

CT Scanning of Sheep – Computed Tomography

What is CT

CT scanning is technology that was developed for use in human medicine. It produces cross – sectional images (slices) through a living animal in a non- invasive way. Images are high resolution allowing detailed descriptions of the body to be made. These can be used for very accurate assessment of body measurements in live animals in a welfare – friendly manner.

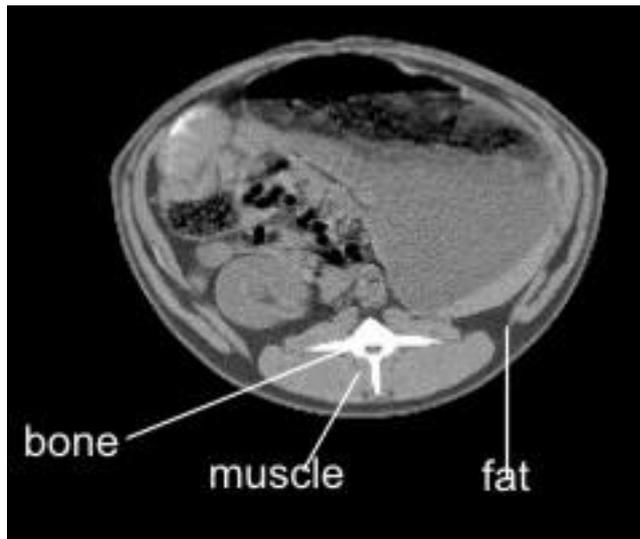
Previously such detail could only be obtained through carcass dissection after slaughter or eye appraisal.

How CT works

Animals are passed through a circular gantry. Low dosage x-rays are emitted in a circular motion round the animal, detectors on the opposite side measure the amount of absorption of x-rays, which depends on the differing density of tissues that they pass through.

A computer uses the information collected by the detectors to generate a two-dimensional picture based on tissue density.

Tissues of different density (fat, muscle, bone) are displayed as different shades of grey in the cross-sectional images and amounts of each tissue can be easily measured using computer software.



Using CT

Animal are scanned at four or six fixed anatomical locations, one in the chest and hind leg, and two in the loin. Scans obtained are subjected to computer image analysis to separate internal organs from the carcass, then to measure areas of fat, muscle and bone. The information is used to predict weights of fat, muscle and bone extremely accurately.

How can CT scanning help improve sheep breeding

CT can accelerate progress in breeding schemes currently using ultrasound to assess carcass fat and muscle weights, because it so accurate and because more information is obtained.

CT scanning offers the next step over and above the use of ultrasound. While ultrasound measures muscle and fat at the last chop, the CT scanner measures the weight of muscle and fat across the whole carcass. Currently the only way to objectively measure hindquarter muscling on a live animal is by using the CT scanner.

In measuring muscle (meat) and fat in live animals breeders are able to make the maximum rates of genetic improvement in these traits.

How accurate is CT?

Three years of research at SAC UK have demonstrated the value of CT. All animals in the trials were scanned by two approaches and then slaughtered and subjected to conventional carcass dissection. The first scanning approach used a few 'reference' scans at specific anatomical locations, whereas the second approach was to 'comprehensively' scan the animal at 20 evenly spaced locations.

Analysis of the data collected showed that the most accurate method of assessing carcass tissue weights was the comprehensive method but it was not much better than using the best scans from the reference approach. The results give confidence that using four cross-sectional scans will accurately predict body composition.

Final Data

The four images are 'gutted', to leave only the carcass. From the final images CT fat, lean and bone are measured in kilograms and presented to three decimal places.

Eye muscle depth, width and eye muscle area are measured in the LV4 image. Measurements from the four scans allow accurate predictions of carcass tissue weights (98% for fat, 96% for muscle, 89% for bone).

The final data is in a form that can be readily entered into SIL, allowing for selection of terminal sires with higher genetic value.

Application of CT for the Sheepbreeder

Selection of meat sheep on CT measurements could increase genetic progress by as much as 50% per annum, compared to selection on ultrasound measurements. However it is not practical to CT scan all the sheep in a flock that are ultrasonically measured each year. The benefit of CT scanning can be obtained by the use of a 'two stage selection'. This involves most animals being scanned using ultrasound. The analysis of this data is run through SIL, from the resulting data the top 10 to 15 percent are CT scanned. The analysis is then run again to include the CT data.