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# Using FarmMaps 4D to improve management of Indigenous pastoral infrastructure

Joel Dillon 1, Peter Cunningham 2

1. Indigenous Land Corporation, GPO Box 652, ADELAIDE SA 5001, Australia. E: joel.dillon@ilc.gov.au. Ph: 08 8100 7100

2. Australian Indigenous Agribusiness Company, PO Box 7502, CLOISTERS SQUARE WA 6850, Australia, E: peter.cunningham@ilc.gov.au. Ph: 08 9420 6300

## Abstract

The Indigenous Land Corporation (ILC) assists Aboriginal and Torres Strait Islander people to acquire and manage land to achieve economic, environmental, social, and cultural benefits.

To support this the ILC maintains a spatial database of property infrastructure information, including property layout, fencing, water points, and other features, for more than 160 Indigenous and ILC-held properties across Australia. The quality and consistency of this information varies depending on information availability and managers, limited access to the information on remote properties or ability to improve it.

To address these issues, the ILC, through its wholly owned subsidiary the Australian Indigenous Agribusiness Company (AIA) [formerly National Indigenous Pastoral Enterprises (NIPE)]<sup>1</sup>, started a project in 2016 to develop detailed property infrastructure information using its in-house Indigenous mapping capability, starting with fifteen NIPE-managed properties.

The FarmMap 4D (FM4D) online application [formerly known as the NRM Spatial Hub]<sup>2</sup> was used to deliver information to the remote property managers. Managers can use FM4D to dynamically view and overlay map layers, and generate maps and reports, to support more effective land management and planning. This single source of information is accessed by project managers, contractors, and property managers alike.

But how did the ILC develop its property information, how is the ILC using the FM4D, and what are the ILC's plans for the future? Moreover, how is this project improving the ability of the ILC and AIA to deliver benefits to Indigenous people?

**keywords:** ILC, AIA, Agribusiness, Indigenous, FarmMap 4D, Mapping

## Introduction

The ILC and AIA are using the FM4D online application to support the management of remote Agribusinesses set up to provide benefits for Indigenous people.

In 2014, after AIA and ILC staff attended a remote sensing pastoral management workshop, the ILC was invited to take part in the FM4D online farm planning and information system pilot. The ILC began reconciling its property infrastructure for use in FM4D but, due to a lack of dedicated resources, minimal progress was made until 2016, when a nine-month AIA funded pilot project was established to collate and refine existing property infrastructure information, and digitise missing information for upload into FM4D.

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<sup>1</sup> Prior to a name change on 29 June 2017, AIA operated as NIPE. For consistency, this paper will use the current operating name, AIA.

<sup>2</sup> Prior to a name change on 1 July 2017, the FarmMap 4D web application was known as the NRM Spatial Hub. For consistency, this paper will use the current operating name, FarmMap 4D.

## Property Infrastructure Information Project

The project's aims included reconciling and validating all recorded property infrastructure information using desktop GIS analysis and uploading it into FM4D, where AIA property managers - who have the best knowledge of the property - can update and refine the details as required.

A project work plan was established, and an additional Data Entry Officer position was created and filled by an Indigenous candidate. Training and technical support were sourced from the FM4D team.

Existing property infrastructure information was extracted from the ILC's databases, available printed and digital map products, and relevant data found from searching almost 3,000 ILC GIS projects.

This information was reviewed using desktop GIS analysis and any missing information located from the relevant data custodians or digitised using satellite imagery and elevation model products (see *figures 1 and 2*).

The result was a refined dataset of property infrastructure information for each property, focusing on five high priority feature categories: fences, paddocks, yards, buildings, major tracks, and water infrastructure.

Validating the information was the biggest task. To ensure high quality and accuracy, all features were checked, compared against reference materials, and rechecked. This involved writing custom applications, double and triple checking attribution, and finally, publishing large format printed maps for AIA property managers to review.

Once property managers' feedback had been incorporated, the information was sent to FM4D to be uploaded. AIA property managers were sent their login details and provided with FM4D instructional videos and guides.

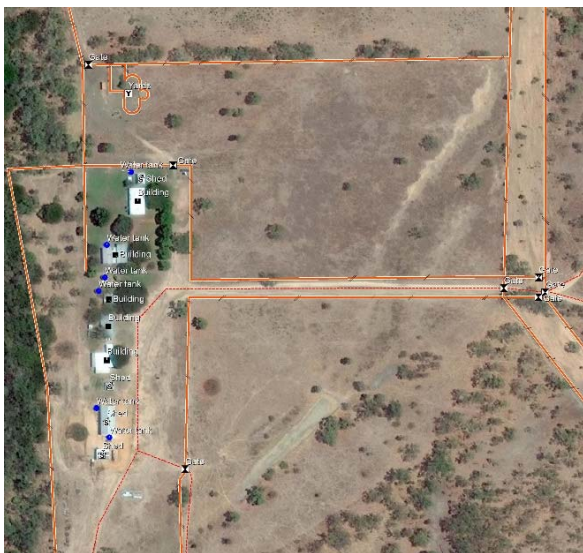


Figure 1. Digitising property infrastructure using desktop GIS analysis.

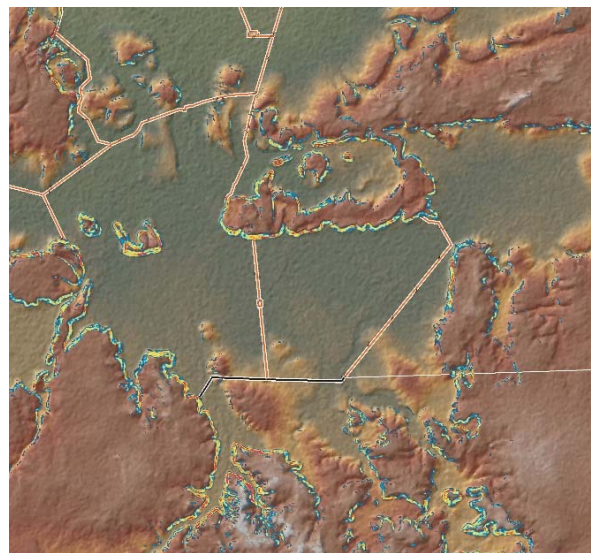


Figure 2. Using elevation models to calculate natural fence lines.

## Outcomes

By hosting its agribusiness infrastructure information in FM4D, AIA has given its property managers and project officers on-demand access to property mapping products. They can now review and update property information and print maps wherever internet is available. They can also use FM4D to view data and perform calculations to support property and strategic management activities, including location of watering points, fire management, pasture health analysis and stocking rates (see *figures and 4*).

AIA's investment in this pilot project has enabled the company to manage its agribusiness property infrastructure information uniformly in a sharable, single source of truth.

Following the pilot, the project was extended to include seven further AIA properties and other selected ILC properties in the Northern Territory, Victoria and New South Wales.

In Northern Australia AIA uses FM4D to assist in stock watering planning. Using the system's distance from water analysis and ground cover analysis tools, the property managers are able to identify the ideal locations for commissioning new bores and watering points.

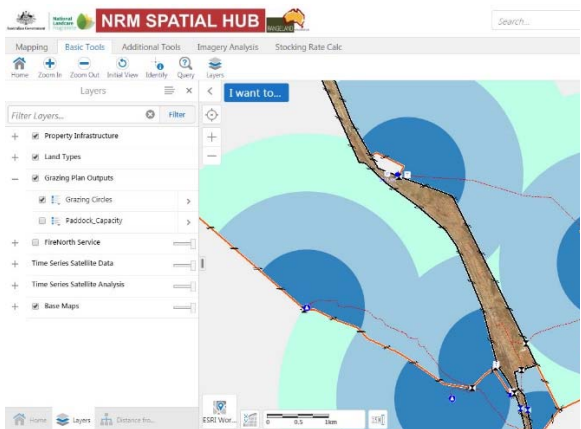


Figure 3. FM4D interface showing the output from the distance from water (cattle grazing) circles tool.

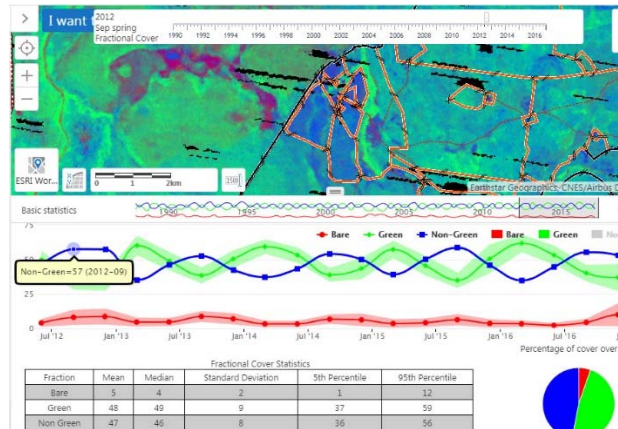


Figure 4. Fractional cover imagery and fractional cover statistics over an agribusiness.

The system is used to generate maps for consultation and works planning with Traditional Owners (TOs) and other stakeholders. Station managers have been able to effectively work with the Traditional Owners to ensure the best location of roads and water points on property (see figure 5).

One AIA property is now using FM4D to manage pastoral infrastructure assets by tracking the condition of yards, water points, and fences. This enables the property to budget for asset maintenance and assist the planning of capital works projects. For example: "if a 10km length of three-strand fence was built in 2010, with an expected life of fifteen years, the fence should be considered for replacement in 2025". By maintaining this information in the FM4D the property is building a detailed schedule of assets to support the agribusinesses' budgeting and insurance needs.

This approach has already demonstrated its value on a trial property and will be implemented as standard practice across all of the AIA agribusinesses in the near future (see figure 6).



Figure 5. TO Ron Barron on a newly graded road in the Mid-West WA



Figure 6. Cattle management planning in The Kimberley.

## Discussion

Using this data management process, the project could improve the quality and timeliness of map delivery and data maintenance for each property. The iterative nature of the project enabled the refinement of practices and tools as the project progressed, delivering an increasing quality of output. It also made use of the best information available – including combining remotely sensed, historical data and on-property knowledge – to develop the most accurate spatial and related data.

Although FM4D is a valuable application, it requires buy-in by the property managers to invest their time in learning and using the system, while still managing daily operations.

Despite involving property managers in all stages of the project, uptake has not happened as quickly as first expected. In future, uptake could be improved by building greater capability within AIA project officers who could work directly with property managers to refine the data and generate printed outputs.

AIA's Western Operations Manager is already worked closely with several properties in Western Australia with great success. Supporting AIA agribusinesses to involve young Indigenous workers in this process could help share the load and develop expertise among a new generation of Indigenous workers in the agricultural sector.

For the project to remain a success, buy-in from the business is essential. To provide an increasing return on investment the business must drive the project. This requires improved communication of the business benefits of the data and system, and implementation of standardised property management processes. More comprehensively embedding the use of the system into standard property operations will also increase the business value the data and system provides.

Furthermore, for the system to inform business decisions, the data in FM4D must be routinely maintained to ensure currency and consistency across agribusinesses. This can be achieved if the maintenance of the property infrastructure information in FM4D is brought into core business processes. Good agribusiness information supports good agribusiness decisions.

## **What we would do differently**

Due to time and budget restrictions, the project team was not able to ground truth infrastructure information. Instead, the advice of AIA station managers was relied on for on-site observations. Visiting properties ourselves would have provided an improved appreciation of property layout, enabled a higher quality product, and assisted in confirming infrastructure details that could not be confirmed remotely.

The project would also have benefited from more system champions within AIA to encourage the adoption of FM4D and to support training for property staff.

## **Future plans**

The ILC intends to continue working with FM4D to expand AIA's access to ILC property infrastructure information. The project has been extended to the end of 2017 with the intention of further extending it into 2018.

Within the ILC, FM4D is being used to support accounting, land management, and Natural Capital Accounting projects. The ILC is keen to standardise implementation of the FM4D across the ILC groups to underpin the continued improvement of property and project management and assist the ILC to continue building a detailed understanding of Indigenous Held Land.

Through integration with standard business workflow, property infrastructure information can be used to underpin existing property and project management, insurance, asset management, and herd management systems to better inform business decisions.

The ILC will continue to increase collaboration with AIA agribusinesses, standardise use of the FM4D, and ensure managers are trained and resourced sufficiently to use the system.

## **Conclusion**

The pilot project has succeeded in building knowledge of agribusiness property infrastructure for use with FM4D.

It has reinforced the importance of working closely with businesses and ensuring that staff are adequately supported.

It demonstrated the business benefits of collating and collaboratively managing information and showed that there is significant potential for streamlining decision making through integration with existing systems.

We are happy to see the growing interest in extending the project's scope in the future.