



Australian Government



FarmPrint benchmarking tool brings CSIRO expertise to farmers



FarmPrint is a unique tool designed to enable Australian farmers to monitor, benchmark and evaluate their on-farm carbon footprint, an important step in identifying actions that can lift the sustainability of their farming operations – improving their own FarmPrint.

FarmPrint is the product of the Energy, Emissions and Efficiency Advisory Committee – 3EAC – a unique collaboration combining the scientific expertise of the CSIRO with the operational experience of MIRA, one of Australia's largest agricultural investment managers, and the specialist low carbon investment focus of the CEFC.

Together with the CEFC, MIRA is using its broad portfolio of agricultural assets to pilot and prove up new farming technologies and production processes, paving the way for the agricultural industry to reduce overall emissions and increase productivity.

This Investment Insight provides an update of the development and testing of FarmPrint in an initial pilot on row cropping assets.

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MIRA and Viridis Ag are hugely valuable project partners because they have allowed us to work with the CSIRO to demonstrate that FarmPrint works on a large scale, across a wide geographical spread. We are excited to see these gains shared with other agriculture producers as they are more developed, to help them cut their own emissions.”

Rory Lonergan,
Executive Director, CEFC

Key features

FarmPrint is designed to be a practical tool for Australian farmers. It is specifically suited for Australian agricultural conditions and draws on CSIRO science. The tool has been piloted on properties run by Viridis Ag, an agribusiness which delivers on-farm operations for a MIRA-managed agricultural investment fund. The benchmark is determined by using the Australian Life Cycle Inventory database, with FarmPrint aiming to be as granular as practicable to determine how an individual farm performs in any particular region against an 'average farm' benchmark.

Key features include:

- Enables monitoring and reporting of an individual farm's carbon or 'farmprint'
- Supports benchmarking with other farms
- Factors in both the area and functional output of a farm
- Identifies farm activities generating high levels of emissions
- Supports decisions about technologies and actions to lower emissions
- Provides additional insights into land and water use, eutrophication, ecotoxicity, acidification and soil erosion

Sustainability drivers

Australian agriculture will increasingly need to provide solid data on the emissions output per unit of production, to meet consumer demand for sustainable products and investor requirements for substantiated evidence of on-farm sustainability, including quantitative metrics.

For many great family farmers, efficient farming practices have always been understood to increase productivity. The FarmPrint tool has been designed to now measure this efficiency with quantitative data.

The FarmPrint methodology and implementation reflects the 3EAC's key objectives, to:

- decrease the emissions intensity of agriculture production
- improve Australia's natural resource base, with enhanced productivity and climate resilience
- increase the value of Australia's agricultural sector, including attracting investment, by capitalising on the benefits of sustainability.

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We know that many landholders are interested in the idea of measuring their emissions, but there has been confusion about what process and tool is most credible. There is definitely a need for consistent methodology that is applicable in a specifically Australian context, and that's what FarmPrint can offer.”

Dr Maartje Sevenster,
FarmPrint co-ordinator and
Senior Research Scientist,
CSIRO Climate Smart Agriculture Group

Economic benefits

In addition to lower emissions and enhanced production, sustainable farming offers a range of economic benefits, which have the potential to deliver important long-term financial gains to agricultural producers.

1

Carbon credits

Which can be earned through enhanced sustainability performance

2

Ecosystem services

With the potential to incentivise and reward farmers for ongoing environmental stewardship

3

Procurement

To encourage sustainable farm inputs with the emphasis on minimising the use of emissions intensive inputs such as fertilisers and pesticides

4

Impact Investment

Giving farmers improved access to capital from investors and financiers committed to low carbon outcomes

FarmPrint pilot and Viridis Ag

In a 12-month pilot, the FarmPrint dataset and methodology was tested on row cropping farms operated by Viridis Ag, an agribusiness which delivers on-farm operations for a MIRA-managed agricultural investment fund.

Viridis Ag entered data for each of its farms into the FarmPrint tool, to record the hectares planted, yield received, all inputs applied and management activities undertaken for each of the farms it operates.

FarmPrint can be used to calculate the effects of many management activities, such as seeding techniques, cultivation techniques, harvesting methods and the fertiliser and chemical applied. While FarmPrint doesn't require all of this information to calculate a result, more data will produce a more accurate result.

Using this data, FarmPrint produced the total carbon emissions for each farm and the emissions produced per tonne of output. Viridis Ag combined the results of each farm to determine its overall carbon footprint.

Robust calculations

FarmPrint's robust calculations allowed Viridis Ag to get a better understanding of the amount and source of its on-farm emissions, particularly fuel and fertiliser.

While Viridis Ag expected fuel would make up a significant portion of its emissions profile, it was unable to measure how significant this was. Benchmarking allowed Viridis to understand how fuel efficient it was relative to other farms and to determine whether its emissions impact was in line with its peers.

Embedded emissions

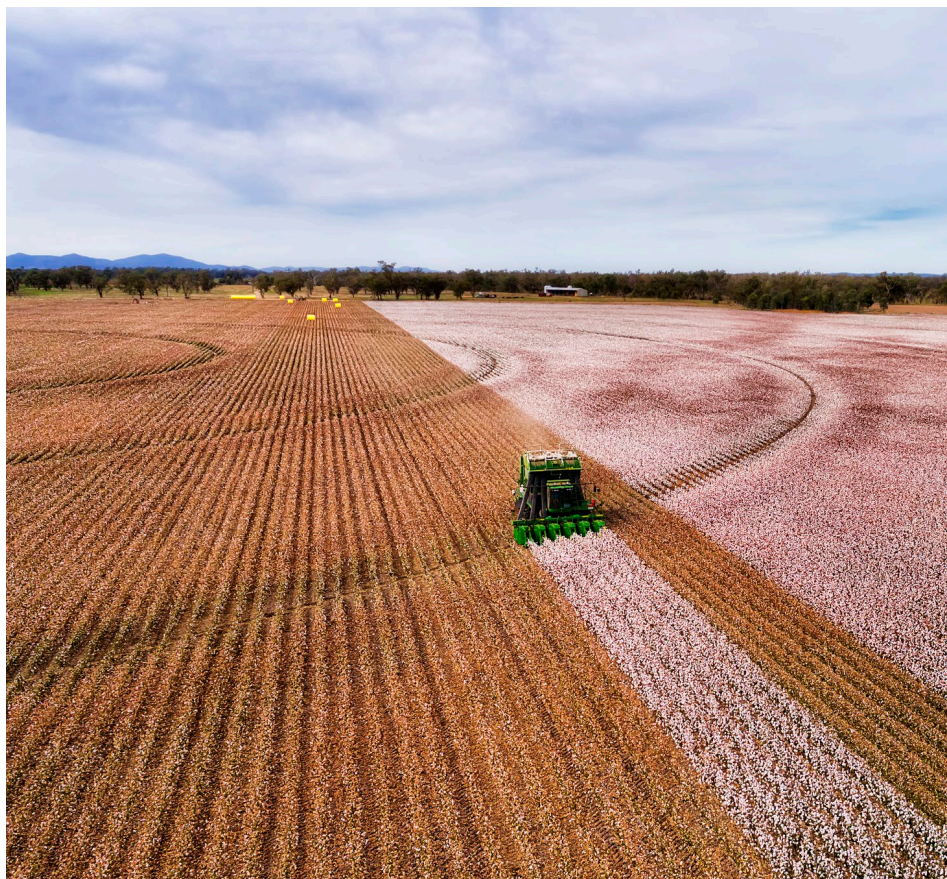
Of particular interest was the FarmPrint analysis of the embedded emissions in fertiliser products. While Viridis Ag was aware that fertiliser had considerable embedded emissions (i.e. the process of making fertiliser is emissions intensive), it was helpful to see just how significant fertiliser was in the overall emissions profile.

Having determined its carbon-emissions profile, Viridis Ag now has the information it needs to build a roadmap towards a lower emissions-intensity operation.

Understanding the benefits

The key benefit of FarmPrint is the ability to track any reduction in inputs and the corresponding reduction in carbon emissions.

Viridis Ag will continue to use FarmPrint in the coming years, including bringing together approximately three years of farm data so it can more fully understand the potential long term benefits that the FarmPrint methodology is delivering to its operations.



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In many ways, the agriculture sector has had a bit of a head start on the sustainability front. Producers in our sector now understand that they have a unique opportunity to drive positive change too. We can tackle some of the big problems facing our world, helping to build a more sustainable society and environment.”

Elizabeth O'Leary,
Head of Agriculture, MIRA

Sustainability and profitability

According to Sean O'Reilly, Division Director and Head of Crop Australia, MIRA, much of the desire to improve environmental performance within the agricultural sector is self-driven.

"Farmers know that sustainability and profitability go hand-in-hand," says Mr O'Reilly.

"They're also increasingly aware of the need for a social licence to operate. The challenge has always been that it's difficult to measure sustainability.

"It's very hard to look at your farming systems and measure the emissions impact of a specific intervention. FarmPrint provides a great opportunity to look at the metrics and ask what does this particular input do, or what does this cultivation method do? It's not just theoretical, it's farm-tested and paddock-ready."

The FarmPrint analysis confirmed the Viridis Ag view that profitability and emissions reduction are aligned in farming. Viridis Ag is already looking for opportunities to reduce input costs such as fuel and fertiliser, while maintaining high production levels. FarmPrint showed that reducing these input costs will also reduce the emissions intensity of farming operations.

Technologies under consideration include:

- machinery that features low emissions, electric, or low fuel consumption capability
- crop rotations to lower nitrogen use
- fertilisers with lower embedded emissions.

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Sharing data doesn't compromise your competitive advantage. Rather, it's an opportunity to learn from our neighbours who are doing it well. The power of a benchmarking tool is that it accelerates our learning and we can share that learning to gain collectively as a sector.”

Sean O'Reilly,
Division Director and
Head of Crop Australia, MIRA

Why would other farmers use it?

FarmPrint has shown itself to be a scientifically robust method of understanding the emissions profile. It is a tool to back up any claims that farmers may wish to make about their emissions intensity and overall sustainability position.

FarmPrint allows farmers to measure the specific impact of one intervention. For example, it can accurately measure the impact of reducing nitrogen on the back of a legume crop.

It is important to have a tool with this level of scientific rigour in the industry, to prepare for potential certification requirements in future.

Viridis Ag row cropping assets



~111,240
hectares



2019 season

~95,000
tonnes grain harvested
(long term average 250,000t+)



12
farm aggregations



National
WA, SA, NSW, Qld

FarmPrint input

Details per farm

Location by SA2 statistical area

Property area, or assessment area

Land use conversions if applicable, area of set aside land

Cultivation in the assessment year: crop, dryland/irrigated, area, yield

Planting and harvest dates

Tillage and residue management details

Water use (ML/ha) if irrigated

Fertiliser use by crop: products, quantities/ha, lime etc)

Crop protection by crop: products, quantities/ha

Fuel use by farm or crop, or tractor operations by crop; aerial spraying

Irrigation pump specifications, including bore depth and pressure head, diesel, grid electricity or solar energy use

Soil organic carbon (tonnes/hectare) and long-term mean annual rainfall and temperature

FarmPrint output

Impact per farm

FarmPrint translates farm activity data into environmental impact scores for monitoring and benchmarking purposes.

For each environmental indicator category, results are presented for the whole farm, as a percentage of total environmental score, per hectare or per tonnes of crop produced.

A breakdown is given by activity as well as by emissions scope (1,2 and 3) across eight environmental indicator categories:

1
Climate change

2
Abiotic depletion

3
Acidification

4
Eutrophication

5
Ecotoxicity

6
Particulate matter formation

7
Water scarcity

8
Land use intensity

Using FarmPrint

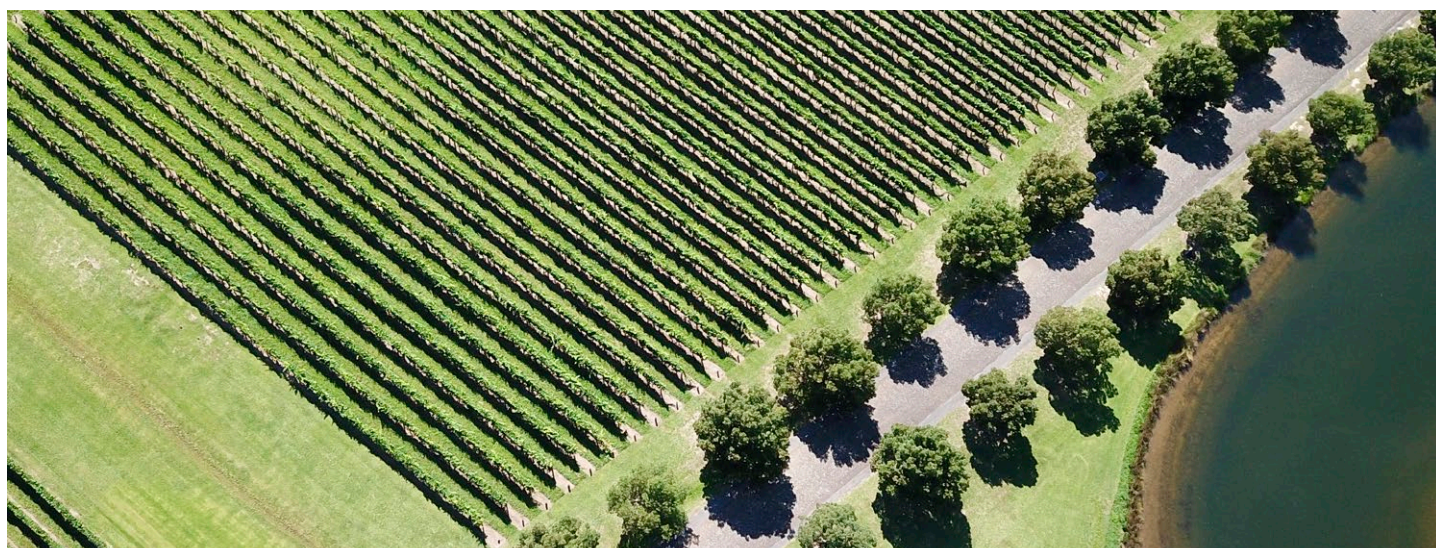
FarmPrint is a web-based tool that allows farmers to input operational information about their farm to calculate the intensity of their current emissions footprint – their FarmPrint.

Activity data is entered for each crop grown in the reporting year, with the corresponding benchmarking values automatically populated. Both farm and benchmark activity data are automatically translated into direct and indirect emissions impacts or land use intensity per hectare of cropping.

A reporting cycle is approximately one year, with start and end dates set, so that all activities supporting a harvest can be taken into account.

“Quantitative data on ecosystem services are very important in managing our investments in agriculture. Without quantitative science-based data it is difficult to assess the effects of the management practices employed. We are excited the FarmPrint tool is pioneering in gathering such data and are looking forward to the next steps.”

Jos Lemmens,
Senior Portfolio Manager Natural Resources, APG which invests in agricultural funds managed by MIRA





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With FarmPrint, we use spatial data to make the farm profiles as accurate as possible. We input details like rainfall and temperature data that allows results to be location-specific, rather than applying blanket emissions scenarios. We can also input specific data about the client's cropping regime that enables genuinely useful comparisons with regional benchmarks.”

Tim Grant,
Director and Founder of Lifecycles,
FarmPrint contributor

Farm by farm comparisons

The benchmarking functionality incorporated in FarmPrint is designed to allow the farmer to compare the environmental profile of their farming practices to an “equivalent farm” of the same area, growing the same crops in the same region, with pre-defined typical practice. This includes a pre-defined typical rotation cycle.

Each benchmark result is drawn from a specific rotation schedule, which drives the soil carbon module and the benchmark nitrogen input. FarmPrint can draw on historic baseline information per farm where available, or use the relevant regional benchmark. Where the farm produces crops that are uncommon for the region, a separate business as usual reference may be required.

The FarmPrint pilot developed benchmarking values for:

- Wheat, oats, triticale, barley
- Maize, sorghum
- Cereals for hay/silage
- Canola, sunflower
- Soybean, peanut
- Chickpea, field bean, field pea, lentil, faba bean, lupin, mung beans

The benchmarking values will be extended to other Australian agricultural outputs as the FarmPrint methodology is further developed.

From pilot to distribution

The benefits of using FarmPrint are evident for farms of all sizes. It can enable farmers to measure and report environmental performance related to crop production not as a one-off action, but as a long-term process, with the opportunity to demonstrate improved performance over time.

There is also potential for farmers using the tool to form benchmarking groups at regional or state level, sharing best practice across the sector.

The next step is to develop FarmPrint into a tool that can be widely adopted by users – not just in broadacre cropping, but in other agricultural sectors where there is good baseline data available, such as horticulture.

The ambition is that FarmPrint will not be another stand-alone tool, but instead a resource that other tools or interfaces can use. By integrating FarmPrint with existing farming technologies, the administrative burden on farmers can be kept to a minimum, while maximising the chances of FarmPrint’s success.

FarmPrint’s technical report has been published by CSIRO. The next stage is for the tool be developed further to allow for a pathway for broader sector adoption..

FarmPrint sponsorship and development

The **CSIRO** is contributing expert analysis and supporting efforts to share clean energy learnings across the farming sector.

The **CEFC** finances clean energy and energy efficiency improvements across the economy, including in the agricultural sector, to help lower Australia’s carbon emissions.

MIRA, through the portfolios it manages, has a strong track record in agriculture, farm management and commodity production, managing a significant portfolio of farmland to further energy efficiency and sustainability practices in the sector.

Viridis Ag, responsible for on-farm operations, seeks to deliver sustainability through innovation, benchmarking and influencing farm production systems and post-farmgate initiatives. Energy use and emissions are key performance indicators.



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An important thing for us is driving sectoral change when it comes to sustainability. Our experience with other sectors has shown the importance of working with larger operators first, and then sharing their practical real-world experience with smaller organisations. We are encouraged by the early interest in FarmPrint and look forward to seeing it developed further, so it can become available across the Australian farm sector.”

Rory Lonergan,
Executive Director, CEFC

About the CEFC and agriculture

With agriculture accounting for some 13 per cent of national carbon emissions, it is clear the sector can make an important contribution to Australia's transition to a low carbon economy.

As a specialist investor, the CEFC works to increase private sector investment in a diverse range of emissions challenges, including agriculture. In addition to the investment in MIRA, CEFC agriculture-related activities include:

1

Harvesting clean energy benefits

Australian farmers have drawn on more than \$345 million in CEFC tailored asset finance to upgrade to energy efficient on-farm equipment and buildings, improve irrigation equipment

2

Agrifood tech innovators

The Tenacious Ventures Fund I, a specialist agrifood tech investment fund, will use CEFC finance to invest in up to 20 agrifood tech companies aiming to lift farm efficiency and food and fibre yields, while cutting inputs and emissions.

3

Better soil, lower emissions

Australia's Soil Carbon Company is drawing on CEFC finance as it develops a microbial treatment for seeds with the potential to lift soil organic carbon levels, improving drought resilience, increasing productivity and cutting emissions.

4

Collaboration gets practical

Together with the National Farmer's Federation (NFF), the CEFC developed a practice guide to proven clean energy solutions that Australian farmers can implement to lift energy efficiency and lower emissions.



About the CEFC

The CEFC has a unique role to increase investment in Australia's transition to lower emissions. With the backing of the Australian Government, we invest to lead the market, operating with commercial rigour to address some of Australia's toughest emissions challenges – in agriculture, energy generation and storage, infrastructure, property, transport and waste. We're also proud to back Australia's cleantech entrepreneurs through the Clean Energy Innovation Fund, and invest in the development of Australia's hydrogen potential through the Advancing Hydrogen Fund. With \$10 billion to invest on behalf of the Australian Government, we work to deliver a positive return for taxpayers across our portfolio.

cefc.com.au