

# Imaging for Automation

and its potential on the meat processing chain

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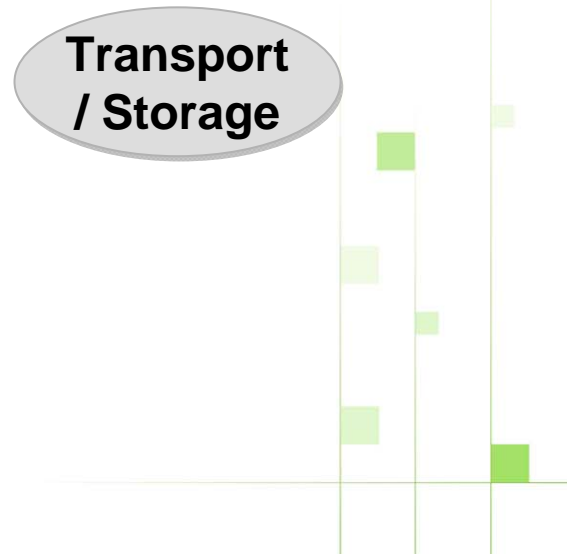
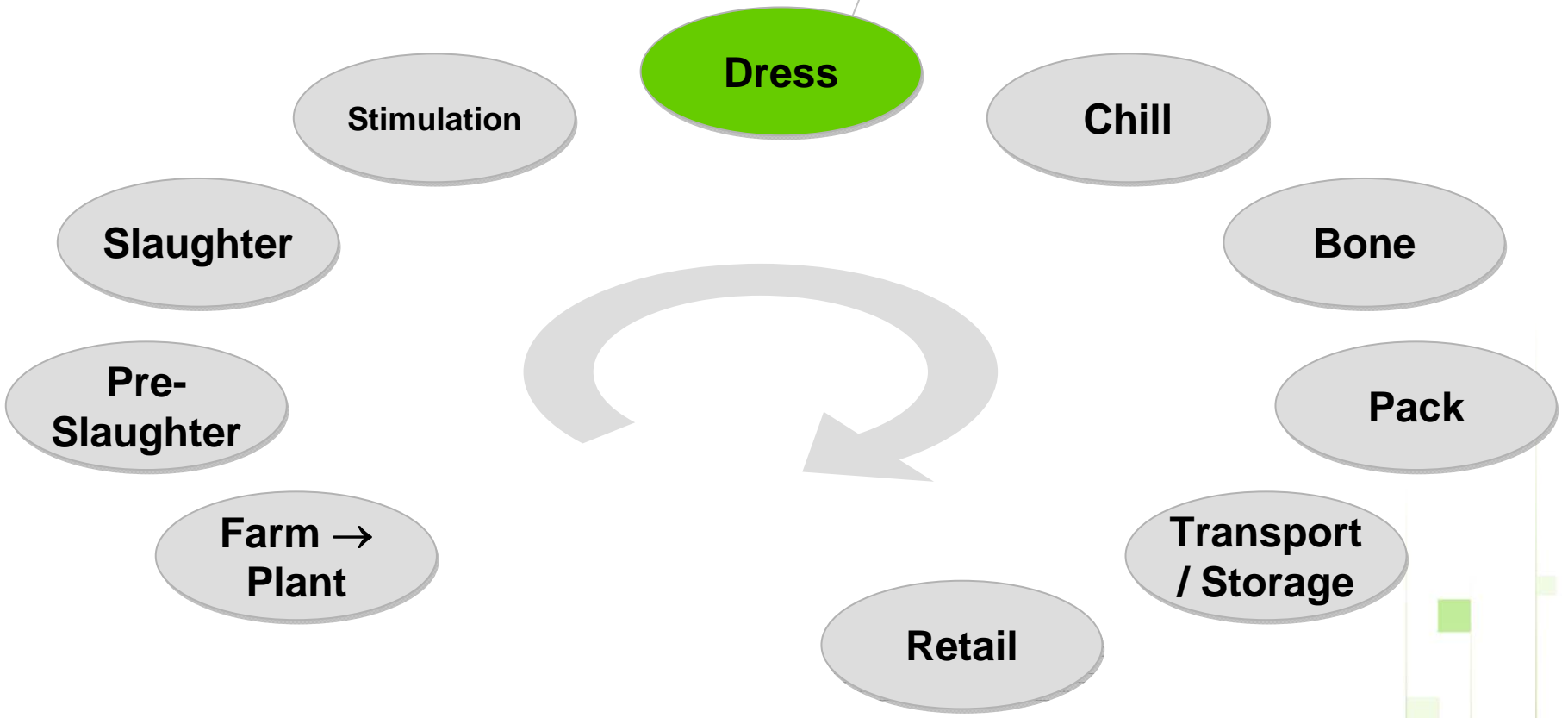
Farming, Food and Health. **First**

*Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi*

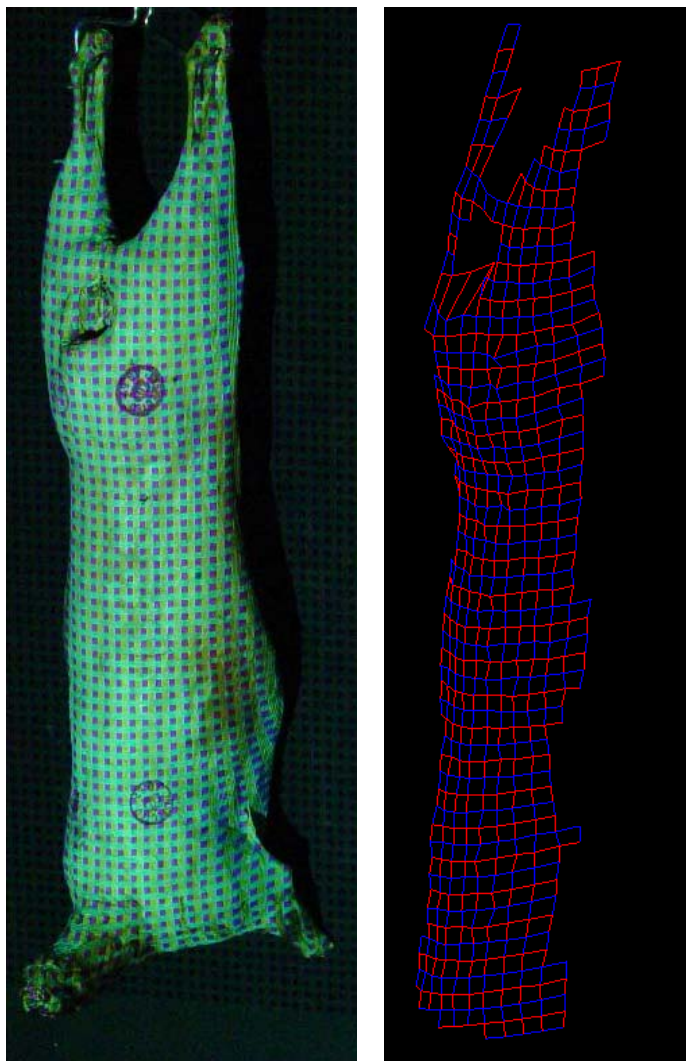
# Fit with process



Automatic Fat Depth (AFD)

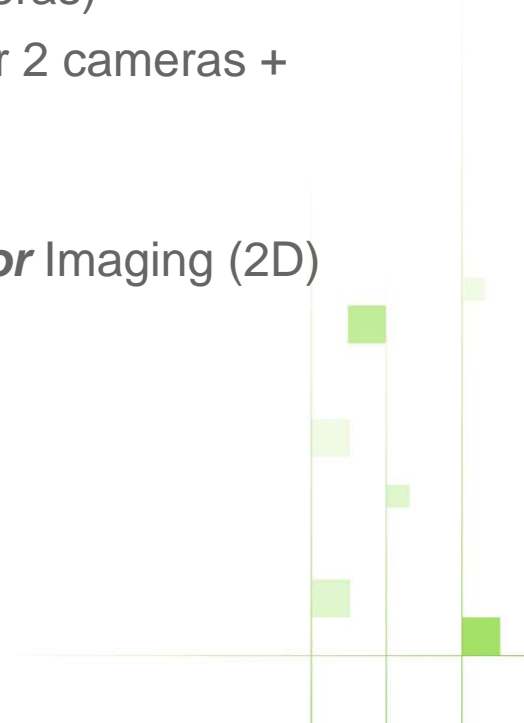


# Experience in Imaging



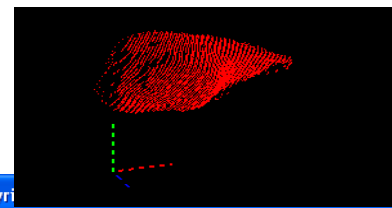
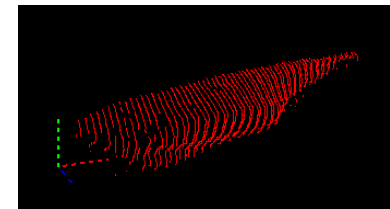
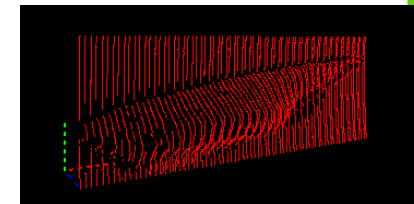
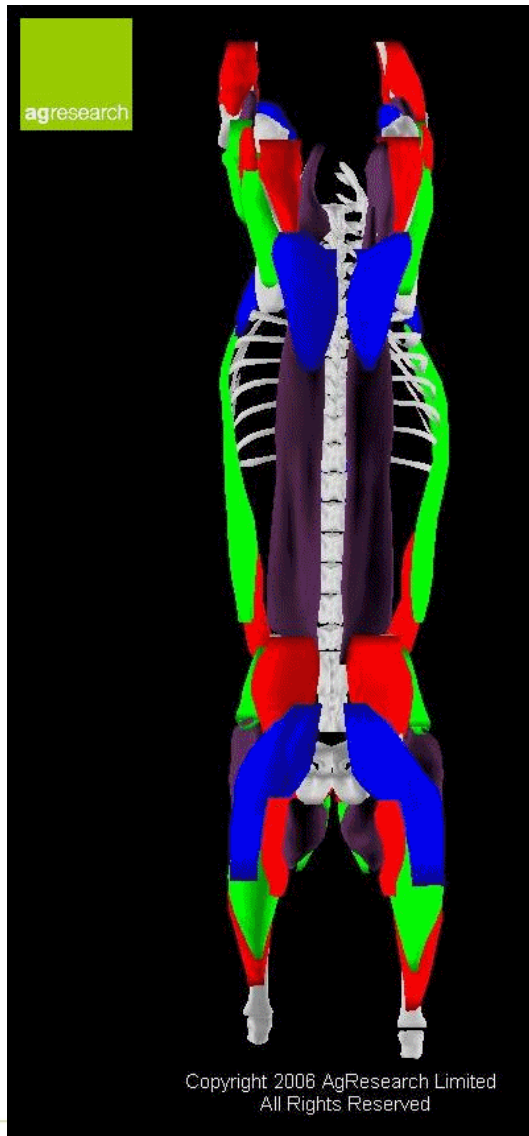
## Imaging of Meat:

- Non-invasive **Exterior** Imaging (3D)
  - Structured light (1 camera + projector)
  - Stereo (2 cameras)
  - Laser-line (1 or 2 cameras + laser line)
- Non-invasive **Interior** Imaging (2D)
  - Ultrasound
  - MRI



# Carcass Model (2006)

## Meat Cut Identification (2005)



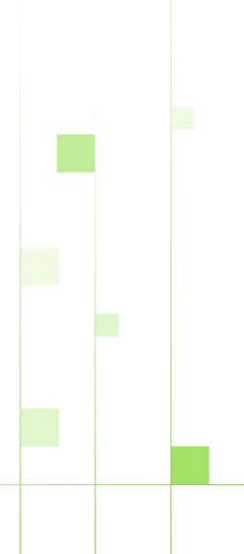
On-line Object Identification, Copyright

Open | Box Outline | **Batch Process** | Background | 2D Outline | 2D Features | Classify | Initialise

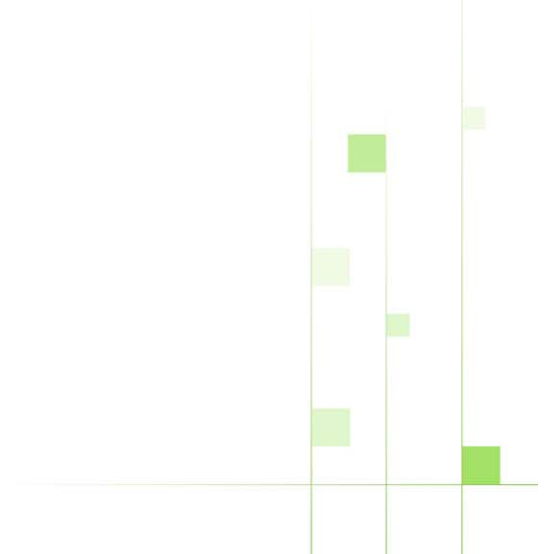
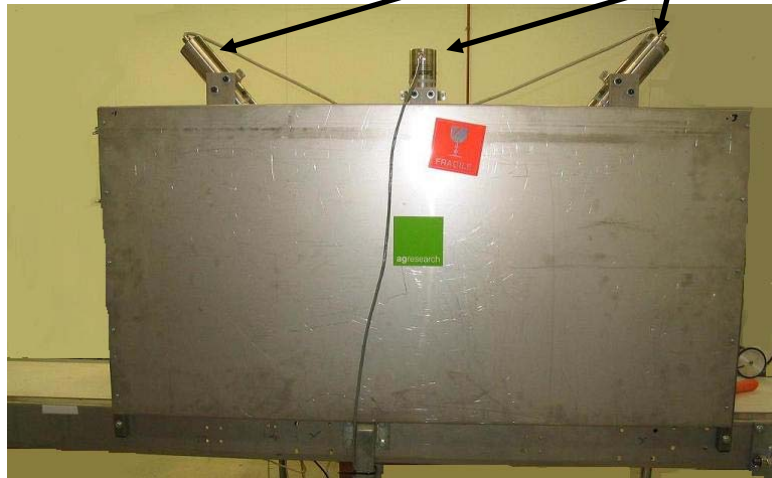
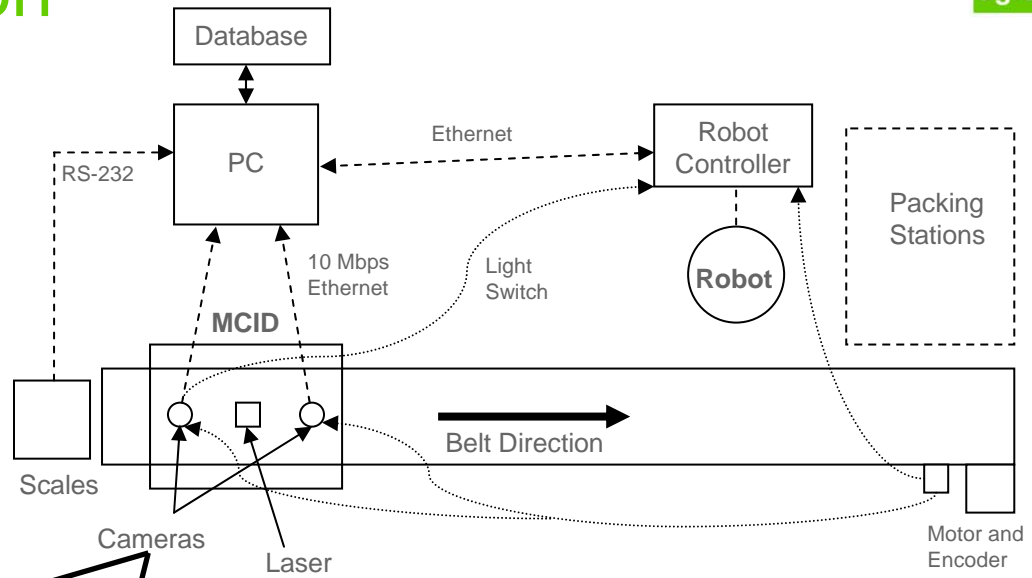
|         |          |
|---------|----------|
| Length: | 357.7 mm |
| Width:  | 156.0 mm |
| Height: | 98.9 mm  |
| Weight: | 1982 g   |

MEDIUM LEG

Lines: 95 | LEG | 265 | UP | RIGHT



# System Integration



# 2D Surface Imaging



Beef Grader - 11111 (Grade standard: Normal)

File Capture Process Help Grading standards Operations

**Grade**  
**2.90**

**Area(mm<sup>2</sup>)**  
**4946.69**

Grading details:

|             |        |
|-------------|--------|
| Total fat % | 9.0708 |
| Edge fat %  | 2.3092 |
| Small fat % | 0.6672 |
| Grade fat % | 6.0944 |

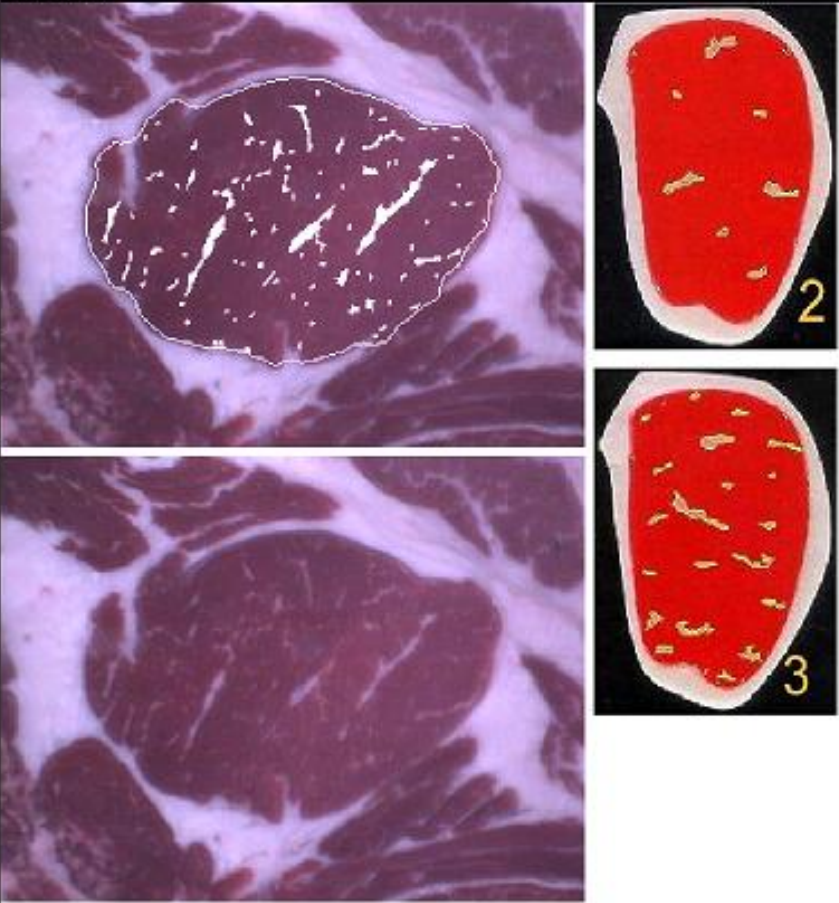
Next action:

Press "Next(P1)" button to accept the grading result.

Or

Press "Redo(P2)" button to select the eye muscle for re-processing.

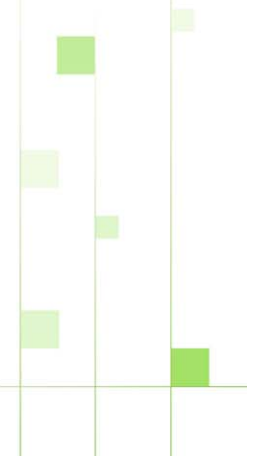
Ready



Next (P1)

Redo(P2)

Cancel(P3)



# What can you see? What could you do?

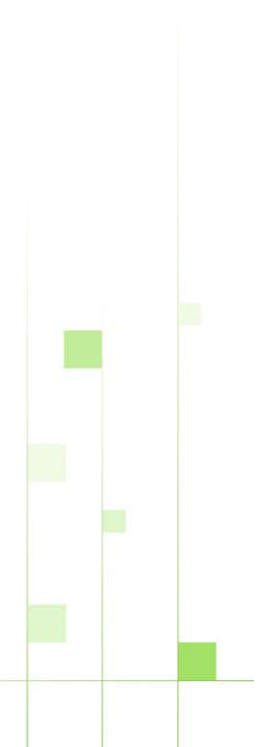
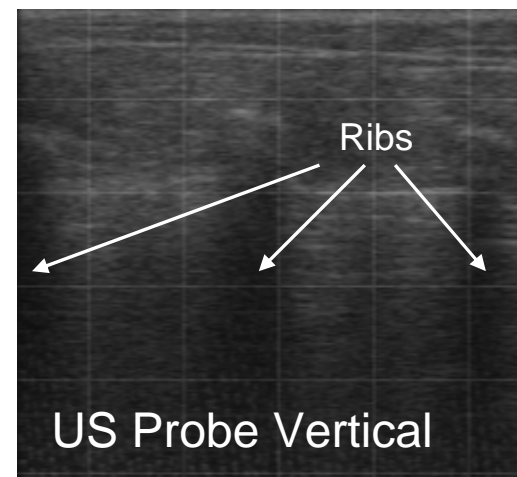
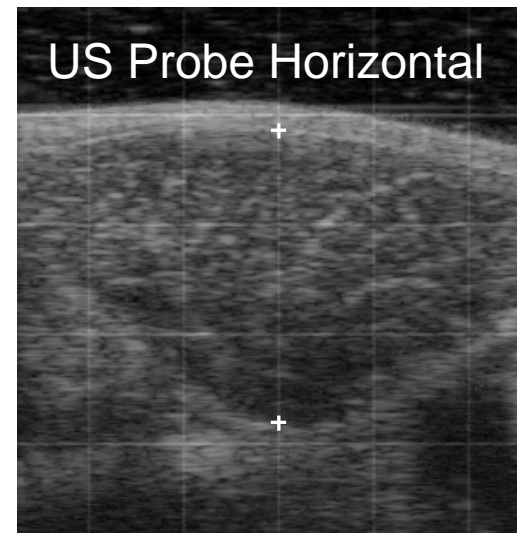
## Ultrasound (US)

- Automatic Fat Depth (AFD)
- Bone location
- Detect eye muscle shape defects i.e. 'Dippy loin'
- Locating cutting tools

## 3D

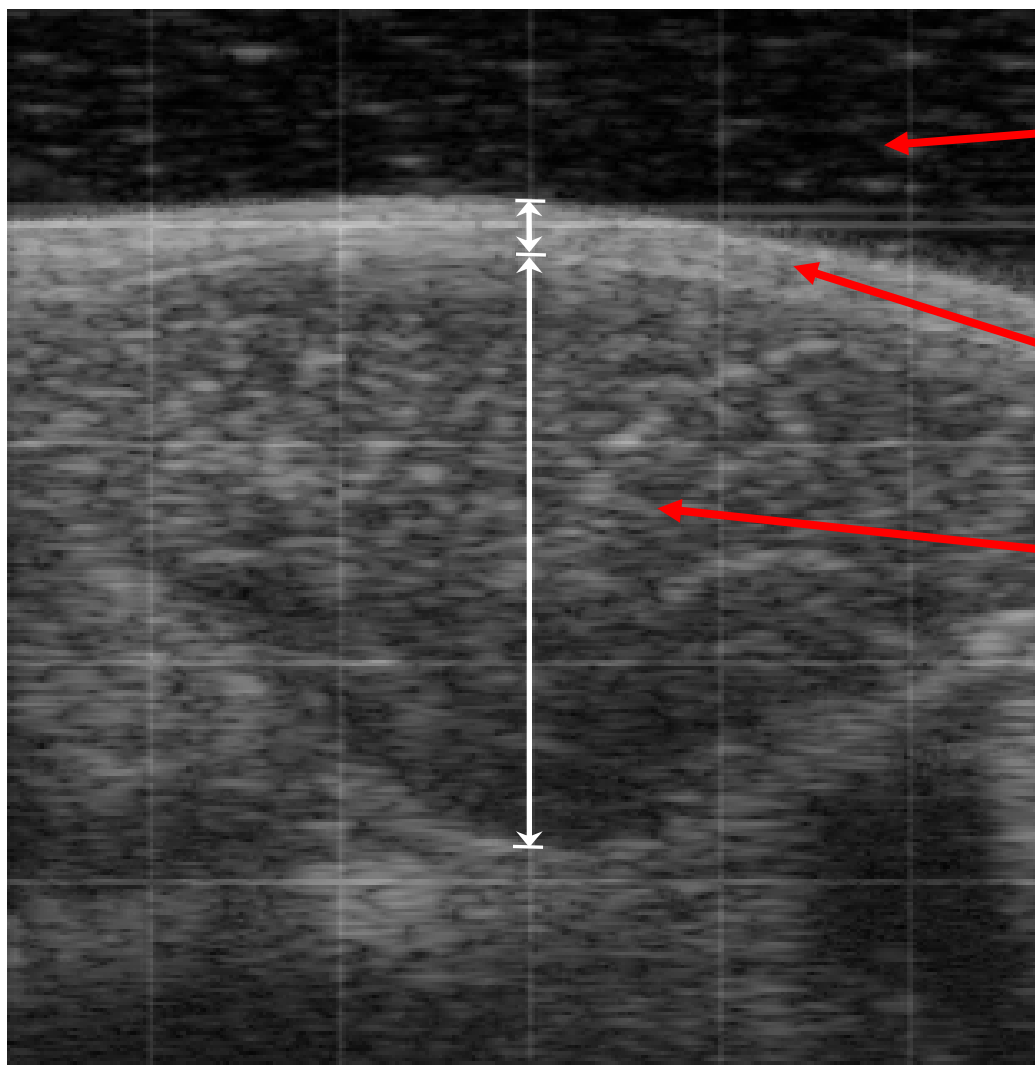
- Size and weight estimation – seen Carcass Model at 2006 workshop
- Cut Identification – seen Automatic Cut Packing at 2005 workshop

And what about beef?





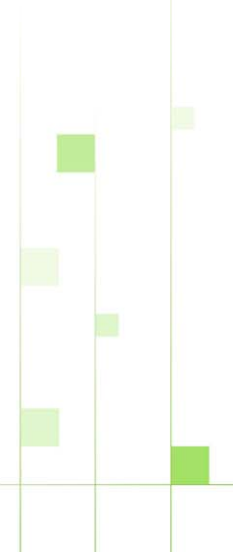
# Ultrasound – Probe horizontal



Patented US Standoff

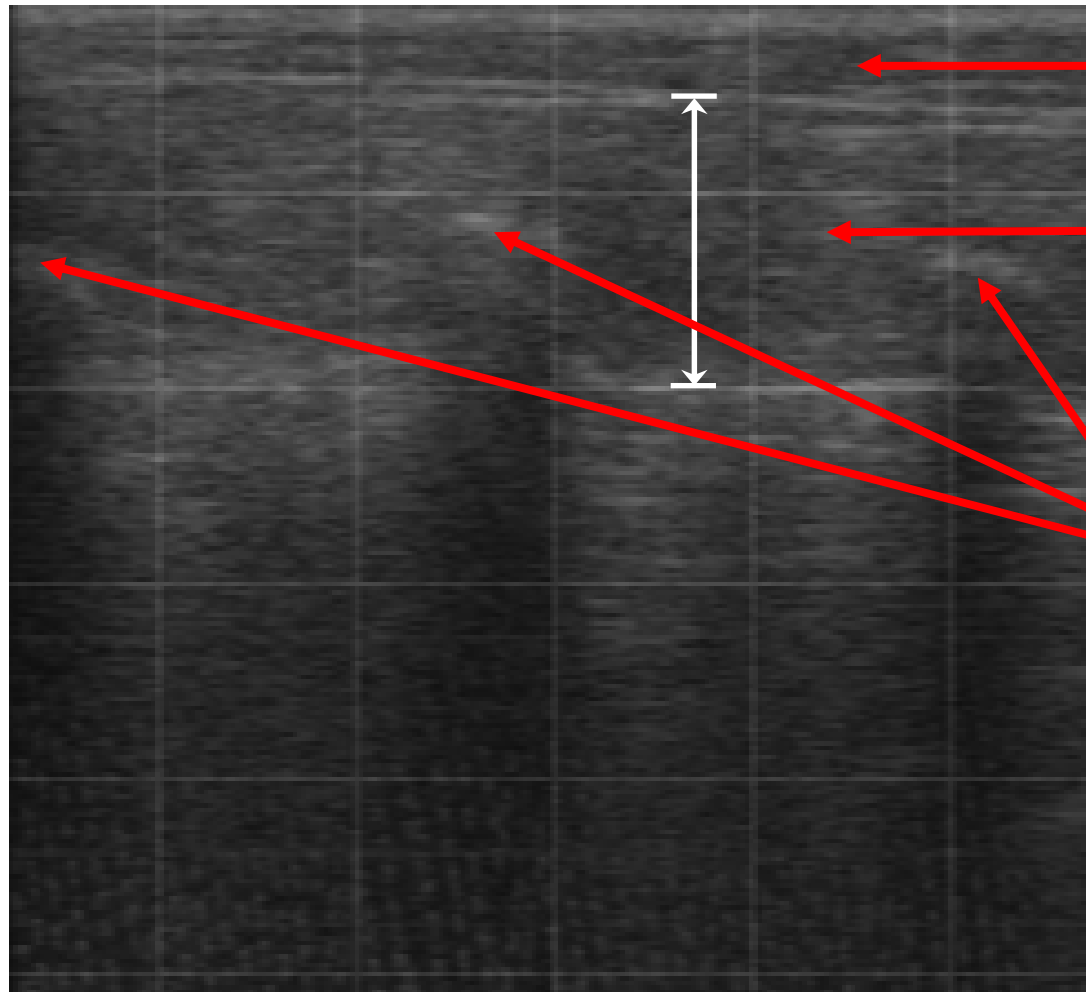
Fat

Eye Muscle





# Ultrasound – Probe Vertical



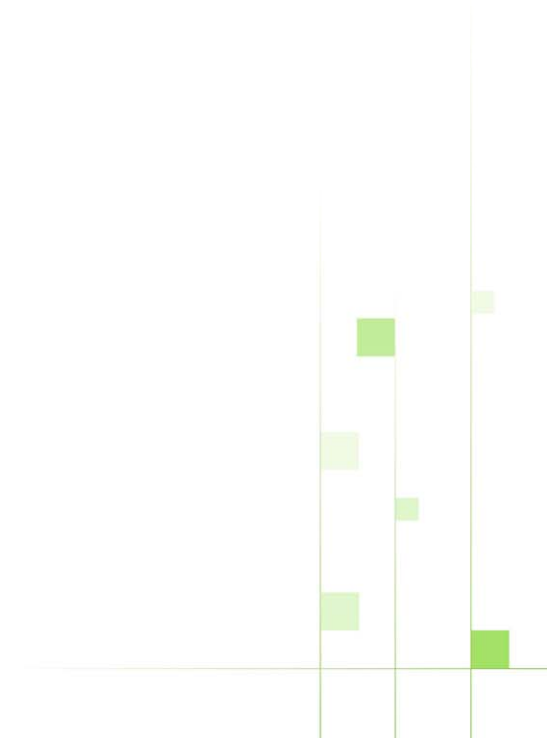
Fat

Eye Muscle

Ribs



# Automatic Fat Depth (AFD)



## Discussion



Is there value in:

- Being able to detect dippy loins?
- Being able to non-invasively see marbling in the eye muscle?
- Knowing the size and shape characteristics of individual meat cuts or whole carcasses?
- Knowing the eye muscle area?
- Detecting bone locations? Where?
- Automatic placement of a cutting tool?
- Being able to track the gap between the ribs?

