

Making the Grade

Beef industry experts explain the ABCs of yield and quality grading.

by Lisa Hawkins

Looking back on our school years we all can remember our favorite classes, such as gym, choir, art or shop. And we can think of some of our not so favorite classes, like math, English, and geography.

No matter what the motivation, the result was education and learning. Some students merited higher grades based on their performance and the teacher's evaluation of work. The better students received A's and B's, while the average students received C's, and the weaker students came up D's, E's and F's.

This type of evaluation is not limited to the school room. Variations of it are found in corporate offices, local businesses and even meat packing plants.

In the meat packing industry there are two methods of evaluating the product worth — yield and quality grading.

Yield grade identifies cattle for differences in yields of boneless, closely trimmed retail cuts from the round, loin, rib and chuck. These four cuts make up 75 percent of the carcass weight and 90 percent of the carcass value.

Quality grade, on the other hand, predicts the palatability of the product based on the amount of intramuscular fat and the animals age at the time of slaughter.

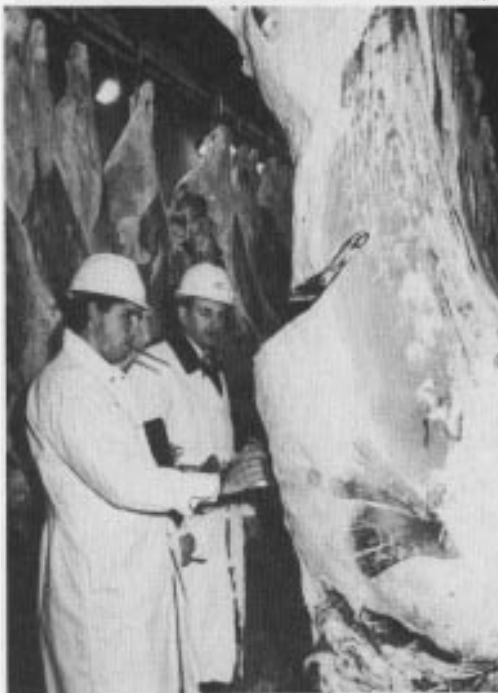
Today's methods of quality and yield grading have come about from more than 60 years of evolution. "The original concept of grading meats was based on using the government's name and reputation to differentiate cattle raised in the Corn Belt from cattle raised in Texas," says Gary Smith, Monfort professor of meat and food sciences at Colorado State University, Ft. Collins.

Smith explains that cattle raised in Texas in the early 20th century were believed to be inferior. Thus a conformation score was assigned which eliminated dairy, Longhorn, and Brahman cattle from the Choice grades.

The U.S. Standards for the Grades of Dressed Beef were drafted in 1916. After revisions, the voluntary beef grading and stamping service standards were put into practice in May of 1927.

The government began stamping beef

to be used on the steamship lines between the United States and Great Britain. However, domestic grading was not used much because the major packing plants had their own methods of evaluating meat. When World War II began, the government made grading mandatory. Grading once again dropped off in 1945. Then in 1949 it was reinstitutionalized due to the Korean War. Up until this point, qual-



John Stowell, CAB supply development director, and Dennis Burson, Extension meat scientist at University of Nebraska, collect data for the National Junior Angus Carcass Contest in Omaha.

ity grading was the only grading system in place.

Then in the summer of 1962 researcher Charlie Murfhey developed a dual grading system. This system emphasized quality and cutability. It was adopted in 1965.

Furthermore, in February of 1976 four major changes were implemented as part of the Beef Grading Standards. The following information was obtained from "Live Animal Carcass Evaluation and Selection Manual" written by Donald Boggs and Robert Merkel.

1. All beef graded must be graded for both quality and yield. Previously, a packer could have carcasses graded for one or the other or both.

2. Marbling requirements were reduced slightly for the Choice and Prime grades.

3. The minimum amounts of marbling specified for carcasses of cattle approximately nine months of age remained unchanged through approximately 30 months of age. Previously, the standards required increased marbling to compensate for increased maturity of all carcasses.

4. Conformation was eliminated as a factor in the quality grading system since research had indicated that carcass shape has very little influence on the palatability characteristics of meat.

Quality grading is based on two factors — marbling and maturity. Marbling is the amount of intramuscular fat, in other words, the dispersion of fat in the lean. Marbling is measured at the rib eye. The degree of marbling falls into one of 10 categories ranging from devoid to abundant degrees. This measurement is carried one step further by federal meat graders who subdivide each degree of marbling into percentages.

The percentages range from 0 to 100 and are measured in increments of 10. The lower the percentage, the less the amount of marbling. For example, a rib eye with a marbling score of *small 20* has less marbling than one with a score of *small 90*.

Maturity is the animal's physiological age at the time of slaughter. The age is determined through carcass indicators. These indicators include changes in bone characteristics, ossification of the cartilaginous tissues, and the color and texture of the rib eye muscle.

As the animal ages, the ribs become wider and flatter; the sacral, lumbar and thoracic vertebrae become fused and ossified; and the rib eye becomes darker and coarser textured. Maturity ranges from A to E, with A maturity the youngest. Maturity is also measured as percentages in increments of 10. The lower the percentage, the younger the animal. For exam-

increments of 10. The lower the percentage, the younger the animal. For example, a carcass with a maturity score of A 20 is younger than one with an A 70.

Once marbling and maturity are determined, they are combined to arrive at the final quality grade. The quality grades are Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner. A and B maturity cattle fall into the Prime, Choice, Select and Standard grades, depending on their marbling scores. However the highest category C, D, and E maturity cattle can be classified under is Commercial.

The more desirable carcasses receive grades of Prime and Choice, with Select being average and Standard, Commercial, Utility, Cutter and Canner making up the rest.

Until 1987, the Select grade was known as Good. The revision of Good to Select did not change the requirements for the grade only the grade name.

The change was brought about by industry fears that Good was a limbo term. Initiators felt Select sounded more desirable than good. Select was promoted as a leaner alternative to Choice and Prime. It seems the industry made a smart move.

"In December of 1987, 1.8 percent of all beef graded in the U.S. graded Select," Smith says. "Now 16 percent of all beef is



Dennis Burson measures the rib eye size on an Angus steer carcass. He counts dots on the grid to calculate total rib eye size.

graded and stamped Select."

Recently there has been some concern raised over whether packers should pay premiums for Select cattle. Part of this belief results from the consumer's demands for a leaner beef product.

"We need a more objective means of assessing carcass value," says Robert

Merkel, professor of meat science, Michigan State University. Merkel believes there will be a movement toward Select in the beef industry.

In contrast, Smith does not believe premiums will be paid for Select meat. He says if premiums were paid for Select meat then only three percent of the beef supply would remain.

"Select is the base," says Smith. "Some people would argue that we don't pay premiums for beef, we just pay for what it is worth."

Another measurement of carcass value is yield grade. The yield grade is a measurement of the carcass cutability. It is based on four factors— fat thickness at the 12th rib, rib eye area, hot carcass weight, and percent kidney, pelvic and heart fat (KPH).

Yield grades range from 1.0 to 5.9, with 1.0 as the leanest. While the yield grade is estimated to the tenth place, the grader only "rolls" the whole number on the carcass. For example, a carcass with a yield grade of 3.7 would be rolled yield grade 3. Yield grades below 1.0 and above 5.0 are rolled 1 and 5, respectively.

The fat thickness is measured at the 12th rib. It is taken at a right angle to three-fourths lateral length of the rib eye from the backbone. The fat thickness is

determined by the amount of fat along the rib eye edge. The measurement may be adjusted as necessary, depending if the carcass is fatter over other areas, such as the cod, brisket, rump and hip in relation to the 12th rib.

The rib eye is measured by using a grid and the hot carcass weight gathered from the packing plant. KPH is estimated in pounds for each side of the carcass. The two sides are added together and divided by the carcass weight to arrive at a percentage.

The formula for yield grade is:

Yield grade = $2.5 + (2.5 \times \text{adjusted fat thickness, 12th rib}) + (.0038 \times \text{hot carcass wt.}) + (.2 \times \text{percentage kidney, pelvic and heart fat}) - (.32 \times \text{rib eye area})$

Both the yield and quality grading are performed by a USDA grader. The graders usually have a B.S. degree in animal science and participated on a collegiate meats judging team. Graders are able to grade approximately 300 carcasses per hour, averaging 12 seconds per carcass.

Working along with the grader is the USDA inspector. The inspector monitors procedures on the kill floor, processing areas and assembly lines. The inspectors check safety and sanitation procedures as well as diseased carcasses. Many inspectors hold degrees in veterinary medicine.

Inspectors and graders are directly involved in the Certified Angus Beef (CAB) program. In order for an animal to qualify for CAB it must be predominantly black hided, beef-type conformation, and without Brahman influence (long floppy ears and hump). The visual appraisal is conducted by the plant employee. Animals which meet these requirements are stamped with an "A." This stamp shows up on the carcass after the animal is slaughtered.

Once in the cooler, the grader inspects the A stamped carcass making sure it meets the CAB requirements. These requirements include modest or better marbling, yield grade 3 or leaner, and A maturity. If the carcass qualifies for CAB it is rolled with the CAB stamp as well as the yield and quality grade stamps. About one of every four animals that meet the visual requirements actually qualify for CAB.

CAB requires carcasses to be yield and quality graded even though the government uncoupled the yield and quality grades in April of 1989.

The uncoupling resulted from people who said yield grading carcasses curtailed the carcass value, says Merkel. None of the major packers have gone to solely one

grading system.

"I don't believe they (packers) will go to one system because retailers have specifications written including both yield and quality grades," says Merkel.

Conversely, Smith believes the uncoupling was a smart industry decision.

"Before, 64 percent of all beef was identified. Today, 91 percent of all beef is identified with one or the other grade or both," says Smith. He says the 64 percent of the packers who both quality and yield graded continue to do so. The uncoupling allowed another 27 percent to perform either yield or quality grading.

"Before, IBP (Iowa Beef Packers) only identified and stamped Choice and Prime beef; now they yield grade everything," says Smith.

What does the future hold for the beef industry? Merkel believes that as a result of consumer demands, meat will become leaner.

"It will be a slow process, however. If we get approval of Beta-Agonist or Somatotropin the change will be much quicker than any other means of breeding," says Merkel.

Somatotropin is a naturally occurring growth hormone, while Beta-Agonist is classified under a different hormone category. Both increase the lean growth and fat breakdown and both can be syntheti-

Degrees of Marbling	Maturity *					
	0	A	100	B	C	D
Abundant	PRIME		COMMERCIAL		CUTTER	
Moderately Abundant	PRIME		COMMERCIAL		CUTTER	
Slightly Abundant	PRIME		COMMERCIAL		CUTTER	
Moderate	PRIME		COMMERCIAL		CUTTER	
Modest	CHOICE		COMMERCIAL		CUTTER	
Small	CHOICE		COMMERCIAL		CUTTER	
Slight	SELECT		UTILITY		CUTTER	
Traces	SELECT		UTILITY		CUTTER	
Practically Devoid	STANDARD		UTILITY		CUTTER	

cally produced.

"These two compounds are much more active in increasing muscle mass than the growth hormones we have now," says Bob Brandt, beef cattle nutrition specialist at Kansas State University, Manhattan. At this time both compounds are going through the steps for drug approval by the Food and Drug Administration (FDA).

Smith does agree with Merkel on one point. He says beef cattle stepping to the

head of the class in 1990 will be leaner yet still able to maintain high palatability characteristics.

As an industry we must continue to educate ourselves on the consumer demands. We must also keep abreast of the latest technology which will enable us to produce a nutritionally dense, high quality, residue-free beef product. For if we stop looking for ways to improve, we will fall behind and go to the back of the class.

Can you make the Grade?

Problems

Yield Grade

#1 (Base)	#6
HCW = 600 lbs.	HCW = 650 lbs.
Adj. 12th Rib FT = .6 in	Adj. 12th Rib FT = .2 in
EREA = 11.0 in ²	EREA = 11.9 in ²
KPH = 3.5%	KPH = 1.5%
#2	#7
HCW = 700 lbs.	HCW = 900 lbs.
Adj. 12th Rib FT = .8 in	Adj. 12th Rib FT = .7 in
EREA = 12.2 in ²	EREA = 15.2 in ²
KPH = 3.0%	KPH = 4.0%
#3	#8
HCW = 500 lbs.	HCW = 575 lbs.
Adj. 12th Rib FT = .6 in	Adj. 12th Rib FT = .1 in
EREA = 11.0 in ²	EREA = 13.4 in ²
KPH = 4.5%	KPH = 1.0%
#4	#9
HCW = 800 lbs.	HCW = 675 lbs.
Adj. 12th Rib FT = .5 in	Adj. 12th Rib FT = 1.1 in
EREA = 14.3 in ²	EREA = 11.0 in ²
KPH = 4.0%	KPH = 5.0%
#5	#10
HCW = 750 lbs.	HCW = 600 lbs.
Adj. 12th Rib FT = .7 in	Adj. 12th Rib FT = 1.2 in
EREA = 10.1 in ²	EREA = 8.3 in ²
KPH = 3.5%	KPH = 5.0%

Bonus Question

Assuming all the above carcasses meet the visual specifications and they all grade high choice, which ones qualify for CAB?

Quality Grade

1) A maturity Slightly Abundant	4) B100 Practically Devoid10
2) B maturity Modest	5) C0 Abundant100
3) A70 Traces	<i>Refer to USDA Marbling chart on Page 80</i>

Yield Grade

HCW 625 lbs.
FT=.5 in
EREA = 11.6 in²
KPH = 3.0%

EXAMPLE

(FT) .5 in. = 3.25 (PYG) [see chart 1]
(HCW) 625 lbs. = 11.3 in² (RREA) [see chart 2]
116 in²(EREA)
.3 x .3 = .09 (Difference in Rib Eye from estimate to actual)
(KPH) 3.0% = -.1 [see chart 3]
Calculations: 3.25 + .09 - .1 = 3.24 (FYG)
USDA Stamp = 3

Quality Grade

A50
Abundant70
QG= Prime+

Term chart

PYG = Preliminary Yield Grade
YG = Yield Grade
QG = Quality Grade
FYG = Final Yield Grade
HCW = Hot Carcass Weight
FT = Adjusted 12th Rib Fat Thickness
KPH = Kidney, Pelvic and Heart Fat
REA = Rib Eye Area
RREA = Required Rib Eye Area
EREA = Estimated Rib Eye Area
ADJ. = Adjustment

Chart 1

Adjusted 12th Rib Fat Thickness	Preliminary Yield Grade
.1	2.25
.2	2.50
.3	2.75
.4	3.00
.5	3.25
.6	3.50 Base
.7	3.75
.8	4.00
.9	4.25
1.0	4.50
1.1	5.00

*For each .1 in of adjusted 12th rib fat thickness greater than .6 add .25 YG; for each .1 in less than .6 subtract .25 YG.

Chart 2

Hot Carcass Weight	Rib eye (ins)
500	9.8
525	10.1
550	10.4
575	10.7
600	11.0 Base
625	11.3
650	11.6
675	11.9
700	12.2
725	12.5
750	12.8
775	13.1
800	13.4
825	13.7
850	14.0
875	14.3
900	14.6

*For each 1 in² REA greater than 11.0 in² subtract .3 YG; for each 1 in² less than 11.0 add .3 YG to the PYG.

*For each 25 lbs. of HCW greater than 600 lbs. add .1 YG and for each 25 lbs. of HCW less than 600 lbs. subtract .1 YG.

Chart 3

%KPH	Adj.
5.0	+3
4.5	+2
4.0	+1
3.5	0 Base
3.0	-1
2.5	-2
2.0	-3
1.5	-4
1.0	-5

*For each .5% KPH greater than 3.5% add .1 YG to PYG; for each .5% less than 3.5% subtract .1 YG.

Turn to Page 148 for problem answers.

Answers from *Can You Make the Grade* on page 81

Scoring

Yield Grade

For every right answer give yourself 10 points.

If your final answer is wrong give yourself practical credit of 1 point per correct column.

Bonus question is worth 20 points. No partial credit is given.

Total points possible: 100

Quality Grade

For each right answer give yourself 10 points.

Total points possible: 50

Overall Grade

Add your yield grade result to your quality grade result and you will have your total points.

Total possible points: 150 (+Bonus = 170)

135 and above	A	Go to the head of the class.
120-134	B	Sit in the second row.
105-119	C	Stay where you are.
104 and below	F	Go to the back of the class.

YIELD GRADE

HCW	FT	PYG	RREA	EREA	ADJ	KPH	ADJ	FYG	Stamp
600	.6	3.50	11.0	11.0		3.5%		3.5	3
700	.8	4.00	12.2	12.2		3.0%	-.1	$(4.0-.1)+3.9$	3
550	.6	3.50	10.4	11.0	-.18	4.5%	+2	$(3.5-1.8-.2) = 3.5$	3
800	.5	3.25	13.4	14.3	-.27	4.0%	+1	$(3.5-.27)+1 = 3.1$	3
750	.7	3.75	12.8	10.1	+.81	3.5%		$(3.75+.81) = 4.6$	4
650	.2	2.50	11.6	11.9	-.09	1.5%	-.4	$(2.5-.09-.4) = 2.0$	2
900	.7	3.75	14.6	15.2	-.18	4.0%	+1	$(3.75-.18+.1) = 3.7$	3
575	.1	2.25	10.7	13.4	-.81	1.0%	-.5	$(2.25-.81-.5) = .9$	1
675	1.1	4.75	11.9	11.0	+.27	5.0%	+3	$(4.75+.27+.3) = 5.3$	5
600	1.2	5.00	11.0	8.3	+.81	5.0%	+3	$(5.0+.81+.3) = 6.1$	5

Bonus Question: Assuming all carcasses meet visual specifications and grade high choice, which ones will qualify for CAB?
1,3,4,6,8

QUALITY GRADE

- 1) Prime-
- 2) Choice 0
- 3) Standard +
- 4) Utility+
- 5) Commercial+

- low
0 average
+ high