# Final report

## Automated Bunk Management – Mort & Co Site Trial


Project code: B.FLT.1015



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# Executive summary

Bunk management is the process of determining feed allocation for pens of feedlot cattle for the following 24-hours. Feed remaining is a significant input to allocation decisions, and the Bunk Scanner has been demonstrated over several previous experimental campaigns to be more precise and accurate at determining these masses in cattle feed bunks than human callers. This world-first achievement enables semi-automation of bunk management utilising scanned data to assist the human decision-making process, or full automation of bunk management employing custom algorithms.

The purpose of this research activity is to demonstrate that feed bunk management is automatable, and to assist determinations of technology's value proposition for Australian lot feeders. The bases of the research are the Bunk Scanner, and a pilot software suite containing algorithms and interfaces enabling cattle feeding systems to be implemented programmatically; the software suite has been called Feedmetrix.

Two Bunk Scanners were built, delivered, and commissioned for the two experiment host sites. Feedmetrix was developed and refined by leading Australian beef nutritionists in preparation for the automated bunk management experiments. The site-based experiment protocols were developed and implemented between MLA and a third party, and these methods and results are project outputs from a parallel and separate research activity.

This final report summarises our major learning experiences from the Grassdale Feedlot experiment. Through our equipment and software provisions and support, a highly-successful research pursuit was completed, demonstrating to the cattle feeding industry that bunk management is automatable. The achieved outcomes ought to represent very significant safe productivity opportunity for Australian lot feeders.

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# 1. Background

The fundamental objectives of bunk management are consistently maximising feed intake, whilst minimising feed wastage and digestive disorders (bloat and acidosis). Calling is a critical input for bunk management, and traditionally it is the human callers' actions directly determine feed intake and carcase weight gain of pens of feedlot cattle.

As an outcome of previous research campaigns, MLA and Manabotix have commercialised a Bunk Scanner (Australian Patent number: 2018203945) which is more precise and accurate at determining feed remaining in cattle feed bunks than human callers. This world-first achievement enables semi-automation of bunk management utilising scanner data to assist the human decision-making process, or full automation of bunk management utilising custom algorithms.

The value proposition of more precise and accurate feed remaining data was unclear. Scientifically robust research was required to determine the animal performance response (carcase weight, feed intake, morbidity, and mortality) when bunks are managed by different levels of automation.

With a view to developing these value propositions, MLA executed projects for a serialised experimental campaign to assess automation levels in commercial feedlots. MLA project B.FLT.1012 represented the implementation of experimental methodologies at two commercial feedlots. Project B.FLT.1010 provided technical support for installation, commissioning, operation, and monitoring of two Bunk Scanners at the two host sites. The two site experiment campaigns were then executed under separate site research agreements: this project (B.FLT.1015) for Mort & Co's Grassdale Feedlot, near Dalby, Qld, Australia, and B.FLT.1016 for the nominated second site's experiment, although this did not proceed to validations due to a lack of cattle availability at the time.

This final report summarises our major learning experiences for the full experiment at Mort & Co Grassdale Feedlot (herein Grassdale).

# 2. Objectives

The overall project objectives that were agreed in the contract are provided in the following list.

1. Determine the effect of semi and full automation of bunk management on feedlot cattle health and performance at Grassdale Feedlot.

All objectives have been met in support of the successful completion of the research activity.

# 3. Methodology

The current project's scope required us to support the Bunk Scanner and custom feeding programme algorithms (within a software framework output from MLA project B.FLT.1007) at Grassdale. The algorithms were delivered to site as a pilot software suite (Feedmetrix) and included user interfaces and Bunk Scanner integrations.

In preparation for the full experiment, a site-specific safety management plan was developed and shared with stakeholders. Additional higher-level methodology for supporting the Grassdale experiment is subject of project B.FLT.1010.

# 4 Results

The following subsection provides information on major learnings during integration and operation of the full experiment at Grassdale.

## 4.1 Summary

The major learnings required by this project's agreement for the experiment hosted at Grassdale are provided below in tabulated format.

**Table 1: Major learnings during integration and operation of full experiment at Grassdale**

| ID | Experience | Learning and control |
|---|---|---|
| 1 | Occasional RTK 'dropouts' across site. | Insufficient range of existing Bunk Scanner internal antennas. High-gain external antennas mounted to ROPS of light vehicle. |
| 2 | Cross-talk interference between Bunk Scanner access point and Digi-Star. | Knowledge of site telecommunications climate, then separation of operating frequencies. |
| 3 | Cantilevered arm of Bunk Scanner interfered with existing static infrastructure, causing sensor damage. | Possible interference events were initially treated via careful manual operation of light vehicle, especially in a known probable area. Scanner provided for experiment had ability to be stowed within vehicle envelope via manual slew, though this was rarely implemented. New Bunk Scanner design may be configured to retract automatically when interference with static event is known. |
| 4 | Improved position locking of Bunk Scanner cantilevered arm in operating and parked positions. | Manual operation of slewing was found to be an imposition for operations personnel. It was also possible to damage cam lever under rough operating conditions. This issue has been engineered-out with new Bunk Scanner AutoSlide arrangement. |
| 5 | Manual handling of data between Bunk Scanner and third-party bunk management software systems. | The manual handling is not ideal, and so appropriate software integrations are preferred. Since the full experiment, this integration has been undertaken with Elynx. |

# 5 Conclusion

The following subsections summarise key insights and implications from the project.

## 5.1 Key findings

Through our equipment and software provisions and support, a highly-successful research pursuit was completed, demonstrating to the cattle feeding industry that bunk management is automatable. The pilot Feedmetrix provides a very scalable and flexible digital environment suitable for any implementation with any feedlot's feeding programme. Major learnings have been identified and have been considered appropriately for the experiment as well as commercial Bunk Scanner implementations.

## 5.2 Benefits to industry

The outcomes of the activities ought to be a very significant safe productivity opportunity for Australian lot feeders, and more details supporting this position are available in parallel reports.

# 6 Future research and recommendations

Additional investment and effort will enable the exploration of automated bunk management benefits in more detail, especially the consideration of more use cases at Grassdale.