

Is it still an option to **assess carcass traits on live animals** making use of **REAL TIME ULTRASOUND** scanning technology?



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Technology has become an indispensable tool for beef producers all over the world, playing a central role in management, decision making and ensuring sustainable and profitable production of a product in high demand. Of course, we must also

ensure that the return on investment in technology is justifiable. The production profile of our country's commercial beef producers is considered by many to be comparable to that of developed countries, the reasons being that we make use of sophisticated breeding methods, technologies and management practices aimed at sustainable and competitive production.

One of the many technologies made use of by the beef production sector includes Real Time Ultrasound scanning (RTU), mainly used for assessing carcass traits and for reproductive management. RTUs is one of the technologies that has also already made its mark in the beef production sector due to its ability to generate objective and quantitative data relating to the internal carcass traits and composition of animals, both of which are of biological and economic importance. One of the

main outcomes of ultrasound data is the generation of breeding values for carcass traits. The latter is used by producers to improve the genetic potential of their herds with regard to meat yield and carcass quality. **There are a couple of advantages to RTUs compared to conventional carcass trait analyses, including:**

- RTUs are executed in a safe and non-invasive manner on live animals, compared to having to slaughter animals (offspring) previously to determine their carcass merit
- Collecting ultrasound data is also much cheaper and more efficient than conventional methods and the data is collected in real time





- Data can be collected on a large number/population of animals for evaluating carcass traits of breeding animals, compared to progeny testing

Carcass traits that can be assessed with RTUs include back fat or rib fat and rump fat, which are considered subcutaneous fat, eye muscle area and intramuscular fat or marbling, which are all indicators of meat quality and yield that ultimately relates to the market value of the carcass.

MARBLING

Marbling, or intramuscular fat, is considered by many a proxy for the general eating quality of meat. In the USA, studies have shown that a minimum of 3% marbling is correlated with improved flavour, while levels above 7,3% on the other hand, discourage consumers that are health conscious. Marbling is also deposited at a later stage of an animal's life compared to the other two fat deposits (rump and rib fat). The genetic correlation between marbling and fat thickness is also low, suggesting

that selection for improved marbling can be done without increasing external fat. One should keep in mind, however, that management and nutrition are both central to the deposition of both subcutaneous fat and intramuscular fat, especially high-energy diets, and particular nutrients. Since marbling is deposited at a later stage of an animal's life, a general rule is that cattle should be scanned during the rounding off phase and on a diet containing the desired energy and nutrients. It should be noted that the South African production system is mainly a weaner calf production system where animals are typically slaughtered after a four-month feedlot period. This prevents young animals from having marbling at slaughter age. From a genetic point of view, marbling is also considered a quantitative trait, meaning it is encoded by numerous genes, each of which contributes differently to the trait.

This trait is also known to be the most challenging one to measure accurately by RTUs; the reason being that in many cases not sufficient marbling is present in the muscle during scanning to measure it accurately and reproducibly. Low levels of marbling also make it particularly challenging to not only quantify the amount of marbling, but also to detect the degree of variation that exists between animals for this trait. The latter is of course essential for selecting genetically superior animals eventually. From experience, it is recommended that at least 5mm of subcutaneous fat must be present before considering scanning for marbling. This is because there is little variation in marbling deposition in animals that have less than 5mm of subcutaneous fat.

It should be noted that although our meat classification system does not accommodate marbling and producers are not compensated for it, some breeds like the Wagyu, do concentrate on this trait, making use of alternative technology to be able to assess it. Of course, our animals are also slaughtered at a much younger age than in most other countries. It should be kept in mind that there are national and international niche markets with a demand for marbled beef, opening export opportunities.



EYE MUSCLE AREA (EMA) OR RIBEYE ASSESSMENT

The size in square centimeters of the EMA is used as an accurate indicator of overall carcass muscling and beef yield. For our production and meat classification system, ribeye area as a trait is much more relevant than marbling. The trait is also highly heritable, enabling selection for superior genetics using breeding values. Similar to other traits, care should, however, also be taken not to focus too strongly on single trait selection but rather have a more balanced approach between the different carcass traits. Focusing for instance, only on the ribeye area may result in an increased mature frame size that will require higher maintenance input costs, amongst others.

SUBCUTANEOUS FAT

Fat is another economically important trait that forms part of our meat classification system and is also assessed by making use of RTUs. Fat is deposited after bone and muscle development and it is also firstly deposited abdominally, followed by inter-muscular deposition, subcutaneously deposition and finally intramuscular deposition. Both rib fat and back or rump fat, indicators of external fat, are highly correlated and heritable, which makes it possible to improve the trait genetically through selection. These traits also influence lean meat yield since fat bulls, for instance, have less lean meat in the carcass. Fat measurements also indicate the bull's fleshing ability and it is generally accepted that either too much or too little fat is undesirable.

In terms of ensuring that there is sufficient variation between animals (for selection purposes in particular) so that genetic differences between animals in relation to fat thickness can be established, it is recommended that the group of animals to be scanned should exhibit a minimum fat thickness of 5mm on the 12/13th rib. The more variation there is for a trait in a group, the greater the possibility of genetic differences between animals. The animals must also be in the best possible condition to ensure the most variation, so animals from the field are usually scanned in the autumn months before they start to lose condition.

KEEP THE SCAN RESULTS CREDIBLE AND SCIENTIFIC - RTUS AND CONTEMPORARY GROUPS

Since the expression of the genes that encode carcass traits are also affected by the environment, animals to be scanned for data to be used in breeding value predictions should be included in well-defined contemporary groups. These groups are separated in terms of breed, sex, being born in a particular calving season and also reared and managed under similar conditions. Well-defined contemporary grouping is essential to enable accurate selection of animals based on their desired phenotypes – in other words, we can accurately and scientifically define differences between animals and use the information to select animals in line with a particular breeding goal.

Short summary of guidelines regarding the implementation of RTU

THE IDEAL AGE AT WHICH RTU SHOULD BE DONE

It is generally prescribed that animals must be between 300 and 800 days old to be accepted for the calculation of breeding values for carcass traits. It is also recommended that the contemporary group of animals to be assessed should have a minimum fat thickness of 5mm on the 12/13th rib to ensure that there is sufficient variation between animals. The latter is vital for accurately quantifying genetic differences between animals in relation to fat thickness, eye muscle circumference etc. Animals (from the field) closer to the 800-day age mark usually also show more fat deposition/variation, emphasizing the fact that older animals are preferred at the time of the scan. The better the condition of the animals to be scanned (which is usually towards the end of the growth season), the higher the chances of finding variation between animals.

How many times are animals scanned making use of RTU?

Animals are only scanned once in their lifetime, so it is important to do it at the right time and within the prescribed requirements and guidelines. It is also advised that, when using RTU data and information, only breeding values are considered for decision-making and not raw phenotypic information.

CONCLUSION

RTU technology has proven itself as a very valuable tool for beef producers, enabling them to make more informed decisions about breeding, management, and marketing that relate to carcass traits. Since animals are also only scanned once in their lifetime, we must ensure that we adhere to the right requirements that will ensure maximum benefit from the results. It is also noteworthy that breeding values relating to RTU information are used and considered as selection tools rather than raw phenotypic information.

THE TOP OF FORM

National Beef Recording and Improvement Scheme (Scheme) of the Agricultural Research Council has been advocating and applying this technology in support of our producers for many years and has a dedicated team of technicians who are accredited to measure back fat, rib fat and eye muscle area. RTU scanning of live animals is also part and parcel of the service package that the Scheme renders in Phase C, RFI and Phase D testing. The Scheme is also adopting and implementing modern developments around RTU hardware and software in order to satisfy the demands of the industry, in particular when it comes to enhancing the overall profitability and sustainability of the beef production sector.