Improving sheep carcass quality using CT scanning

Background
A high proportion of the lambs produced in Britain fail to meet target fat and conformation grades. The wider use of performance recording and selective breeding in sheep, together with the use of new technologies such as CT scanning, could have a major impact on this problem.

More accurate selection with CT scanning
CT (computed tomography) is a medical imaging technique which produces images of body cross-sections, using low dose X-rays, without harming the animal. The detailed images produced allow very accurate estimation of body composition and tissue distribution.

Selection of meat sheep on CT measurements could increase genetic progress by up to 50% per annum, compared to selection on ultrasonic measurements. However, it is not practical to CT scan the thousands of breeding sheep that are ultrasonically measured each year in Britain. Much of the benefit from CT scanning all animals can be obtained at a fraction of the cost, by the use of ‘two stage selection’. This involves most animals being scanned ultrasonically 'in the field', with only the best of these then having CT measurements made.

Achievements
Research at SAC and BioSS (Biomathematics and Statistics Scotland) has:

- Identified the best CT scanning sites for measuring carcass composition in meat sheep – three cross-sectional scans, one each from the chest, the loin and the hind leg, give near perfect accuracy for measuring carcass lean and fat weights. Muscularity can be assessed from a single position.

Cross-sectional CT scan through the chest of a sheep. Different densities are displayed as shades of grey. Dense tissues appear light, less dense tissues appear darker.
scan in the hind limb or, more comprehensively, from a special 3-dimensional scan.

- **Produced software for rapid interpretation of CT scans** – this is vital to allow CT scanning results to be used in selecting sheep a few weeks, or even days, after scanning.

- **Identifying the optimum design of breeding programmes to make cost-effective use of CT scanning.** Economic returns from CT scanning are expected to be highest when:
  - the top 10 to 20% of ram lambs are submitted for CT scanning, based on their ultrasonic scan results on farm.
  - only the best CT-scanned rams (top 10%) are selected for breeding – the better the rams chosen, the higher the gains.

**Scanning service for breeders**

SAC offers a CT scanning service for sheep breeders. Clients include the major sire referencing schemes in meat sheep breeds, which are using CT to accelerate improvement of carcass quality.

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**Research Partners:** SAC, Biomathematics and Statistics Scotland, Charollais Sire Referencing Ltd, Elite Texel Sires (UK) Ltd, Signet and Suffolk Sire Referencing Scheme Ltd

**Research Sponsors:** Meat and Livestock Commission, the Department for Environment, Food and Rural Affairs, and the Scottish Executive Environment and Rural Affairs Department, through the LINK Sustainable Livestock Production Programme

**SAC Reference Number:** 521113