High-tech boost for beef producers

March 17 2015, by Fiona Mcgill

Black Angus cattle have been the target of the MLA/UTS 3D imaging research. Credit: Thinkstock

The farmers of the future will soon have a new tool at their disposal. Within two years, an artificial intelligence system trained to recognise indicators of animal condition will take its place in the yards of livestock producers.

Robotics expert Alen Alempijevic is developing technology that uses inexpensive off-the-shelf cameras to analyse cattle as they pass through a

crush. Operating at 30 frames a second, sensors capture 3D images of fat and muscle deposits which are then used to provide an accurate condition score for each beast.

A beef producer could use this analysis to decide, for example, the nature and duration of a feeding regime to bring an animal to prime condition, or how to manage his breeding program. Saleyard buyers could use the technology when selecting live animals.

Alex Ball is general manager of livestock production at Meat and Livestock Australia (MLA), which funded the project. He anticipates that by early 2017, farmers will be using real-time, high-tech imaging systems.

Dr Ball, a beef producer at Armidale, on the NSW northern tablelands, says beef and lamb farmers are crying out for better tools to measure and manage their stock to hit yield and eating-quality benchmarks.

"Predicting yield [in live animals] is the holy grail in our industry," he says. "At the moment we rely on poor information from a range of different measures … and accuracy is as low as 20 to 30 per cent. This technology would mean a transformative shift in livestock management with accuracy as high as 80 to 90 per cent.

"This technology will help farmers with management of breeding – using genetic traits to select the next generation; in minimising non-compliance; and in fine-tuning an animal prior to slaughter – does it need more time on grass or is it ready to go [to market] now."

Dr Alempijevic, a senior lecturer in the engineering and IT faculty at the University of Technology, Sydney (UTS), used the expertise of highly skilled cattle assessors in visually grading grade fat and muscle as the starting point to develop his live-animal imaging device.

"An animal deposits muscle and fat in different areas of the body, which results in different shapes," he says. "Humans do not perceive dimensions accurately but they are inherently capable of discriminating shape differences.

"The next step was to turn a shape, such as muscling, into a mathematical description and assign it a value."

Using the mathematical description, as well as a fat measurement obtained by ultrasound and the muscle score ascribed by an expert assessor, Dr Alempijevic and his team taught their machine to estimate an animal's condition based on the 3D shape the machine "sees".

"Essentially we are enabling computers to think and reason about what they see," he says.

During the past three years, Dr Alempijevic has made several trips from his UTS office to the yards and paddocks around Armidale and Grafton where he has shot tens of thousands of frames of the rear ends of purebred Angus cattle.

He says some of his university colleagues have been amused by photos of his rural forays. However, the computing expert is not so far from his comfort zone. Though born in the Sydney suburb of Fairfield, he spent most of his teenage years on the family farm in south-western Serbia where his migrant parents took their two young sons to live in the 1980s. One son stayed to farm with his father; the other headed back to Sydney to study.

The start of Dr Alempijevic's research coincided with the end of a research project run by the NSW Department of Primary Industries which involved creating a herd of 230 Angus cows and their progeny, representing 75 per cent of the breed's genetic traits. At the same time,

affordable RGB-D sensors able to provide 3D mapping were hitting the market.

"This technology only became sufficiently accurate, fast and affordable within the past few years, which has really spurred the research," he says.

Dr Alempijevic says his research partnership with the MLA aims to help farmers get the best price for their livestock by growing beef consumers want.

"If the farmers can match what we like in terms of expectation, then we're satisfied and they get optimum value. If there's a tool that will assist them, it's passing the parameters of consumer demand straight to the farmer," he says.

MLA's Dr Ball says that when an animal at slaughter does not fall within the industry grid for yield, the loss to the producer can range from $10 a head in sheep up to $80 a head in cattle. On the Meat Standards Australia (MSA) grid, based on eating quality, the loss for non-compliance can be as high as $300 per beast.

Dr Alempijevic is in the early stages of extending his project to sheep. As well, a parallel stream of research for the MLA looks at breeding herds, using a body condition score to determine an animal's capacity to sustain progeny.

"And it's not just the livestock industry, it's in general – robotics and the integration of sensing and artificial intelligence will help us bridge this gap between consumer demand and the producer."

Provided by University of Technology, Sydney