

Real-time Ultrasound and Performance Measures to Assist in Feedlot Cattle Sorting for Marketing Decisions.

A. S. Leaflet R1872

R. G. Tait, Jr., Graduate Assistant
G. H. Rouse, Professor of Animal Science
P. B. Wall, Graduate Assistant
W. D. Busby, Extension Livestock Specialist
D. L. Maxwell, Ag Specialist

Summary and Implications

Real-time ultrasound can be used to make marketing decisions for fed cattle. Of primary importance are evaluations for intramuscular fat, subcutaneous fat, and live weight. This information can then be used to stratify cattle into marketing groups ranging from need/ready to sell immediately (i.e. too heavy, too fat, or already reached Choice grade) to not ready for market until after feeding for several additional days (i.e. 35 days).

Real-time ultrasound can also be used to identify cattle that are approaching the threshold of a higher quality grade. These cattle should benefit from additional days on feed, and should warrant further premiums in most market situations. Conversely, cattle that are near the upper end of the fat cover limit for a particular yield grade may move to the next higher yield grade with additional time on feed and be discounted.

Introduction

Decision support systems are necessary for producers to make informed decisions about how to manage cattle for marketing decisions. This report is designed to describe the protocol used for Iowa State University research cattle to determine when cattle should be harvested.

Materials and Methods

Iowa State University research cattle are scanned with real-time ultrasound as they approach harvest time. Ultrasound measures collected are live weight (WT), subcutaneous fat over the 12th rib (FAT), and percent intramuscular fat (PFAT). All of these measures can be determined with the collection of longitudinal ultrasound images.

A few decisions need to be made about the environment the cattle are likely to be marketed into. These decisions are outlined in Table 1. A decision structure is then put into an If-Then-Else formula in Excel[®] using the decision criteria given in Table 2, and assigning a harvest group to each individual animal. Actual harvest decisions then can be modulated by how aggressively the manager wants to market cattle based on current market and anticipated markets.

A general description of cattle represented by each harvest group is given in Table 3.

Results and Discussion

The approach taken to make decisions regarding the harvest date for cattle, basically involved placing the cattle in one of two categories: 1) market soon (within one week), or 2) feed an additional 35 days. Using the decision order shown in Table 2 cattle were placed into a harvest group (Table 3).

When the cattle are weighed one of the following decisions are made: 1) keep cattle an additional 35 days if they will not make minimum carcass weight without discount, 2) sell cattle that are approaching the upper limit for carcass weight, or 3) consider ultrasound measurements for cattle that are gaining adequately and within weight bounds.

Ultrasound measures can be helpful in the marketing decision process. For example predicting whether cattle within the acceptable weight range will grade Choice today, or are currently Select and would benefit from an additional 35 days on feed to increase the likelihood of reaching the Choice grade is helpful in determining a marketing decision. Ultrasound fat cover measurements are also useful to predict Yield Grade and the possibility of discounts and premiums.

Table 4 relates the results of combining ultrasound measurements (PFAT relating to quality grade and FAT relating to yield grade) with weight to make a decision whether to market now or 35 days later. Compared to an experienced visual sorting technique which routinely receives carcass data after sorting decisions are made, the greatest advantage for ultrasound may have been identifying Yield Grade 2 cattle that had enough intramuscular fat to grade Choice. Overall, ultrasound based marketing decisions differed from visual appraisal based marketing decisions approximately 10-20 percent of the time.

Ultrasound also identified Average Choice cattle very well. All animals in both years, which were identified with ultrasound to be Average Choice, were subsequently graded as Average Choice at harvest. There were also animals that graded Average Choice and were not identified as Average Choice with ultrasound. This may also be useful information if there are differences between marketing channels in their premiums available for Average Choice cattle.

Implications

Ultrasound was beneficial in determining harvest groups on cattle. When compared to visual appraisal of cattle there were differences on marketing group assignment on about 10 to 20 percent of the cattle. The primary advantage of ultrasound based marketing decisions was in

identifying cattle which had enough intramuscular fat to grade Choice, without excessive subcutaneous fat (a driving force behind visual harvest date assignment systems). Consequently cattle which did not have enough intramuscular fat to grade Choice at first marketing were subsequently fed longer to increase the probability of grading Choice. Further refinement of this method may be possible to identify cattle which are not quite Average

Choice, but may have a stronger possibility of moving into the Average Choice grade with additional days on feed as well.

Acknowledgements

The authors would like to thank the management and staff at the following organizations for assistance in data collection: ISU Armstrong Research Farm, Lewis, IA

Table 1. Adjustable data for feedlot marketing decision making.

Term	Definition
Discounting Factors	
OUTWT	Live weight at which discounts for too heavy of carcass is likely to occur
OUTFAT	Fat cover at which discounts for being too fat (YG 4) is likely to occur
TOOLIGHT	Live weight at which discounts for too light of carcass is likely to occur
Optimizing Factors	
ACCWT	Live weight at which enough weight has been added to consider selling
ACCPFAT	Ultrasound percent intramuscular fat measure that corresponds to USDA Choice grade
ACCFAT	Ultrasound subcutaneous fat measure that corresponds to inflection point (fattening stage) of growth curve

Table 2. Decision structure for Iowa State University research beef cattle program endpoint determinations.

Decision Order	Harvest Group	Criteria met
1	1.0	WT > OUTWT or FAT > OUTFAT
2	2.0	WT < TOOLIGHT
3	1.9	WT < ACCWT and FAT < ACCFAT and PFAT < ACCPFAT
4	1.1	WT > ACCWT and FAT > ACCFAT and PFAT > ACCPFAT
5	1.8	WT < ACCWT and PFAT < ACCPFAT
6	1.2	WT > ACCWT and PFAT > ACCPFAT
7	1.3	WT > ACCWT and FAT > ACCFAT
8	1.7	WT < ACCWT
9	1.5	everything else (essentially only WT > ACCWT)

Table 3. Description of cattle represented within each harvest group.

Harvest Group	Description of the cattle
1.0	Cattle likely to receive discounts for being too heavy or too fat
1.1	Cattle that have reached acceptable levels of WT and FAT and PFAT
1.2	Cattle that have reached acceptable levels of WT and PFAT
1.3	Cattle that have reached acceptable levels of WT and FAT
1.5	Cattle that have reached acceptable levels of WT
1.7	Cattle that have not reached acceptable levels of WT (may be acceptable FAT or PFAT)
1.8	Cattle that have not reached acceptable levels of WT and PFAT (may be acceptable FAT)
1.9	Cattle that have not reached acceptable levels of WT and FAT and PFAT
2.0	Cattle that have not reached a weight likely to avoid discounts for too light of carcass

Table 4. Differences in marketing decisions based on ultrasound assigned harvest groups vs. visually assigned harvest groups.

Total Head	First Mktg Head	Number sold ultrasound ^a vs. keep visual	Premium/Discount	Reason for premium or discount from ultrasound based decision
2001 Marketing Season				
120	80	5	Prem	Sold as YG 2 instead of YG 3
		1	Prem	Sold as YG 3 instead of YG 4
		2	Disc	Sold as Select instead of Low Choice
		7	Prem	Sold as Low Choice instead of continuing to feed
2002 Marketing Season				
139	62	5	Prem	Sold as YG 2 instead of YG 3
		1	Prem	Sold as YG 3 instead of YG 4
		9	Prem	Sold as Low Choice instead of continuing to feed

^a Ultrasound measurements were used to make the decision to sell the cattle. This column represents the cattle that were sold at first harvest based on the ultrasound measurements, that would not have been sold at first harvest based on the visual appraisal system, but rather 35 days later.