



# Final report

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## Best Practice Manual – Feedlot Cattle Staging Facilities

Project code: B.FLT.5016

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Date published: 24 April 2024

PUBLISHED BY  
Meat & Livestock Australia Limited  
PO Box 1961  
NORTH SYDNEY NSW 2059

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

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## Abstract

Feedlot cattle staging facilities are enclosures used for the receipt, feeding, and dispatch of cattle, prior to entry into a feedlot accredited under the National Feedlot Accreditation Scheme (NFAS). These facilities are operated and maintained by the lot feeder receiving the cattle into their accredited feedlot, and may be located adjacent to, or detached from, the accredited feedlot complex. The dietary intake of animals in feedlot cattle staging facilities may be entirely from a prepared ration (total mixed ration) or may include some grazing of pasture or forage plants actively growing within the facility (partial mixed ration). This project delivers a Best-Practice Manual for the design and management of Feedlot Cattle Staging Facilities.

Site visits to existing operations, combined with a review of relevant research and guidance, identified best-practice design and management already in use within the Australian feedlot industry, or other similar industries like free-range pork and poultry operations or dairy farms. Soil samples were also obtained from sites, which identified highly elevated soil nutrient concentrations across high-intensity facilities and adjacent to high-intensity areas within low-intensity systems. This, combined with international research, confirmed the need for greater environmental design and management controls for high-intensity systems and areas. The intent of the information provided in the best-practice manual is to incorporate best-practice feedlot design principles and grazing management principles where they are most applicable.

This document provides the following benefits to industry:

- Ideas and options to allow producers to take a flexible approach to the improvement of existing staging facilities, whilst ensuring appropriate environmental outcomes.
- A clear incentive to operate at best-practice and manage the land to its capacity and not a feedlot productivity outcome.
- A balanced approach to the use of staging facilities during drought.

There was limited research available on which to base the information provided in the Best-Practice Manual. As such, it was difficult to make definitive statements or claims. More broadly, there has been limited environmental research, outside of emissions research, completed recently by MLA. Future research, particularly in relation to animal behaviour and environmental impacts, is required to inform statements made within the document.

## Executive summary

### Background

Feedlot cattle staging facilities are enclosures used for the receipt, feeding, and dispatch of cattle, prior to entry into a feedlot accredited under the National Feedlot Accreditation Scheme (NFAS). These facilities are operated and maintained by the lot feeder receiving the cattle into their accredited feedlot, and may be located adjacent to, or detached from, the accredited feedlot complex. The dietary intake of animals in feedlot cattle staging facilities may be entirely from a prepared ration (total mixed ration) or may include some grazing of pasture or forage plants actively growing within the facility (partial mixed ration).

The intent of the Best-Practice Manual is to provide ideas to assist producers and consultants to implement improvements to existing and future feedlot cattle staging facilities. However, it is not intended to be used as a regulatory tool or a minimum standard.

It is hoped that this document may be a catalyst for future research and, ultimately, incorporation of design and management requirements into the next revision of the National Guidelines for Beef Cattle Feedlots in Australia.

### Objectives

The project has the following objectives:

- (1) Consultation with a technical reference committee consisting of environmental scientists, agriculture engineers, state-based regulators, lot feeders, MLA and ALFA representatives on standards to ensure appropriate environmental management of feedlot staging facilities.
- (2) Consultation workshop at the ALFA-MLA Vets and Nutritionist meeting to determine management considerations for feedlot staging facilities.
- (3) Appropriate industry, stakeholder and regulator consultation for development of the guidelines.
- (4) Review of peer-reviewed literature and other literature for development of guidelines, including a previous report that will be provided to the successful applicant
- (5) A guideline for operating feedlot cattle staging facilities in appropriate format (allowing for potential uptake into a QA program) agreed with technical reference committee that includes (but not limited to);
  - Development of a definition for feedlot cattle staging.
  - Development of definitions for other backgrounding systems in Australia would also be relevant for this work (to assist in defining the scope of the Guidelines for cattle staging facilities).
  - Planning and design.
  - Regulatory requirements and guidance from industry programs including how such facilities interact with planning and zoning regulations including periodic drought declared provisions.
  - Risk assessment and decision support tools.
  - Case studies and checklists.
  - Best management practices;
    - Shade and shelter
    - Grazing under these systems
    - Supplementary feeding

- Environmental care including water monitoring and soil testing
- Groundcover
- Animal health and welfare – including opportunities for preparation of cattle prior to feedlot entry – ie with appropriate vaccinations.
- Biosecurity.

To the extent that they were varied during Steering Committee Meetings, the objectives have been achieved. Further stakeholder engagement is to occur with the final draft document.

## **Methodology**

The following is a summary of the methodology used in this project:

- (1) Completed Steering Committee Meeting 1 to discuss the draft definition of feedlot cattle staging facilities and the intended purpose of the document.
- (2) Prepared a revised definition of ‘feedlot cattle staging facilities’.
- (3) Completed a review of relevant research, legislation, policy, and guidance material associated with backgrounding, feedlot regulation, agricultural runoff controls, and other relevant intensive livestock industries (free-range pork, free-range poultry, and dairy).
- (4) Completed Steering Committee Meeting 2 to present the draft ToC and discuss the approach to stakeholder engagement.
- (5) Completed preliminary stakeholder engagement with relevant state regulators and agriculture departments.
- (6) Undertook site visits to six feedlot cattle staging facilities ancillary to established feedlots and prepared five case studies following the site visits.
- (7) Obtained 34 soil samples and laboratory analysis results of these samples.
- (8) Prepared the Best-Practice Manual: Feedlot Cattle Staging Facilities document in a collaborative and staged approach.

## **Results/key findings**

The final draft of the Best-Practice Manual: Feedlot Cattle Staging Facilities has been prepared and will be released to industry. Soil sampling results have been collated and presented without identifying the source of the sample. Photos were obtained from site visits and the Mulloon Institute. Five case studies were prepared based on the information obtained during the site visits. Site visits and case studies included visits to family and corporate operations, large and small, and geographically diverse.

## **Benefits to industry**

This document provides the following benefits to industry:

- Ideas and options to allow for regulators and producers to take a flexible approach to the design and management of feedlot cattle staging facilities.
- A clear incentive to operate at best-practice and manage the land to its capacity and not a feedlot productivity outcome.
- A balanced approach to the use of staging facilities during drought.
- Publication of best practice design and management knowledge to help ensure protection of land and environment.

## **Future research and recommendations**

Further research on animal behaviour within feedlot cattle staging facilities, along with rigorous research into the environmental impacts from varied operations is required prior to the incorporation of key concepts into the National Guidelines for Beef Cattle Feedlots in Australia.

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## 1. Background

Although there is some variation between states and the National Guidelines for Beef Cattle Feedlots in Australia (National Guidelines), the definitions of feedlot uses and grazing uses are clear. However, ambiguity and uncertainty emerge where cattle are held in small paddocks and/or large pens and a portion of their feed intake is from feedstuffs provided from external sources (e.g. grain or fodder). These operations vary substantially and are not well defined by any state or industry body. For this reason the Australian Lot Feeding Industry has established a definition for facilities, termed feedlot cattle staging facilities, run in direct association with NFAS accredited feedlots. Due to the variability in purpose, design, management and regulation, cattle staging areas (paddock feeding adjacent to a feedlot), there is not a concise minimum standard that can be applied to these facilities.

Ambiguity in the definition of these operations has also created ambiguity on the appropriate design and management practices. However, the intent of the Best-Practice Manual was to provide ideas to assist producers and consultants to implement improvements to existing and future operations. It is not intended to be used as a regulatory tool or a minimum standard. Decision-making tools are also needed to help guide decisions as some aspects of best-practice design and management are costly and not necessary for all sites.

The free-range pork and poultry sectors have done substantial research into the potential environmental impacts of free-range areas. Although different industries, the process and type of research that has been conducted by those industries over the past 10 years provides a potential pathway for short-term and long-term research programs for feedlot cattle staging facilities. Internationally, there is also limited research on and guidance for the design of feedlot cattle staging facilities. Much of the internationally available information would not meet the strict regulatory requirements of the Australian feedlot sector.

## 2. Objectives

The project has the following objectives:

- (1) Consultation with a technical reference committee consisting of environmental scientists, agriculture engineers, state-based regulators, lot feeders, MLA and ALFA representatives on standards to ensure appropriate environmental management of feedlot staging facilities.
- (2) Consultation workshop at the ALFA-MLA Vets and Nutritionist meeting to determine management considerations for feedlot staging facilities.
- (3) Appropriate industry, stakeholder and regulator consultation for development of the guidelines.
- (4) Review of peer-reviewed literature and other literature for development of guidelines, including a confidential report that will be provided to the successful applicant
- (5) A guideline for operating feedlot cattle staging facilities in appropriate format (allowing for potential uptake into a QA program) agreed with technical reference committee that includes (but not limited to);
  - Development of a definition for feedlot cattle staging.
  - Development of definitions for other backgrounding systems in Australia would also be relevant for this work (to assist in defining the scope of the Guidelines for cattle staging facilities).
  - Planning and design.

- Regulatory requirements and guidance from industry programs including how such facilities interact with planning and zoning regulations including periodic drought declared provisions.
- Risk assessment and decision support tools.
- Case studies and checklists.
- Best management practices;
  - Shade and shelter
  - Grazing under these systems
  - Supplementary feeding
  - Environmental care including water monitoring and soil testing
  - Groundcover
  - Animal health and welfare – including opportunities for preparation of cattle prior to feedlot entry – ie with appropriate vaccinations.
  - Biosecurity.

All objectives have been met to the extent that they were varied and agreed to during Steering Committee meetings. Further stakeholder engagement, particularly with regulators, is expected to be completed once the Best-Practice Manual (final draft) has been reviewed by ALFA and MLA representatives. In-depth regulator engagement was deferred during Steering Committee Meeting 1. It was also agreed that the document would be referred to as a best-practice manual instead of a guideline.

## **3. Methodology**

### **3.1 Steering Committee Meeting 1**

#### **3.1.1 Steering Committee Meeting 1 PowerPoint**

The technical reference committee, described in the milestone achievement criteria, was amended with the formation of a Steering Committee. The steering committee consisted of MLA representatives, available members of the ALFA R&D committee, and relevant members of the project team. In lieu of a formal agenda and meeting record, a Microsoft PowerPoint presentation was developed to guide discussion during Steering Committee Meeting 1 and provide a record of the outcomes of the meeting. The PowerPoint included an outline of the following topics:

- Scope and purpose of the guideline
- Draft definition of cattle staging facilities
- Description of three different cattle staging facility systems
- Existing regulatory framework
- Interaction between cattle staging facilities and drought feeding
- Approach to the guideline structure and case studies
- Management tools (added after meeting)
- Communication strategy

#### **3.1.2 Draft Definition of Cattle Staging Facilities**

Prior to Steering Committee Meeting 1, a summary of the potential definition was provided for discussion. This summary was amended during and following the meeting with an expanded definition

subsequently developed. Definitions or descriptions of different types of cattle staging facilities were also developed to provide industry with flexibility and allow for different best-management practices. The final definition was incorporated into the Best-Practice Manual.

### **3.2 Legislation, Policy, and Guidance Review**

As the topics to be discussed within Steering Committee Meeting 1 included regulatory requirements and the interaction of cattle staging facilities and drought feeding, it was necessary to complete part of the literature review. State-based government planning and environmental legislation, policy, and guidance relating to grazing, drought feeding, backgrounding, and lot feeding was reviewed to understand whether cattle staging facilities are already described within existing policy and guidance. Plain-English summaries of relevant legislation, policy and guidance were completed, which formed part of the final literature review. Excerpts from the relevant legislation were collated as an appendix for future reference.

### **3.3 Steering Committee Meeting 2**

The steering committee met on 19 May 2023 to discuss whether regulators would be engaged early in the project and to allow for feedback from the steering committee on the draft definition of cattle staging facilities. The meeting also included discussion on the relationship between drought exemptions and cattle staging facilities. A draft Table of Contents for the best-practice manual was also presented.

### **3.4 Regulator engagement**

Teleconferences were held with environmental regulators and/or agricultural policy officers from Queensland, New South Wales, Victoria, and Western Australia. Generally, these were held as open discussions with comments consolidated into answers to the following questions:

1. What's your experience with the regulation of cattle staging facilities?
2. How do you define and regulate backgrounding/cattle staging facilities?
3. How do you consider drought exemptions and their impact on cattle staging facilities use?
4. Do you have any policies or procedures on how you deal with cattle staging facilities?
5. What innovative design, management, or operational ideas have you seen for cattle staging facilities?
6. What do you believe needs to be addressed as part of a best-practice document?
7. Are there any changes to policy or legislation that this project should consider?

### **3.5 Site Visits and Sampling**

Site visits to feedlots in the following areas were completed:

- Texas, Queensland;
- Nanango, Queensland;
- Warialda, New South Wales;
- Dalby, Queensland;
- Charlton, Victoria; and
- Meandarra, Queensland.

Soil samples were obtained from two of the above feedlots and two other feedlots with varying design and management for associated staging facilities.

Water sampling was not completed due to the timing and logistics required for obtaining surface water samples.

### **3.6 Preparation of the Best-Practice Manual**

As Milestone 3 consisted of the full development of the Best-Practice Manual across a 7-month period, the development of the document was delineated into several stages:

- Draft and final table of contents (ToC);
- Working draft document (dot points); and
- Final draft document – fully developed draft with photos and diagrams.

This process was completed to ensure that the project undertook a collaborative approach with ALFA and MLA representatives early in the development of the document.

As part of Milestones 4 and 5, the final document will be prepared, with final formatting completed by MLA after Milestone 5.

#### **3.6.1 Definition**

A draft definition was developed first to ensure that the Best-Practice Manual appropriately covered the uses intended. This was provided for Steering Committee Meeting 1 as part of Milestone 1. Following feedback from MLA and ALFA, the definition was refined with the removal of distinct definitions for different types of facilities.

#### **3.6.2 Table of Contents**

A draft table of contents (ToC) was developed following Milestone 1 and prior to Steering Committee Meeting 2. This was presented during the meeting with feedback noted. Following the meeting, the updated ToC was provided to MLA and ALFA representatives for approval. This ensured the structure of the document was going in the right direction prior to substantial progress on content.

#### **3.6.3 Working Draft**

The working draft document included information under each heading to provide context or the intent of each section of the ToC. The runoff controls section, which was crucial but likely to be contentious, was provided in full. General comments were provided by MLA representatives.

#### **3.6.4 Final Draft**

The final draft document, which was prepared in AgDSA document templates, was completed as part of this Milestone. The document includes photos and the incorporation of key sections of the case studies, especially where these case studies identified best-practice design and management. This document included input from all members of the project team, with specific technical advice provided on animal welfare and nutrition. The final case studies were also completed.

## 4. Results

### 4.1 Best-Practice Manual

Best Practice Manual: Feedlot Cattle Staging Facilities has been completed in an AgDSA document template along with photos and diagrams. It is anticipated that there will be further amendments following submission as part of this Milestone. This document will require reformatting into the MLA document template. As such, it is provided as a 'Final Draft'.

The Feedlot Cattle Staging Facility Management Record template will be provided in Microsoft Excel format.

Five case studies have been completed for varied operations across different states with different capacities and ownership structures.

All original photos used in the document will be provided to MLA.

A signed image release deed poll has been provided to MLA from owners of properties where site visits were completed covering permission to use photos from those site visits in the report.

### 4.2 Sampling

#### 4.2.1 Soils

The collated sampling results have been presented for Colwell phosphorous, electrical conductivity, and nitrate nitrogen as key indicators for the impact of nutrients from manure deposition. In most cases, two sites from two enclosures (pen/paddock) were sampled at each facility. One sample was obtained from underneath a shade structure.

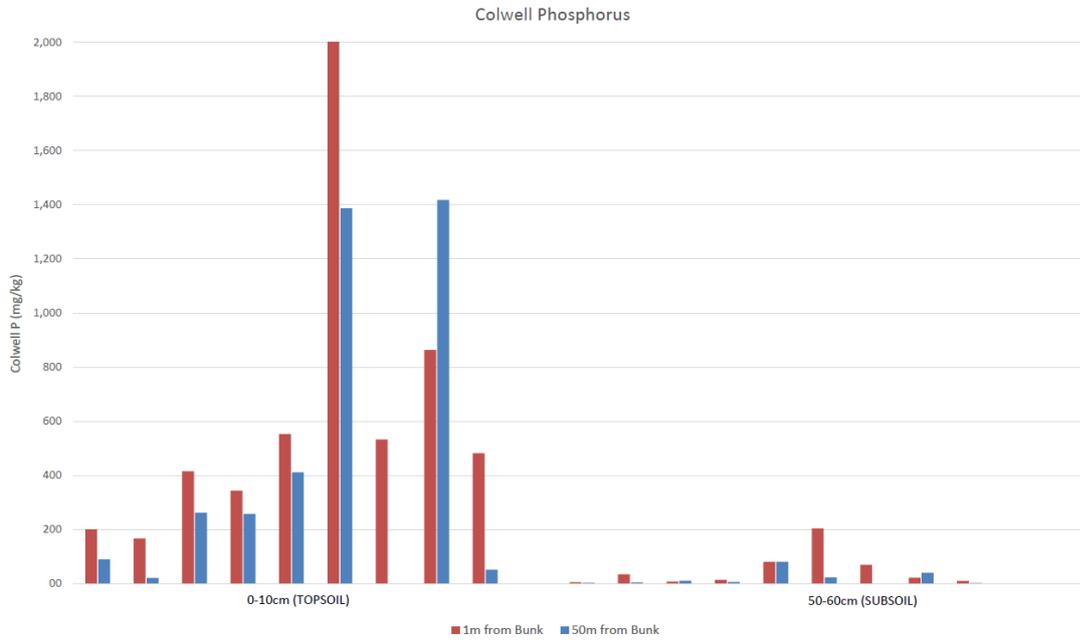
The following is a brief description of the grouped results (red and blue bars):

- Sites 1 & 2
  - Low-intensity facility with 45 ha paddocks with 80-100% grass cover;
- Sites 3 & 4
  - Low-intensity facility with bunk and trough in single 8 ha paddocks with approximately 70 % grass cover;
- Sites 5, 6 & 7
  - Site 5 was within a moderate-intensity 40 ha paddock with 70 % grass cover;
  - Site 6 was within a high-intensity paddock with no grass cover and observed manure pack.
  - Site 7 was under a shade structure within the moderate-intensity paddocks (red only)
- Sites 8 & 9
  - Site 8 was a moderate-intensity paddock with 80 % grass cover
  - Site 9 was a low-intensity system with actively managed multi-species pasture with 90-100 % coverage.

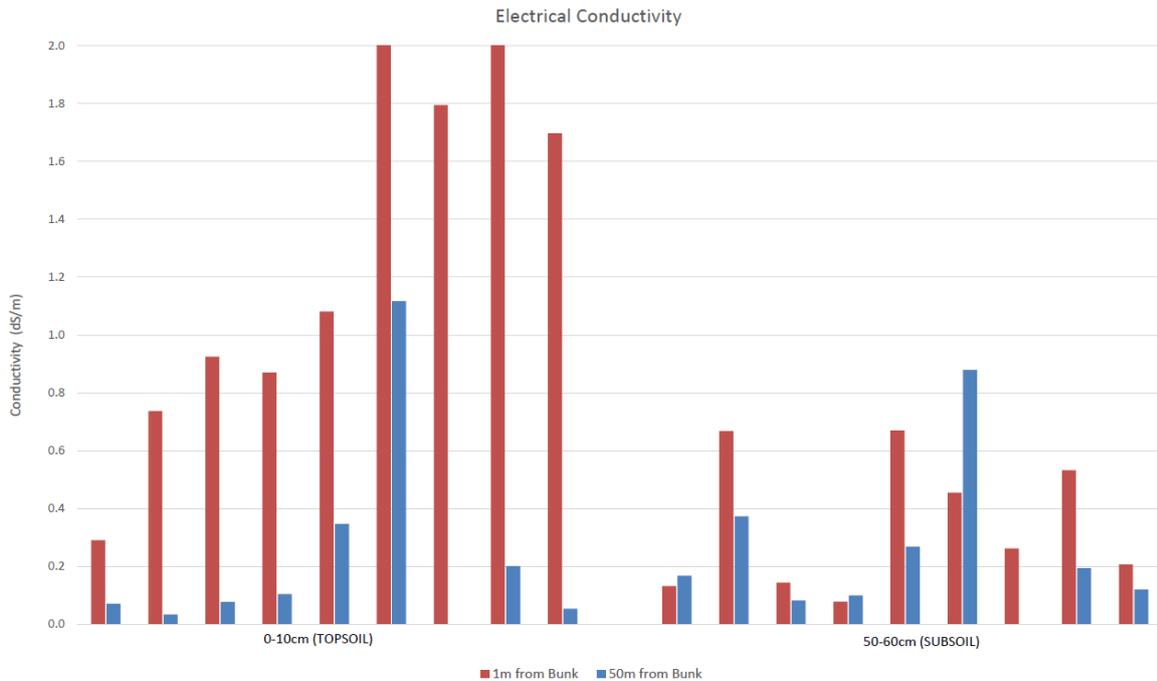
Results from the soil sampling varied with all but one sampling site showing higher soil nutrient concentrations near the feed bunk than 50 m away from the feed bunk. Laboratory analysis results for Colwell phosphorus, electrical conductivity, and nitrate nitrogen are presented in Figure 1, Figure 2, and Figure 3, respectively. One sampling site showed higher concentrations of nitrate nitrogen away from the bunk. The highest nutrient concentrations were in soils from a high-intensity system with no grass

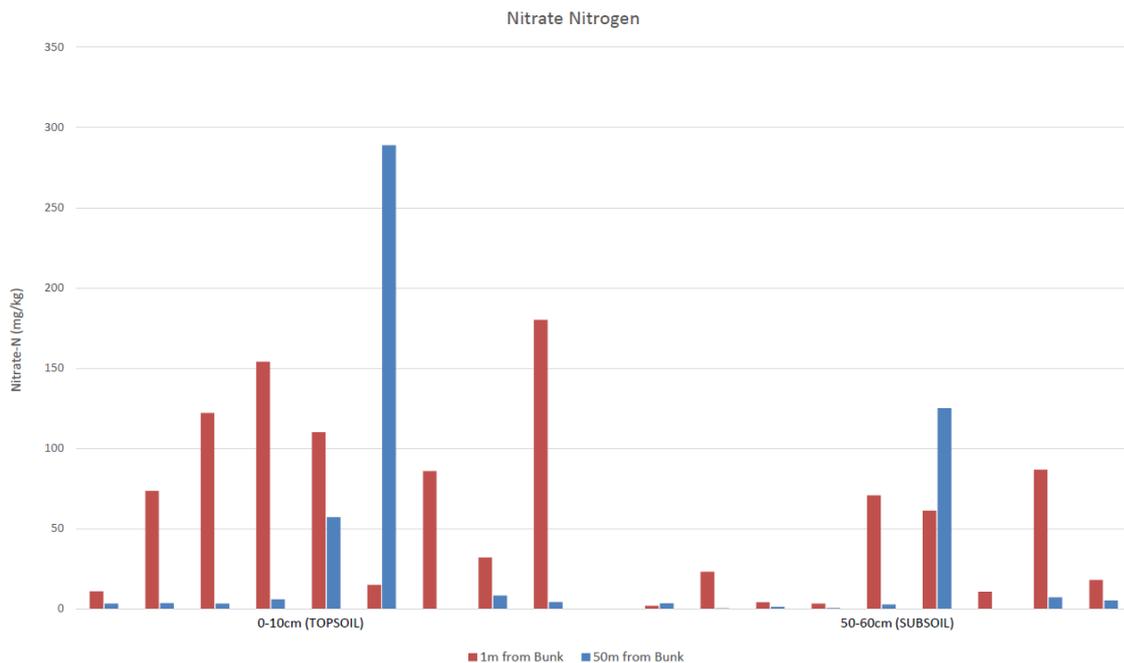
cover and observable manure accumulation. However, elevated nitrate nitrogen at 50-60 cm only appears to be occurring in moderate to high-intensity systems. Even adjacent to the bunk, nitrate nitrogen, which is most likely to move through the soil profile, does not appear to be elevated in low-intensity systems.

**Figure 1 – Soil sampling results (Colwell phosphorous)**



**Figure 2 – Soil sampling results (electrical conductivity)**



**Figure 3 – Soil sampling results (nitrate nitrogen)**

## 5. Conclusion

### 5.1 Key findings

- The site visits confirmed that many of the best-practice concepts incorporated into the manual are already in place at large and small feedlots. There is also substantial variability in the intensity, design, and management of staging facilities and the document needs to remain flexible to allow for these systems to continue to operate.
- Soil nutrient concentrations within high-intensity systems and around high-intensity areas within low-intensity systems (e.g. feed bunks and shade) indicate that these systems or areas present a risk to the environment. Soil nutrients in the samples from the high-intensity system were 10 to 20 times normal agronomic ranges. Depending on the site, this may result in impacts to groundwater through leaching or surface water from contaminated runoff. If these results were observed within a feedlot effluent or manure utilisation area, substantial regulatory action would be enforced.
- These results indicate that high-intensity staging facilities are likely to have runoff characteristics closer to feedlot effluent than runoff from a grazed paddock. This justifies the inclusion of feedlot design and management principles (i.e. construction of a controlled drainage area and pen cleaning) for high-intensity systems.
- Key aspects of the Best-Practice Manual should be incorporated into the National Guidelines for Beef Cattle Feedlots in Australia. However, it is difficult to do this until follow up research can provide quantitative analysis of the environmental risks and efficacy of design and management practices. Information within the Best-Practice Manual is only based on anecdotal evidence and drawing links to other industries.

## 5.2 Benefits to industry

This document provides the following benefits to industry:

- Ideas and options to allow regulators and producers to take a flexible approach to the improvement of existing staging facilities, whilst ensuring appropriate environmental outcomes.
- A clear incentive to operate at best-practice and manage the land to its capacity and not a feedlot productivity outcome. This document should make low-intensity systems more attractive, whilst allowing high-intensity systems providing appropriate controls are implemented. For some facilities, the implementation of recommended best-practice will be cost prohibitive. This means a reduction in the intensity of normal operations will be a more viable result.
- A balanced approach to the use of staging facilities during drought. Whilst it is not intended to influence existing regulations, the information provided in the Best-Practice Manual allows for the changing use of staging facilities during drought. However, it is reliant on appropriate runoff controls, management, behavioural change, and rehabilitation being implemented by the lot feeder.
- A way to encourage non-feedlot backgrounding operations to meet the same cost and regulatory requirements of the feedlot industry. The information gathered in this project identifies that paddock feeding operations, particularly high-intensity systems, pose a risk to the environment. As best-practice for high-intensity staging facilities is to construct a controlled drainage area, regulators may use this information for paddock feeding operations.

## 6. Future research and recommendations

### 6.1 Future Research

There was limited research available on which to base the information provided in the Best-Practice Manual. As such, it was difficult to make definitive statements or claims. More broadly, there has been limited environmental research, outside of emissions research, completed in Australia. Future research is required to inform statements made within the document. Much of this research has been conducted in free-range pork and poultry systems. Research could include:

- Animal behaviour research to understand how animals use different sized enclosures in staging facilities;
- Productivity, performance, and animal welfare or wellbeing research based on length of backgrounding and other variables;
- Rigorous environmental research on the following topics:
  - Runoff quality and efficacy of runoff controls;
  - Soil nutrient distribution and management;
  - Odour, noise and dust emissions;
  - Pasture management;
  - Post-drought paddock rehabilitation programs; and
  - Shade and vegetation management.

The above research should be completed prior to the inclusion of data-based requirements in an updated National Guidelines for Beef Cattle Feedlots in Australia.

## **6.2 Future discussions**

As this was an MLA document, it was not possible to make definitive regulatory statements or influence state or local legislative frameworks. As such, continued advocacy by ALFA is required to ensure that planning and environmental definitions remain current and suitable for modern feedlot operations. Advocacy around drought and other emergency events is also required to ensure that the broader cattle industry can operate effectively to maintain industry-wide animal welfare outcomes.

This may require a collaborative approach with Cattle Australia and other industry bodies (e.g. dairy). This collaborative approach could include a national planning and environmental framework to define livestock activities, which can be adopted by all state and local governments. This would enable consistency across states and provide clarity to the definition of feedlots, grazing, and supplementary or intensive feeding.

## **6.3 Updated National Guidelines**

There was a clear message from several of the state regulators that a Best-Practice Manual would not necessarily solve the regulatory issues they were facing. Many requested that a science-based, national minimum standard or guideline document be prepared to assist in defining and regulating supplementary and intensive feeding. Whilst the Best-Practice Manual can be retained and updated as a stand-alone document, components of the information provided, with updates based on future research, should be incorporated into the National Guidelines. This is reinforced by the recent development of the Feedlot covered housing Systems: Best-Practice Design and Management Manual and regulatory issues associated with covered housing adoption.

## **6.4 MLA Manual Development**

Whilst a method and project outline was developed as part of the request for tender, and subsequent contract, some aspects of the project outline were changed quickly at Steering Committee Meeting 1. Of note were the need or relevance of case studies.

During Steering Committee Meeting 2, it was identified by ALFA and MLA representatives that the document development process had been more collaborative in this project. However, as the consultant developing the Best-Practice Manual, further collaboration should have been completed during the development of the document. Feedback on the working draft document was provided by MLA representatives, but further feedback from members of the ALFA R&D committee, as producer representatives, would have been valuable.

## **6.5 Best-Practice Extension and Adoption**

Whilst the preparation of a Best-Practice Manual is valuable, such documents are often only used by regulators and consultants. If used by regulators, the implementation of best-practice is likely to occur following the development of feedlot cattle staging facilities. Normally, this is because of environmental issues or complaints from the community. Under this scenario, it may be too late for appropriate changes to be implemented, or the necessary changes may be cost-prohibitive. These outcomes can be avoided by early and direct advice being provided to producers before the development or expansion of their facilities.

This was evident during and following site visits which included some brief advice on improvements. Of note, one of the small producers visited could make simple changes to their facility to improve management, particularly in relation to grass cover management. Further, one producer was looking for online, satellite-based pasture management tools but was not aware of those which were available.

For many producers, some of the best-practice design and management, may seem excessive or unnecessary. However, individual operations may only require the implementation of some of the concepts provided in the document. However, deciding on the selection and design of these practices may be difficult without professional advice.

MLA-funded producer extension workshops would be valuable to drive understanding and adoption of best-practice. This could be through small group workshops or one-on-one extension and site-specific advice. Producers are often heavily reliant on consultants or advisors and unlikely to read through long documents to find the information they need. These workshops could also include the expansion or extension of data management and decision-making tools adapted to site-specific operations.