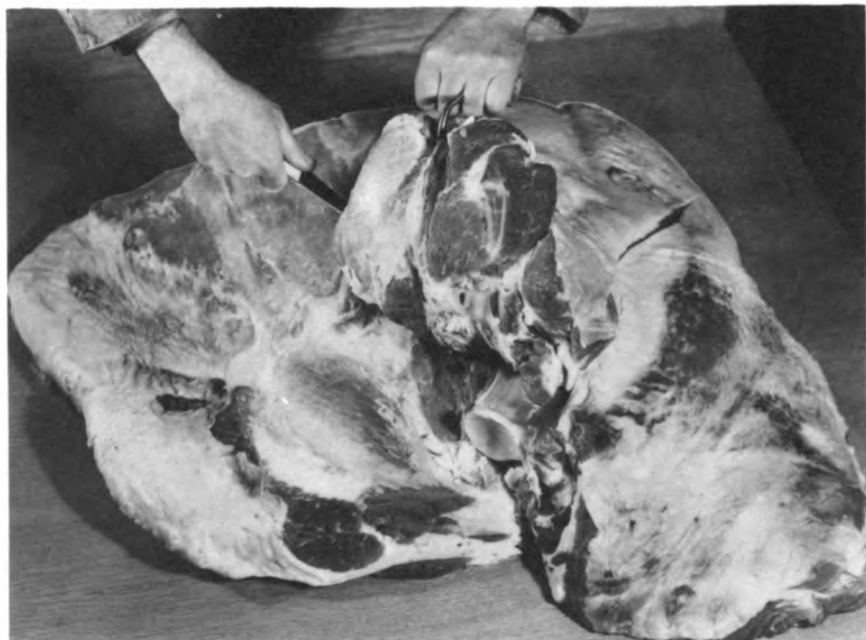


Figure 17. Removing the clod from the chuck.

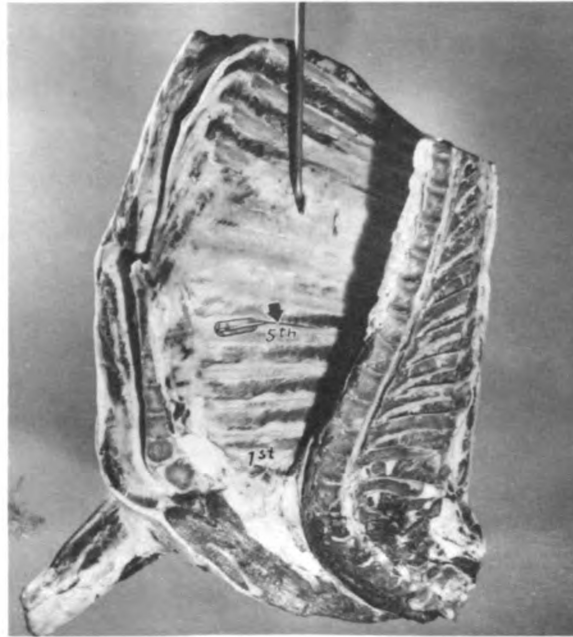


Figure 18. Inserting boning knife between fifth and sixth ribs of the forequarter.

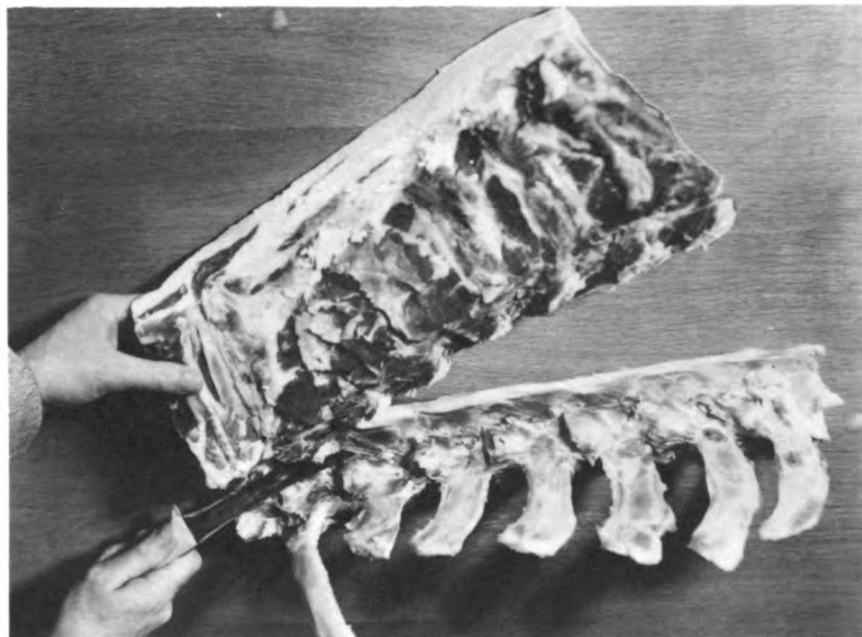


Figure 19. Separating loin strip from backbone.

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