The Journal of Extension

Volume 45 | Number 4 Article 14

8-1-2007

Ultrasound Technology Helps Youth Raise Industry-Acceptable Market Animals

Scott A. Nash
University of Idaho, snash@uidaho.edu

August 2007 // Volume 45 // Number 4 // Research in Brief // 4RIB4

Ultrasound Technology Helps Youth Raise Industry-Acceptable Market Animals

Abstract
Ultrasound estimates of carcass data have been collected on over 1,900 4-H market hogs, lambs, and steers at fairs in southeast Idaho from 1999 to 2005. The data were collected as part of an educational program to help youth raising animals for the food chain to understand industry acceptability. The results of the data indicate that market hog loin-eye size increased 1.14 inches while backfat thickness decreased by 27%; market lamb ribeye area increased almost 15%; and the number of steers with adequate IMF to reach the USDA Choice quality grade increased 130%.

Scott A. Nash
Extension Educator, Youth Development
Bingham County
Blackfoot, Idaho
snash@uidaho.edu

University of Idaho

Introduction

4-H animal projects have always provided youth with an opportunity to raise market animals that end up in the food chain. Through the 4-H program, youth develop and enhance life skills such as goal setting, responsibility, record keeping, and cooperation as well as build self-esteem. The popularity of animal projects continues to grow and has spread to many non-agriculturally based families.

Because of the growth of the project, it became apparent all participants lacked knowledge. This was evidenced after the 1995 Eastern Idaho State Fair when the steers were harvested--a USDA beef grader predicted that 23% of the market steers exhibited at the state fair would grade choice or better. Up to that point in time, data were only available on the steers that went to the packing plant located over 150 miles away. Youth were not able to travel to the plant to view the carcasses from their animals. There were no carcass data available on the market hogs and market lambs. The lack of available carcass information meant a lack of educational opportunities for 4-H exhibitors.

The lack of available carcass information and the low quality of animals exhibited at Idaho fairs was a concern to 4-H volunteers. Market animal fair committees in southeastern Idaho counties had been introduced to the use of ultrasound prior to 1995. They were excited about the possibility of gaining carcass information and saw it as an educational tool to teach participants.

The use of ultrasound as a tool to estimate composition of live animals was introduced to the livestock industry in the 1950's (Price, Pfost, Pearson, & Hall, 1958). Subsequent improvement in ultrasound technology has allowed for 90% accuracy when predicting 12th rib back fat in beef cattle (Brethour, 1992) and 82% accuracy when estimating ribeye area (REA) (Perkins, Green, & Hamlin, 1992). More studies indicate that correlations between ultrasound estimates of rib and rump fat thickness in beef cattle and their subsequent carcass measurements range from 0.57 to the low 0.90s. Correlations between ultrasound predictions of beef ribeye area and carcass REA measurements range from 0.43 (Smith, Oljen, Dolzeal, Gill, & Behrens 1992) to 0.83 (Robinson, McDonald, Hammond, & Turner, 1992).

Computer software has become available for predicting percent intramuscular fat (IMF) (marbling)

from real-time ultrasound scans. Brethour (1992) reported a correlation of 0.77 between ultrasound predicted IMF and carcass marbling score. A 1998 Iowa State University Beef Research report listed correlations between ultrasound predicted IMF and carcass marbling scores ranging from 0.40 to 0.80, where 0.70 is fairly common. A study conducted by Nash, Harrison, Packham, Panting, and Duckett at the University of Idaho in 2000 to monitor changes in beef IMF over time indicated an ultrasound predicted IMF accuracy of 82% when compared to carcass measures of marbling.

The accuracy of ultrasound estimates of the 10th rib backfat and loin-eye area in swine has been reported at 83% and 12th rib fat in sheep at 63% (Houghton & Turlington, 1992). Ultrasound estimated ribeye area in sheep was reported to be 82% accurate by Panting, et al., in 2000. Duckett and Klein conducted a study in 1997 to compare the accuracy between trained visual evaluators' estimates of carcass traits in swine and ultrasound predictions of the same traits. The study found an R^2 value of 0.39 when visual estimates of carcass traits by trained swine evaluators were compared to actual carcass data and an R^2 value of 0.62 when ultrasound estimates of carcass traits were compared to actual carcass data. The findings in this study indicate that ultrasound values are more accurate than visual estimates by trained evaluators. The same study determined that ultrasound predictions of swine carcass traits, hanging carcass measurements and standing carcass measurements were the same ($p < .05$) (Duckett & Klein, 1997).

Today's purebred swine producers rely on ultrasound data to estimate breeding values on their animals (Moeller, 2002). According to the National Centralized Ultrasound Processing Lab (CUP), data on over 200,000 head of cattle are processed annually through the lab (2005). The CUP lab also reported that 24 beef cattle breed associations use the ultrasound data to develop carcass Expected Progeny Differences (EPDs) for use in seed stock selection.

In 1996 the Eastern Idaho State Fair (EISF) market animal committee had the opportunity to use ultrasound and decided to implement the technology to predict carcass measures on the market steers exhibited at the fair. According to ultrasound estimates, less than 28% of the steers exhibited at the 1996 EISF had enough percent IMF to qualify for the USDA Choice quality grade. This percentage is well below industry average. Also in 1996, the market hogs were scanned in Caribou County (a small southeast Idaho county) and found to have less than 50% fat free lean, which is also below industry average. Starting in 1999 and continuing through 2006, in addition to the market steers, all of the market hogs and market lambs were scanned at EISF.

Materials and Methods

Four University of Idaho Extension educators wrote grants and received funds from the Idaho Beef Council to attend training and certification in ultrasound technology. Once trained, the educators implemented an educational program using ultrasound technology to estimate carcass measurements of the market animals exhibited at the Eastern Idaho State Fair.

Educational workshops were also developed to reach youth and adults throughout southeastern Idaho. At the workshops, market steers, lambs, and hogs were scanned. Workshop participants were then educated about the carcass estimates, what they meant and how the market animals fit USDA specifications. Educators taught over 500 youth and adults about current USDA meat animal carcass specifications and industry standards. Workshops were also held to teach proper animal selection, care, and nutrition. The majority of workshop participants exhibited market animals at county fairs in southeast Idaho with 25% of them exhibiting market animals at EISF.

Ultrasound technology was then implemented as an evaluation tool on market steers, lambs and hogs at six county fairs in southeast Idaho and at the 1999 EISF. During weigh-in at the fair, each 4-H animal was ultrasounded by a trained and certified technician. The steers were scanned in a beef cattle chute, while hogs were scanned in a swine ultrasound chute, and sheep exhibitors held their lambs like they were exhibiting them in the show ring. Vegetable oil was poured over the animals' backs between the 12th and 13th rib on steers and lambs, and between the 10th and 11th rib on hogs. The ultrasound technician located the proper image of each animal's ribeye/loin-eye using a transducer, then froze a cross-sectional image on the ultrasound screen and traced the image using electronic calipers. A horizontal image was taken across the 11th, 12th and 13th ribs of steers to determine the percentage of IMF (marbling). Values were entered into a computer program from three independent images to calculate the percentage of IMF.

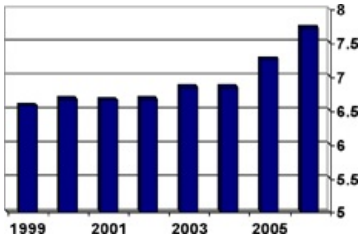
Each youth received a picture of his or her animal's ribeye/loin-eye area and backfat thickness. Steer exhibitors also received the percentage of IMF in their animals' ribeyes. Youth were then able to determine how their animals compared to industry standards. Adult volunteers and fair boards implemented a carcass contest using ultrasound data to determine the top carcass animals. The EISF junior livestock committee provided market animal judges with ultrasound information to use as a tool when evaluating the animals. Sponsors provided cash awards for the exhibitors of the top three ultrasound carcass animals in each species. Youth were rewarded for raising animals that fit industry standards.

Results

Data collected from 632 market hogs indicate the average hog's loin-eye area was 6.58 inches^2 in

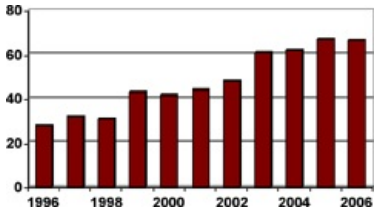
1999 but increased 17% to 7.72 inches^2 in 2006 (Figure 1). At the same time, backfat decreased 27% from 0.84 inches in 1999 to 0.61 inches in 2006. During the same period, the percent lean increased from just under 50% to 54.38%. Percent lean is based on the muscle-to-fat ratio. These data indicate that swine have become leaner and more muscular.

Figure 1.
Swine Loin-eye Area



Data collected at the Eastern Idaho State Fair Junior Beef Show on 206 steers indicate that the percentage of steers with enough IMF to reach the USDA Choice grade improved from 28% in 1996 to 67% in 2006 (Figure 2), which is an increase of 130%. Quality grade is based upon the amount of marbling or flecks of fat in the muscle. More marbling in the muscle means a higher percentage of IMF and thus a higher quality grade. A higher percentage of IMF should also correlate with better eating quality of the meat.

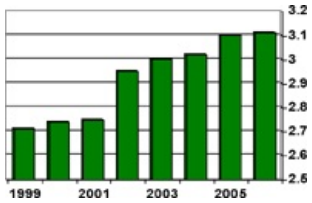
Figure 2.
Percent Steers Grading Choice



Data collected from 947 market lambs at southeast Idaho fairs shows an increase in ribeye area while maintaining an industry-acceptable fat thickness. An increase in ribeye area means a bigger "lamb chop."

In 1999, the average ribeye area for lambs was 2.71 inches^2 and fat thickness was 0.17 inches. In 2006, the average ribeye area for lambs was 3.11 inches^2 (Figure 3) with a fat thickness of 0.20 inches. The 14.7% increase in muscle with an acceptable fat thickness provides a more industry-preferred product.

Figure 3.
Lamb Ribeye Area



4-H youth and volunteer leaders have utilized ultrasound information to aid in their animal selection and management practices, which has led to an increase in animal quality. Youth participants have voiced support for the use of ultrasound technology. One 4-H member said, "Now I can look at my pig and tell if he's too fat. Before we used ultrasound, I didn't know the difference and my pig was just a pig." Another youth added, "When my animal meets industry standards, I know I did my best." A third youth shared:

> I have learned to look at animals that have the potential to meet industry-acceptable standards. When I pick out my steer for the next year, I am better prepared to pick a steer that will meet the standards and make the buyer happy.

Over $1,000 in cash awards and prizes has been donated by sponsors for exhibitors of ultrasound carcass award winners at EISF, indicating community support for the use of the technology. Buyers at the EISF 4-H livestock auction are now using ultrasound data to identify animals with more muscle, more IMF, and less backfat. In 1996, 60% of the hogs and 22% of the steers were purchased for personal use; however, in 2006, 100% of the hogs and 60% of the steers were purchased for personal use.

Conclusions and Recommendations

The use of technology continues to increase and serve a valuable role in our society. Ultrasound

provides a state-of-the-art approach to evaluating meat animals. Today's farmers and ranchers producing 4-H animals are using ultrasound information for the selection of their seed stock. Youth who raise 4-H animal projects are stewards of animal agriculture because the animals they produce end up in the food chain.

Through the 4-H program, youth develop and enhance life skills such as goal setting, responsibility, record keeping, and cooperation as well as build self-esteem. These skills are learned by doing. Introducing ultrasound technology as an evaluation tool allows youth to increase their knowledge about the quality of the animals they raise. Today's youth are not intimidated by the use of this so called "new technology." As technology continues to be a part of everyday life, it is important to use it as a tool to enhance the education of 4-H participants.

References

Brethour, J. R. (1992). The repeatability and accuracy of ultrasound in measuring backfat in cattle. *Journal of Animal Science*, 70:1039.

Centralized Ultrasound Processing Annual Progress Report. (2005). The National CUP Lab and Technology Center. Ames, IA.

Duckett, S. K., & Klein, T. A. (1997). Ultrasound: A tool for evaluating carcass quality in live animals. University of Idaho Department of Animal and Veterinary Science Research Brief. University of Idaho, Moscow, ID.

Houghton, P. L., & Turlington, L. M. (1992). Application of ultrasound for feeding and finishing animals. A review. *Journal of Animal Science*, 70:930-941.

Iowa State University Beef Research Report. (1998). A.S. Leaflet R1529. Iowa State University, Ames, IA.

Moeller, S. J. (2002). Evolution and use of ultrasonic technology in the swine industry. *Journal of Animal Science*, 80 (E. Suppl. 2):E19-E27.

Nash, S. A., Harrison, S. N., Packham, J. H., Panting, R. R., & Duckett, S. K. (2000). Monitoring changes in carcass quality across time-on-feed using real-time ultrasound to optimize endpoints. Case study. *The Professional Animal Scientist*, 16:202-205.

Panting, R. R., Harrison, S. N., Jensen, J. C., Nash, S. A., Packham, J. H., Whittier, D., & Duckett, S. K. (2000). Utilizing real-time ultrasound to predict carcass quality of lambs. *Journal of Animal Science*, 78 (W. Suppl. 1):W3 05.

Perkins, T. L., Green, R. D., & Hamlin, K. E. (1992a). Evaluation of ultrasonic estimates of carcass fat thickness and longissimus muscle area in beef cattle. *Journal of Animal Science*, 70:1002-1010.

Price, J. F., Pfost, H. B., Pearson, A. M., & Hall, C. W. (1958). Some observation on the use of ultrasound measurements for determining fatness and leanness in live animals. *Journal of Animal Science*, 17:1156 (Abs.).

Robinson, D. L., McDonald, C. A., Hammond, K. & Turner, J.W. (1992). Live animal measurement of carcass traits by ultrasound: Assessment and accuracy of sonographers. *Journal of Animal Science*, 70:1667-1676.

Smith, M.T., Oljen, J.W., Dolzeal, H. C., Gill, D. R., & Behrens, B. D. (1992). Evaluation of ultrasound for prediction of carcass fat thickness and longissimus muscle area in feedlot steers. *Journal of Animal Science*, 70:29-37.