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To offset or inset – that is the question

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Introduction

Soil carbon sequestration has been heavily promoted as a climate mitigation strategy by the Australian Government, but the magnitude of its potential effect has been overstated. The practical mechanism is through farmers undertaking a soil carbon farming project to earn carbon credits under the Australian Carbon Credit Unit Scheme. Undoubtedly there are agronomic and environmental benefits for farmers to improve soil health through increasing their soils' organic matter. But there are significant drawbacks to farmers selling carbon credits to buyers to use as offsets for their own greenhouse gas (GHG) emissions, rather than retaining or 'insetting' their valuable carbon to reduce the emission intensity of their own produce, which would make them preferred suppliers in national and international markets.

Background

If there is any chance of limiting the projected increase in the mean global temperature to 1.5°C by 2100, as required under the Paris Climate Agreement, not only do all human-induced GHG emissions need to be eliminated, but a very substantial reduction in atmospheric carbon dioxide must also be achieved through negative emission strategies.

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A fundamental premise of the concept of carbon offsets is that the carbon sequestered must be additional to that which is sequestered under 'business-as-usual' management.

One such negative emission strategy heavily promoted in the Australian Government's Long Term Emissions Reduction Plan (2021), has been an expectation that soil carbon sequestration, acting through an increase in stabilised soil organic matter, will provide 20 per cent of the offsets needed to achieve a net zero economy. The primary mechanism for encouraging landholders to achieve this has been through Australia's Carbon Credit Unit Scheme, resourced by the Emission Reduction Fund (ERF), which incorporates the Carbon Farming Initiative, first legislated in 2011, and administered by the Clean Energy Regulator (CER). Under this scheme, for each tonne of carbon dioxide equivalent (CO_2e) that is sequestered one Australian Carbon Credit Unit (ACCU) can be earned.

According to the CER register, of the 139,316,681 ACCUs awarded to 2022 projects since 2011–12, only 254,913 of these units have been for a total of 498 soil carbon projects. That is, for the more than 10 years the program has been running, only 0.18 per cent of the ACCUs issued have been for soil carbon projects and that for only 7 projects (CER 2023). Hence, the idea of soil carbon farming earning money from ACCUs has not attracted much support from Australian farmers.

Prior to March 2022, income from ACCUs was mainly earned by a farmer selling to the Australian Government at a contract price determined by reverse auction. This price averaged only $14.90 over 15 auctions. However, in March 2022 the Government decided to allow farmers to withdraw from these contracts and sell on the voluntary market where the price fell from >$57 and at the time of writing hovers around $30 per unit (accus.com.au).

Buyers in this market are businesses that purchase ACCUs to 'offset' their own emissions under the amended Safeguard Mechanism, when either these emissions are technically too difficult to abate or commercially it is cheaper to buy offsets than invest in emission reduction technologies.

A fundamental premise of the concept of carbon offsets is that the carbon which is sequestered in the program must be additional to that which is sequestered under 'business-as-usual' management (White 2022). In the case of soil carbon, this requirement means that farmers who, through good management, have already built up the carbon in soil organic matter are not able to benefit under the ERF rules. However, these farmers will have achieved productivity benefits that generally exceed any extra income derived from ACCUs (Meyer et al. 2015), which must be discounted by fees paid to aggregators of up to 30 per cent of the ACCU income generated.

On the other hand, by having their farms audited for net greenhouse gas emissions under the government's Climate Active scheme (www.climateactive.org.au), they could be recognised as suppliers of low emissions intensity produce. Such a process is called 'insetting' the carbon credits. Businesses such as supermarkets and manufacturers who have carbon-neutral targets and are aiming to decarbonise their supply chains as quickly as possible will choose such producers as preferred suppliers, with corresponding financial benefits. Notably, the only metric on which the supply chain can purchase lower Scope 3 produce from farmers is on a unitary basis, i.e. emissions intensity. To achieve a lower emissions intensity requires the adoption of efficient practices on-farm, so

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that insetting soil and tree carbon sequestration becomes a vital part of lowering the farm's footprint to ensure priority access to markets.

This creates a dilemma for farmers who have entered soil carbon schemes. If the intention is for the farm to sell low emissions produce, or to demonstrate that they meet supply chain targets by 2030, they will need to 'inset' carbon credits towards their overall farm balance and therefore cannot sell them to monetise the upfront investment. This has potential to make soil carbon credits technically redundant by 2030. Farmers can also no longer sell these ACCUs back to government, and still claim low net emissions status, because all purchased ACCUs are now allocated to the enhanced Safeguard Mechanism's 'cost containment reserve'. These ACCUs are now made available to Safeguard facilities that cannot achieve targeted on-site decarbonisation, or purchase safeguard mechanism credits, or ACCUs on the open market (CMI 2023).

Drawbacks of carbon credits as offsets

The use of carbon credits as offsets has been criticised because their widespread use could delay the deep decarbonisation necessary for the world to meet its Paris targets (Cullenward et al. 2023). Furthermore, there is the possibility of double counting (Cullenward et al. 2023). For example, when generic credits are traded between countries, the same credits may be claimed by the originating and receiving countries, especially if the trade is between private entities (notably, voluntary market carbon credits do not include unique tracking to prevent double counting, so the same soil carbon can be sold on multiple markets). There are also problems of a lack of guaranteed additionality and non-leakage in schemes not subjected to rigorous government regulation, in addition to the impermanence of soil carbon sequestration (Kirschbaum 2006). For example, all the registered soil carbon projects under the Australian ERF have a permanence period of 25 years and there is no obligation for the carbon sequestered to be maintained after that time. This has the perverse effect that ACCUs issued for soil carbon projects before 2025 may not be recognised in Australia's Nationally Determined Contribution report for 2050, the target year for the country to attain net zero, so that overall emissions may increase at the end of the contract period.

Optimistic assessments of the contribution of soil carbon sequestration to mitigating climate change have been challenged for not recognising the effect of carbon saturation (Moinet et al. 2022). As demonstrated in many field trials worldwide, with the exception of peat soils, the rate of soil carbon accumulation slows as the soil approaches a new equilibrium level (Poulton et al. 2018). This phenomenon occurs on a time scale of 25 to 100 years, depending on environmental conditions and soil type – this may occur sooner in sandy soils than clay soils (Powlson and Galdos 2023). In general, clay soils offer more absorbing surfaces for organic compounds and more protection of organic matter against decomposition by soil microorganisms. As a soil approaches carbon saturation, the challenge is that with the sale of soil carbon credits, a farmer may not be able to further increase soil carbon to meet their own

Although the over-riding benefits of increasing soil organic matter are agronomic and environmental, any contribution that this makes to mitigating climate change is welcome.

supply-chain demand in the future. However, the liability of the carbon stock that has been sold must be managed. This is the same principle for trees that are approaching maturity, but the carbon has been sold, meaning there is a need to plant more area to achieve further sequestration.

The last word

There is general agreement about the benefits of soil organic matter for improving a soil's physical condition, which in turn can improve its resilience to adverse weather conditions and contribute to the ecosystem services that depend on a healthy soil. In addition, there are specific examples where crop and animal productivity has been increased, especially when the N supply has not been limiting (Powlson and Galdos 2023). Thus, although the over-riding benefits of increasing soil organic matter are agronomic and environmental, any contribution that this makes to mitigating climate change is welcome.

The Australian Agricultural Sustainability Framework (McRobert et al. 2022) has clearly indicated that the next ESG criterion for agriculture is likely to focus on biodiversity. Clearly a healthy soil contributes to farm biodiversity as well as general farm sustainability and productivity. There is therefore every incentive for farmers to build soil organic matter to the maximum potential, without being driven by soil carbon credits as the motivator.

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Carbon insetting and offsetting in Australian ag systems

When farmers utilise management practices and strategies to increase soil organic matter, they do more than realise significant benefits to their environment, production, and business. They also enhance landscape soil carbon sequestration: a greenhouse gas (GHG) emissions mitigation strategy supported by the Australian Government and promoted in policy largely via the Australian Carbon Credit Unit (ACCU) scheme. In addition, soil carbon sequestration can be a distinct asset-generating activity for some land managers.

To realise this value in markets, farmers may sell their carbon credits as an 'offset' to purchasers who wish to reduce their respective GHG footprint, or 'inset' the value of their sequestered carbon to reduce their own emissions portfolio and potentially increase the market appeal and/or value of their production.

To help shed light on this complex topic, we asked two people working in the ag carbon space to consider the knowledge gaps faced by farmers, the potential for perverse outcomes and how markets can better contribute to sustained carbon sequestration.

Skye Glenday

Co-Chief Executive Officer, Climate Friendly

Skye is Co-CEO of Climate Friendly, a profit-for-purpose organisation that partners with agricultural producers, traditional owners, conservation organisations, governments and businesses to urgently store carbon, repair nature and advance reconciliation.

David Heislers*

Landscape & Sustainability Analyst, Kilter Rural

David has been with Kilter Rural since 2008 and has had extensive and evolving experience in regenerating farming landscapes on Kilter's managed farmland; registering and managing carbon projects; constructing carbon and environmental accounts; and formalised ESG reporting.

* Note that the views expressed here are heavily my own thoughts and do not necessarily reflect the breadth of view across my organisation.

Question 1 – What are the biggest knowledge gaps for producers when they consider the choice between carbon insets and offsets?

Skye Glenday:

One of the biggest challenges for producers is understanding their carbon emissions profile and carbon management options. It can be difficult for producers to navigate the growing number of carbon calculation tools and government policies and programs. Starting with a natural capital assessment and developing an integrated land management strategy can help select the best tools and applicable programs for the management changes you want to make.

There are also different commercial partnership and supply chain options for carbon management, including choices about whether to "inset" or "offset". Bringing it back to basics – it's important to understand the difference between insetting and offsetting, and that you can do one or both of these (particularly for farms that are carbon positive).

If your integrated land management strategy involves undertaking a carbon farming project, you can generate carbon credits from storing carbon in soil and vegetation, or from reducing livestock emissions. You then have a choice to inset, offset or a combination of both. If you do not undertake a carbon farming project, your main option is to inset.

For example, if you have a carbon project, you may decide to "inset" to negate emissions from fuel, fertiliser, electricity and livestock. This involves "cancelling" some or all of your ACCU certificates you generated equivalent to the number of emissions you want to "inset". In this model, producers may seek greater market access or a price premium on the verified sustainable, carbon neutral agricultural products that they generate. Alternatively, you could decide to sell some or all of your ACCUs to another party. The other party will then "cancel" the ACCUs as an "offset" to negate their own emissions.

Insetting can also be done without generating carbon credits. This involves undertaking an assessment of your "net" emissions profile. No ACCUs are created, but any carbon removals from trees and soil are directly counted toward your carbon reduction and sustainability claims.

David Heislers:

There are many decision points to be considered that for many must be overwhelming. Firstly, there's the identification of whether a landholder is aiming for carbon neutrality outcome for their operational asset (whether for philosophical reasons or ultimately of a reputational value motivation) or aspires for another more direct farm revenue stream from trading carbon credits. By playing the market, that is by selling high and buying low, carbon neutrality can be achieved as well as potentially the recouping of revenue. However, the future market view of this approach remains uncertain, for instance the quality and efficacy of the cheaper purchased offset may come into question.

Whichever pathway is selected, potentially different standards for measurement and reporting apply, all of which are varyingly mature. If formally generating carbon credits, either under the ACCU scheme or an international standard, do you enter into a contract (government or by voluntary private arrangement) or more actively sell on the spot market? How then do you find someone reputable and price-reasonable you can trust to support such complicated endeavours?

The other great quandary is that of time. Not just on keeping on top of the daily transactions of your carbon farming operation (on top of farming operations more generally), but also for how long you need to commit to whatever arrangement you have. To be concerned with a 25 (or 100) year encumbrance on your property under a contracted carbon obligation, or perhaps more a free-wheeling approach whereby carbon is inset for carbon neutrality which is typically just accounted for on an annual basis?

Question 2 – How would you describe the potential perverse outcomes attributed to carbon insetting or offsetting, respectively?

Skye Glenday:

Both insetting and offsetting come with benefits and costs, so it's important to fully understand what will work for your family or business. Integrity is key for both insetting and offsetting, so verifiable results are really important in both contexts. There are two different ways to conduct insetting, and one way to conduct offsetting, as described below.

Insetting without ACCUs could potentially come with lower measurement and verification costs. However, this can be variable depending on any reporting standard requirements. Measuring changes in carbon storage in soils and vegetation is technically challenging. While research is being done to lower costs and new technologies are emerging, oversimplifications or cutting corners to save costs could raise valid questions around integrity and may not meet evolving supply chain or certification requirements. Relying solely on carbon neutrality assessments to inset may result in market premiums to "early movers", but over time the lack of ACCUs behind the transaction could leave producers more vulnerable to a gradual erosion of that premium. Additionally, implementing a practice change without establishing a carbon farming project at the time the change commences may render producers ineligible to start a project in the future. Further, since no ACCUs are issued in this model, the farm emission profile could be more vulnerable to fluctuations in climatic cycles, with lower carbon storage expected during poor seasons. This is because it is harder to carry-over or 'bank' surplus carbon storage between good years and bad if an ACCU is not generated.

Insetting with ACCUs could enhance the negotiating power of producers in the supply chain, as ACCUs have a quantifiable market

value. Additionally, it can potentially help smooth fluctuations between good and bad years. If you generate surplus ACCUs in a good year, there is greater potential to bank them and use them in a year with higher emissions.

Offsetting with ACCUs can provide a new revenue stream through the sale of ACCUs. However, this means the ACCUs that are sold cannot be used by the producer as part of their own sustainability claims, as this would constitute double counting. Additionally, a carbon farming project is a long-term commitment, typically for 25 years, whereas insetting may involve shorter time commitments. As such, carbon farming is not for everyone.

David Heislers:

Carbon insetting is likely something you can progress at your own pace, especially if the motivation is more a philosophical or business reputation building one. By definition it involves a local solution to local emissions, with this solution potentially generating broader local outcomes such as farm productivity gains and increased biodiversity. So, it's part of closing the sustainability loop at the local level and has value in building local community aspiration and wellbeing. However, if insetting was to be mainstream then national progress in sequestration may be slower, less efficient and perhaps less rigorously tracked; and there'd be potentially less and more expensive carbon in the market.

If the insetting approach is established as a core activity guaranteeing market access then the outlook for this activity may escalate quickly. It's also possible that without a premium realised with the commodity being sold post-insetting that this becomes just another (potentially significant) cost to farmers, just to stay in business.

Carbon offsetting, while perhaps more financially rewarding to the landholder (albeit with all the associated obligations), provides a disconnect between the source of emissions and sink of carbon. A carbon emitter, like a land developer clearing native vegetation, can make an easier decision to emit and make simple good with the purchase of a credit. While this transaction is efficient in the form of a market, how are we certain that the original intent to drive down of emissions is actually achieved?

Question 3 – What improvements can be made to carbon markets to drive defined and sustained carbon sequestration outcomes?

Skye Glenday:

The *Integrated Farm & Land Management* carbon farming method that's currently being co-designed with the Australian Government and a broad range of stakeholders provides a great start. A key benefit of this approach is it's a modular design. After more than a decade of experience with carbon farming we know that carbon projects are not one-size-fits-all. Each property is different, as is each land management strategy. A modular approach means that producers can select the land management activities that align with the biophysical conditions of their property and their land management goals. This should enable a greater number of producers to get involved.

Additionally, under the modular integrated farm and land management method, land managers will be able to undertake multiple carbon management activities on a single property for the first time. For example, they can adopt rotational grazing practices to improve storage of carbon in soil and also regenerate native forests on the same property. Undertaking multiple activities in a single project could reduce transaction costs, as one audit can cover multiple activities, and also the cumulative carbon storage from multiple activities can help make the land management practice changes more commercial viability to implement.

Establishment of a voluntary national environment and land data platform,* with strong data privacy protections, is another key innovation that could greatly reduce costs, enhance accuracy of carbon measurement and enable more producers to get involved in carbon management activities.

Lastly, the new Nature Repair Act provides an exciting opportunity for producers to restore and protect biodiverse habitats alongside improved carbon management and sustainable agricultural production.

* This Climate Friendly video helps explains how a voluntary National Integrated Land Database could work: https://youtu.be/vT7bz8FZUUc

David Heislers:

Farmers are already operating in the facing of climate change, whether this is shifts in growing conditions and seasons; or coping with more extreme weather events more often. With multi-decadal obligations on farms participating in carbon markets, somehow these markets will need to be able to operate fairly within this dynamic and not have farmers wearing undue or unintended financial risk. The security of having other benefits recognised, apart from just carbon, is perhaps part key to this. Productivity improvements are likely correlated with carbon, so other ecoservice benefits such as biodiversity, natural pest mitigation, pollination services and flood control – all of which have broader public benefit – ought be enabled to attract a premium on associated carbon credits, if not by un-correlated (to carbon) stewardship payments. Farming is used to the highs and lows of seasons (of both on-farm production and markets), but in an increasingly tougher agricultural environment that is only likely to become more disrupted by climate change effects. A fair return for what farmers do and produce, in addition to an improved diversity of farm income streams, is required if we expect them to be able to weather the headwinds ahead.

Additional comments

Skye Glenday:

When producers are considering how to manage carbon on their property, it's important to assess options from a holistic perspective. While soil carbon is important, it's just one component. Carbon can also be stored in vegetation. Livestock or other agricultural commodities can be managed or produced in a way that has lower emissions. Likewise, different energy supply options for vehicles, machinery, and infrastructure (e.g. solar, wind, gas, diesel, coal etc.) impact the farm emissions profile. Carbon management is also intertwined with biodiversity and agricultural production as part of an integrated land system.

Further, one big development in 2024 is the introduction of mandatory climate risk reporting for large businesses and financial institutions in Australia. While relatively few farm businesses will be required to report their emissions directly under the new rules, it's likely that end-buyers of agricultural products (such as supermarkets) will seek emissions data from their supply chain, and that banks will seek information as part of mortgage arrangements.

Undertaking an assessment of the natural capital on your property (including the carbon, biodiversity, and production profile of your farm) is a helpful first step to both provide you with information to make your own carbon management choices, as well as data that may be required as part of increased supply chain or financial reporting. This assessment can inform development of an integrated land management strategy that is aligned with your family or business objectives and articulates any land management practice changes you plan to make to lower emissions or increase carbon storage, protect or repair biodiverse habitat and increase agricultural sustainability and productivity.

Supporting Australian farmers' decisions on carbon opportunities

As climate change causes an increase in the frequency and strength of natural disasters, Australian farmers must cope with an extended range of financial risks while juggling productivity and efficiency goals. Investing in sustainability measures, improving natural capital and participating in carbon markets offer tangible and intangible rewards, but can also involve cost and effort – and the resulting benefit to the farming business is not always readily apparent.

As discussed in recent AFI publications and events, the proliferation of options for Australian land managers to engage in new carbon opportunities has resulted in a 'confusopoly' which stymies uptake of these opportunities. For many primary producers the perceived cost of participation – be it time, money or the combination of both – is higher than the return. Increasing sustainability-based regulatory and/or reporting requirements in global trade markets and the finance sector add to the confusion and increase the perception of difficulty. The drivers of participation in these opportunities – which include meeting policy commitments, addressing corporate risk and fulfilling consumer demands – often overlap, further muddying the waters from a participant's view.

While confusing, these trends offer emerging opportunities across five distinct value pathways for producers who are able to navigate this complex landscape. Carbon is an essential ingredient for agriculture, and reinvesting this back into farming systems is a win-win regardless of the option chosen.

An online resource developed by the AFI for AgriFutures – the **Carbon Opportunity Decision Support Tool (CODST)** – offers a practical method for landowners and primary producers to navigate the tricky landscape of carbon opportunity choices. The CODST has been designed to also work offline via USB, ensuring producers with poor internet access can still utilise the resource.

Reinvesting carbon back into farming systems is a win-win regardless of the option chosen.

The CODST forms part of a $2 million investment in carbon initiatives by AgriFutures. This multi-year research package aims to build understanding of carbon management, and explain how farmers, growers and supply chain businesses can participate in carbon projects. Supporting Australian farmers and farm businesses to remain competitive in the context of the growing environmental, social and governance (ESG) conversation was one of the driving forces behind the tool's development.

The tool covers five primary opportunity paths for on-farm carbon-building activities:

1. Participation in **the Emission Reduction Fund** (ERF), i.e. generating ACCUs (Australian Carbon Credit Units) as a portfolio to:
    a. sell to organisations seeking to offset their emissions,
    b. retain to offset the ACCU generator's own emissions, or
    c. a combination of hold/sell
2. Participation in private carbon markets (similar to the ERF but without government verification and management)
3. Access to sustainability linked loans or other preferential finance arrangements
4. Carbon neutral certification or accreditation for market access/premiums
5. Productivity gains and improved resilience via systems improvement

By taking users through a decision-tree questionnaire the tool asks users to 'choose their own adventure', to consider their own business plans and the pros and cons of the

The key message of the Carbon Opportunity Decision Support Tool is to know your options and make good choices.

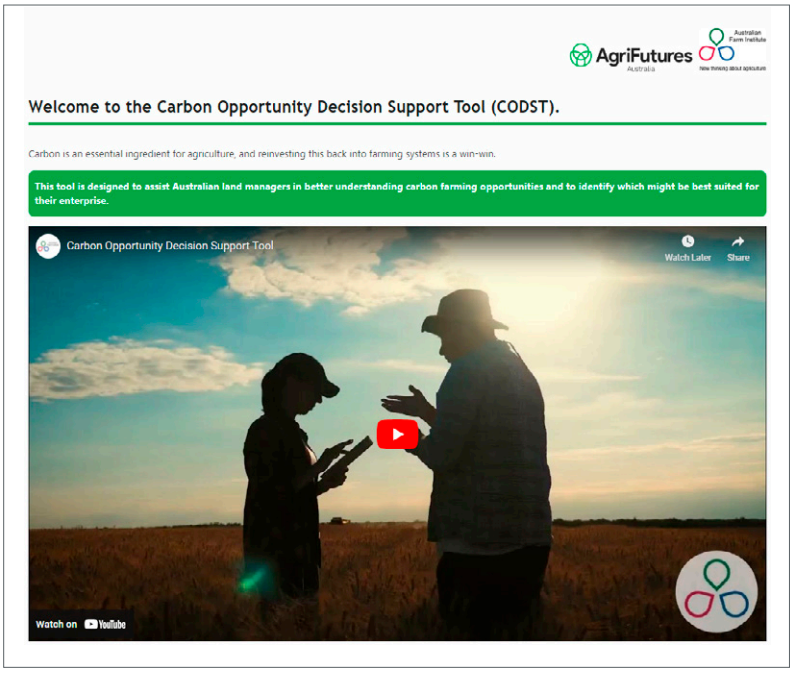
primary options and their interconnection. To help make sense of a complex policy environment, these questions focus on business situation, future plans, risk appetite and attitudes rather than the specific management practices or financial performance of an enterprise.

To be applicable across commodity types, geographical areas and business structures, the CODST has been designed to provide a high-level view and educate users on the key facets of each opportunity. Within the tool, links, additional resources and case studies enable further investigation of particular aspects of carbon sequestration activities.

The key objective of the CODST project has been to identify and clarify carbon opportunity pathways for Australian primary producers, to improve uptake of existing options and to forecast emerging opportunities and risks. With a lot of 'noise' about carbon opportunities, the key message of the tool is to know your options and make good choices. For example, carbon markets are a useful tool in promoting and rewarding sequestration, but they are not the only option. With sustainability reporting becoming mainstream, farmers also need to understand 'insetting' – keeping carbon credits to balance your own emissions ledger – as well as offset markets.

As a key component for resilient agricultural systems, building up carbon in your production cycle is crucial. The CODST has been designed to help producers work out which pathway best fits a business's goals, capabilities, and strategic plans, emphasising that whatever path is chosen, getting carbon back into the farming system is the ultimate goal.

- Access the tool at **carbontool.farminstitute.org.au**



On to the next paddock

After investing enormous energy and effort into the AFI over the past eight years, Executive Director Richard Heath is leaving the Institute to lead the nascent Zero Net Emissions from Agriculture Cooperative Research Centre (ZNE-Ag CRC) in February 2024.

Richard said it has been a genuine privilege to be part of the only independent think tank for the sector, and thanked the AFI team for consolidating the Institute's position as a leader in policy thought.

"This team punches well above its weight to effectively deliver quality research to advance Australian agriculture," Richard said.

> *"During my time at AFI we have made substantial contributions to national discussions on digital agriculture, drought response, social licence, and sustainability to name but a few. I am very proud that these contributions will continue to inform the development of policy for many years to come.*

"I'm excited to be joining the ZNE-Ag CRC at a time when collaborative research to advance the sustainability goals of Australian agriculture has never been more important," he said.

Speaking on behalf of the AFI staff, AFI General Manager and Acting CEO Katie McRobert said while they looked forward to working alongside Richard on complementary work to benefit the industry, they would miss his presence in the team.

"It's a rare thing to find that alchemy within a group of workmates where everyone sparks off each other in such a positive way," she said.

> *"Richard's role in bringing together this extraordinary bunch of people is certainly one of his great achievements – thanks to his direction, we've built an amazing resource of human capital in the AFI. In addition to an impressive depth of knowledge and breadth of experience, Richard brings a strong sense of camaraderie and genuine enjoyment of the work into a team dynamic. It's been both a professional honour and personally a lot of fun for us all to share part of the journey with him."*

AFI Chair Andrew Spencer expressed the Board's deep appreciation for Richard's tenure, describing him as an outstanding leader.

"Under Richard's direction the AFI has not only remained at the forefront of Australian farm policy discussions to ensure a viable future for our agricultural community, but also extended its focus on evidence-based policy solutions to the global stage," Andrew said.

> *"While Richard will be sorely missed, the Board has full faith in the team to continue delivering research, commentary and analysis of the highest quality into 2024, during which we will also celebrate the milestone of the AFI's 20th year."*

Colleagues from the Global Forum on Farm Policy and Innovation (GFFPI) also acknowledged Richard's important role as a co-founder of the international collaboration initiative.

"We wish Richard the very best as he takes up this important position," said Shari Rogge-Fidler, CEO of Farm Foundation and GFFPI member.

> *"His drive and passion were vital in bringing together the GFFPI partners to increase the sustainability of agriculture across the world, and I know he will continue to pursue that goal as he tackles this new challenge."*

Richard starts as CEO of the ZNE-Ag CRC on Monday 26 February.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Land use competition priorities in a net zero future

This article is an abridged version of the AFI Discussion Paper '*Balancing land use competition priorities in a net zero future'. Download the full paper at* farminstitute.org.au/land-use-priorities-in-a-net-zero-future.

How we use land

As a significant user of Australia's land, agriculture is both vulnerable to and responsible for mitigating the heightened challenges brought about by climate change (McRobert et al., 2019). Activity in the agriculture and land sectors contributes a notable portion of Australia's greenhouse gas emissions; reducing those emissions and increasing stored carbon in landscapes is an important part of stabilising global temperatures.

A growing population means land uses, such as residential, mining and renewable energy generation will need to continue to expand to meet future increased demand. This will create a heightened risk of increased land use conflict in the future as incompatible industries compete for limited, and declining, resources. Further, the impacts of climate change will negatively impact on the health of the natural capital agriculture relies on to produce food and fibre, reducing the land available for profitable and sustainable agricultural production (McRobert et al., 2019).

Carbon storage and biodiversity improvement programs are frequently cited as potential panaceas for the emissions problem – after all, Australia has so much land, and so much of it considered 'uninhabited'. Yet land use change, e.g. from agricultural use to reforestation, requires trade-offs; and trade-off decisions must be informed by evidence and a long-term view of societal benefits.

The Land Gap Report (Self et al., 2023) notes that the area of land required for land-based carbon removal to meet global governmental climate mitigation pledges is equivalent in area to the combined areas of the European Union,

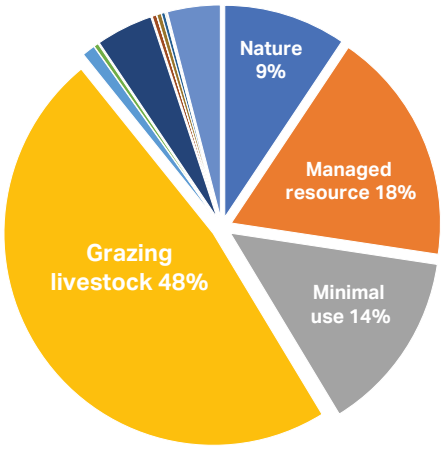


Figure 1: Land use in Australia (based on Land Use of Australia 2015–16, ABARES).

Source: ACLUMP (2016).

Turkey, South Africa, and India. Climate change must certainly be arrested, and at the same time we must continue to provide food and shelter.

Australia's land use is predominantly agricultural, with 48% dedicated to grazing on native vegetation or modified pastures, 4.4% dedicated to dryland cropping and a total agricultural use of 53.5% (Figure 1), with the Indigenous estate at 438 million hectares or 57% (Jacobsen et al., 2020). Farmers make up just 2.5% of the nation's workforce (NFF, 2017b) and Indigenous Australians just 3.8% of the total population (ABS, 2021). Both groups are often overlooked and marginalised in decision-making at a national scale – yet both are vital to ensuring land use change is managed respectfully and sustainably for the greater good.

Land use in a net zero future

As we shift to a low carbon economy, competition for land use will continue to increase. Renewable energy resources will be in higher demand, along with mining of precious metals for the development of associated infrastructure, requiring an expanded land

> *"People talk about competing land uses co-existing with one another, but no one wants to just exist; we want to flourish and thrive..."*
> *(Fox & McRobert, 2020)*

use footprint. Population growth will increase pressure on agricultural production and productivity. Avenues for carbon sequestration, biodiversity preservation and ecosystem connections will become critical pieces of land use policy.

These competing priorities for land use are not new. To date, markets have largely been left to identify the highest value land use, whether that be residential, commercial or industrial use; farming and forestry, energy production, infrastructure, mining, waste management, or more recently environmental market participation. While markets are starting to identify investment in natural capital as long-term value creation (IIRC, 2013), this is a slow-moving shift. Leverage must be employed to ensure short-term private goals do not impede the long-term public good.

Many primary producers across Australia already accommodate energy, infrastructure and environmental land uses alongside or outside agricultural production on their properties, with varying levels of success and comfort. Solar, wind, and coal seam gas projects, as well as programs to sequester carbon and/or protect biodiversity have been integrated across Australian farms. Return on investment calculations utilising financial information from these markets are one of the key inputs landholders use in determining whether to integrate multiple land uses on their properties; yet this information is notoriously difficult to obtain or compare. For small to medium scale land managers, these decisions are rarely made on a purely financial basis. Family considerations (succession planning), social expectations and emotional attachment to the land are all key influencing factors.

Emissions reduction is not the only land-related crisis the world faces. Achieving the UN Sustainable Development Goals (SDGs) includes ensuring food security to achieve zero poverty, providing equitable access to clean water and protecting biodiversity and ecosystem landscapes. The challenge of perverse outcomes from investing in one SDG area at the potential expense of others has been identified since they were established. Most SDGs involve utilising land, other natural capital assets, or a combination of both. The multi-faceted nature of the issue is demonstrated in the Australian Agricultural Sustainability Framework (AASF), which incorporates environmental, social and governance factors to provide a holistic view on sustainability values across the sector.

The recent Parliamentary inquiry into food security made a point of recommending that "the Australian Government develop a strategic plan to protect agricultural land from … utilisation for non-agricultural purposes" (House Standing Committee on Agriculture, 2023). These findings echo the results of the AFI's 2023 Roundtable on connecting Australia's agrifood strategies, in which participants agreed that better coordination of land use policies and strategies at both a national, cross-sector level and between different levels of government was an urgent imperative.

The Land Gap Report estimates that approximately 1 billion hectares of land are needed to undertake biological carbon removal projects to meet current global climate pledges (Self et al., 2023). This analysis also calculated that more than half of the land required to meet the sequestration levels for net zero pledges would need to change from its current use to be solely used for plantations and/or forests (Dooley et al., 2022). Achieving these levels of land-based carbon removal could have disastrous effects on global food security and significant socio-economic impacts on rural communities.

Many national pledges appear to be overreliant on land-based carbon removal, avoiding emphasis on emissions reduction activities across the economy. Incorporating increased carbon sequestration on land already used

Achieving these levels of land-based carbon removal could have disastrous effects on food security.

for agricultural purposes will not be enough to achieve current global climate pledges. Although it will undoubtedly play an important role, on-farm carbon sequestration is not a silver bullet solution to achieving net zero. Land use decisions and planning must emphasise economy-wide emissions avoidance, with land-based carbon capture storage (CCS) and sequestration treated as essential additions to the net-zero toolkit.

Policy developments

In September 2022, the Australian Government ratified its commitment to the Paris Agreement, confirming a Nationally Determined Contribution (NDC) to reduce emissions to 43% below 2005 levels by 2030. The Net Zero Plan currently in development includes legislated GHG emissions reduction targets and a commitment to reach net zero by 2050.

Although technology and innovation remain key pieces of the net zero puzzle, current policy has seen a policy shift towards a combination of legislated targets and incentivising private markets to achieve public good outcomes.

The Emissions Reduction Fund (ERF) governed by the Clean Energy Regulator (CER) places a price on carbon equivalent gases. This includes the establishment of the Safeguard Mechanism which enforces large corporate polluters to reduce their emissions. Much of Government's investment into reducing agricultural emissions has focused on encouraging landholder participation in carbon markets through the Carbon Outreach Program and grants for baselining soil carbon on farms.

Of the 2009 registered carbon projects (as at November 2023), 27% were listed as using the agriculture methodology – and 67% of these ag projects are run by a single soil carbon project developer. Australian farmers are not flocking to carbon markets. To ensure permanence of sequestration, participating in carbon markets is a long-term commitment. To make the best decision for future sustainability of their enterprise, landholders must consider whether participation in markets aligns with their risk appetite, future business strategy and succession plans. Transaction costs are another inhibiting factor: productivity and co-benefits from increasing soil carbon can outweigh potential benefits from participating in markets (White et al., 2021). However, compromises in policy design intended to make sequestration more attractive by reducing transaction costs can render it a highly inefficient policy (Thamo & Pannell, 2016).

It has been suggested that environmental markets are a trap for the agricultural sector, providing "false hope for farmers and are a distraction from the action we need now" (Beshara, 2022). Historically, polluters have preferred to purchase offsets to reduce their carbon accounts, rather than have regulatory interventions for emission reduction thrust upon them; a contributing factor in the overreliance on land-based carbon sequestration / removal options to achieve net-zero targets. Although some landholders have benefitted from the establishment of private markets such as the ERF (and potentially the newly-legislated Nature Repair Market), market incentivisation is viewed by some of Australia's leading economists as a flawed policy instrument. The implementation of incentive structures to 'offset' carbon or biodiversity losses by achieving additional gains elsewhere can introduce unintentionally contrary incentives.

The National Agriculture and Land Sectoral Plan (under development) intends to enable investment and promote a common understanding of what is achievable in emissions reduction. Five other sectoral plans are also under development, all of which interrelate with agriculture, covering electricity and energy, transport, industry, resources and built environments. The success of these plans and their ability to drive action on emissions will depend largely on stakeholders' access to land or ability to influence land use decisions.

Sectoral interdependencies must be explicitly recognised to ensure these plans will interact with one another successfully.

Do environmental markets provide 'false hope for farmers' and a distraction from the urgent action required?

Where are the tensions?

Human beings have a strong impulse to choose sides. In agriculture we see examples of this 'us' versus 'them' mentality play out between urban dwellers and rural communities, environmentalists and farmers, 'regen' and conventional producers, even between ag commodities. While choosing sides is unhelpful, expecting utopian harmony isn't realistic. Focus should instead be on ensuring that such tensions lead, where possible, to constructive outcomes.

For example, the formation of Landcare into a national program demonstrated the value of previously combative sectors (agriculture and environment) working together, driven by shared values for a common good. Collaborations between Aboriginal people and the agricultural sector offer a transformative path forward for respectful, sustainable land use (Australian Farm Institute, 2023). Local Aboriginal Land Councils, as custodians of their local areas, are pivotal; together with farmers, they can safeguard cultural heritage sites, implement sustainable traditional practices, and celebrate biodiversity (Captain-Webb, 2023).

Identifying shared values is key to unlocking constructive collaboration across stakeholder groups with competing priorities; an approach used to positive effect in development of the AASF.

Increased competition for finite land resources to fill multiple (and often not complementary) land uses is likely to result in disputes not only between local communities and external entities but also within the communities themselves. While types and sources of land use conflict across can be diverse, common contributing factors include planning, compliance resourcing, communication and education (McRobert et al., 2020).

In situations where landholders receive compensation for sharing land resources, such as in coal seam gas access agreements, compensation calculations often do not account for non-economic impacts, such as diminishment of natural or social capital (Fox & McRobert, 2020). Economic impacts capture only a portion of the effects of such conflict on land managers and the community. Mental health, social and physical amenity, industry decline and erosion of trust are primary impacts of land use conflict (McRobert et al., 2020); and in regional and remote communities, mental health and wellbeing services are often difficult to access or oversubscribed.

Australia does not yet have nation-wide strategic identification of prime agricultural land. State and Territories have varying levels of plans and strategies in place, however there is no overarching national picture in place. Identification of critical assets and planning decisions must balance the trade-offs between short-term economic gains and long-term sustainability of the agricultural sector. They must also consider the net social benefits to a community and mental health impacts on residents from competing land uses (Fox & McRobert, 2020). Proactive identification of critical assets, both for agriculture and other competing land uses can help decrease conflict.

Where is the leverage?

Financial incentives alone may not be enough for farmers to engage in practice changes such as environmental planting (Westaway et al., 2023). In fact, people don't make rational decisions as often as we'd expect – or hope. Traditional economic theory assumes that human beings are generally rational, and that markets, institutions, and organisations are capable of self-regulating. Behavioural economics offers a different view, and helps explain why people make illogical choices.

Differentiating the 'why' of a desired action from the 'how' and 'what' makes the value clearer. 'What' (i.e. actions, tasks, activities) is driven by spatial reasoning and analytical thinking. 'How' (systems and processes) and 'why' (purpose

and passion) are driven by trust and gut instinct. Understanding behaviours and heuristics is crucial to developing successful policy.

Focusing on sustainability **outcomes** rather than specific **practices** allows for innovation on-farm and provides farmers with flexibility to achieve efficiencies unique to their enterprise (Heath, 2023). Reliance on practice-based approaches stems from the lack of options for scalable, efficient, and economic direct measurement of outcomes that are being claimed.

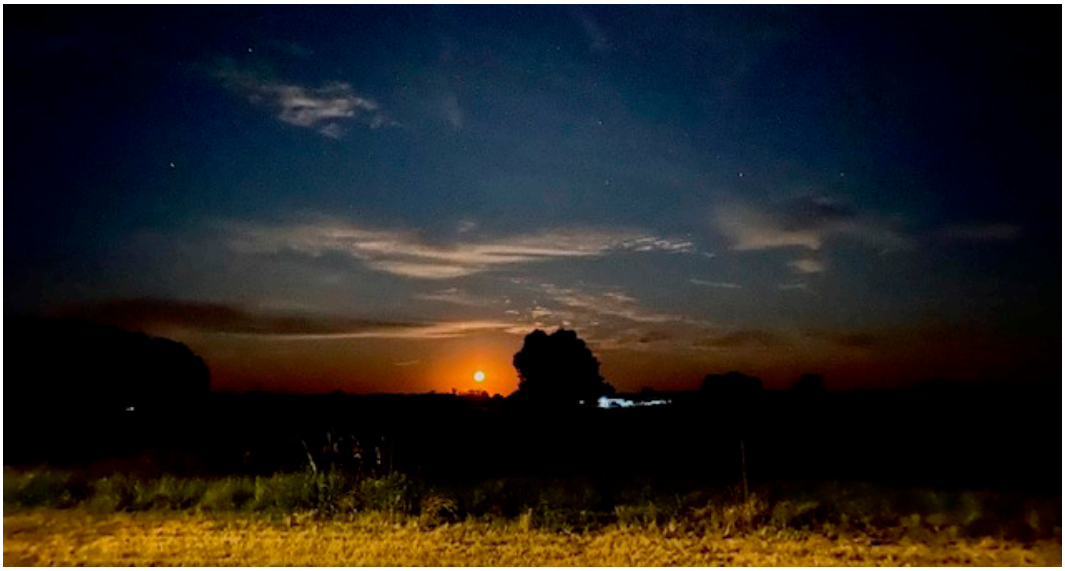
Evidence-based planning for nationally significant land use developments must balance the trade-offs between short-term economic or political gains and the long-term solutions for food security and ecosystem services that agriculture provides (Fox & McRobert, 2020). Successful land use policy for net zero will require extremely demanding levels of integration and spatial resolution; the research community has a vital role to play in providing a robust evidence base for this. Additionally, if the drive for net zero is too blinkered in approach, unintended distortions to policy and markets are a significant risk (Reay, 2020). Shaping transitions successfully (such as for energy, agriculture and land use) depends on the understanding of both the spatial and functional dimensions of urban and rural land-use, which should be the core focus to developing place-based policies toward net-zero energy municipalities (Poggi et al., 2020).

Holistic, place-based approaches which consider the unique characteristics and needs of different regions and communities in the agricultural sector and value chain are more likely to deliver beneficial outcomes than narrowly-focused plans. Enabling greater scheme flexibility can enable, for example, farmers to choose to plant vegetation where it best suits local conditions, to align policy tools with farmer values and to ensure that land stewards have the knowledge and support to make these decisions (Westaway et al., 2023). In addition, critical agricultural assets must be identified and protected by all levels of government (McRobert et al., 2020).

Balancing land use competition priorities in a net zero future will require applying local lenses on a big scale, aiming to achieve economies of scale where possible; while recognising that those who manage the land know it best, and have its best interests at heart.

> *"The wisdom of Aboriginal people on land stewardship and care is a precious resource that holds immense potential for the present era. Our wisdom isn't just for emerging generations of Indigenous leaders, but for all Australians with responsibility for caring for country, and we want to share it." (Simpson, 2023)*

NB: *For the reference list, download the original paper.*



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farminstitute.org.au/membership

Soil security in focus

Australian farmers can lead globally significant research

Soil is the foundation of most food and fibre production in Australia, yet little is understood about farmers' relationship with their soil and the farming practices which build soil security.

Researchers at the University of Sydney, led by Prof. Alex McBratney, are pioneering work to unpack what is termed 'human connectivity' – that is, the connection of land managers with soil under their care. The project team also includes AgriKnowHow and the AFI.

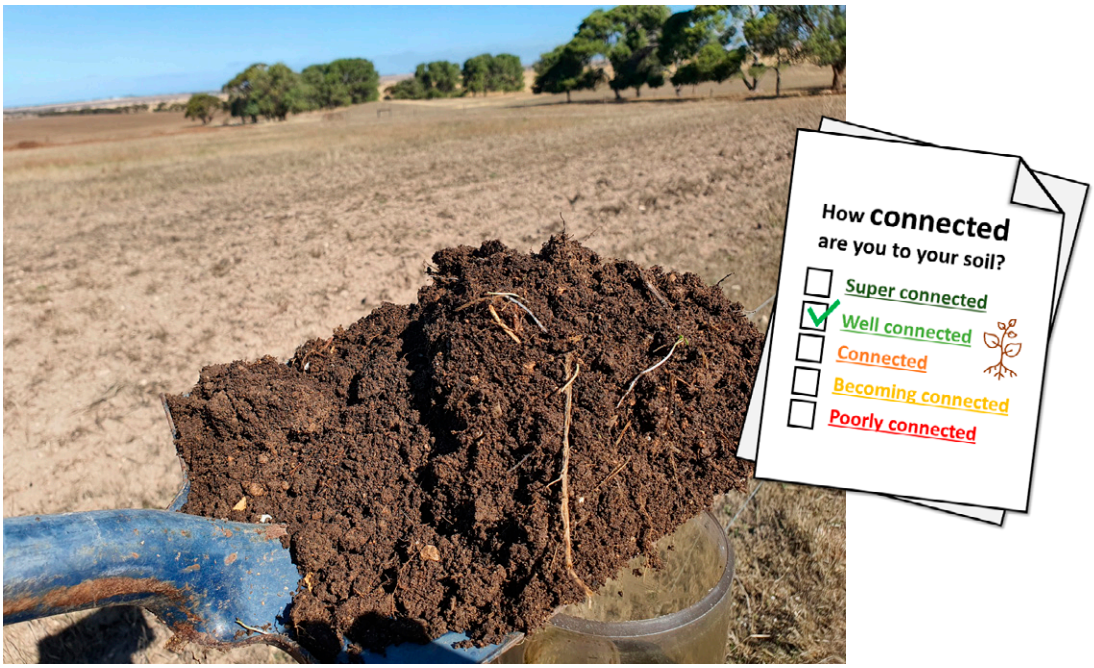
Human connectivity to soil is one of five vital factors identified by global research as influencing the security of the world's soils. The other factors are productive capacity, its physical, chemical and biological condition, factors relating to financial and cultural values, and the policies applied to land management.

"Although the importance of soil to humanity is of historic significance, currently, there is no well-established way to measure human connectivity to soil," said Prof. Alex McBratney.

"This is the challenge we are working on, and we need the help of Australia's farmers. From the project results we hope to provide an approach that can be applied globally to better direct soil policy, education and practice development based on firm evidence, not perceptions or conjecture."

To understand the perception of soil threats and practice benefits, a Soil Connectivity Evaluation Tool has been developed by the project team. Unlike a traditional survey, the evaluation tool provides both the research team and the tool user with information.

"On finishing the evaluation, each participant can immediately access a personalised soil connection report," explained Dr Emma Leonard, AgriKnowHow. The report highlights areas where a soil manager has vulnerabilities and provides links to extension resources which can help to address these issues. "We are very conscious that farmers are fed up with surveys," Dr Leonard said. The evaluation approach is



designed to provide practical guidance about potential improvements to soil management rather than simply harvesting information.

"For example, farmers might have good knowledge of soil threats but if they have low interest in managing the issues then change is hard to achieve. Sometimes calling out the need to think differently is as great a motivation to change as the provision of information on best management practice," she said.

Early indications from the evaluation suggest that the threats of soil erosion, acidification and structural decline are primary influences on practice choices and management decisions. However, salinisation, loss of soil carbon and degradation of soil organisms are less likely to be considered. Lack of attention to these threats will reduce soil security; something that is highlighted in the personalised reports provided to those who complete the tool.

The research team aims to have an in-depth dataset from across the country by the end of January, to create a sophisticated picture of Australian soil connectivity. The project requires a minimum of five completed evaluations in each of 107 areas, which have been segmented based on the density and scale farming business in each area. To date this has only been achieved in a cluster of farming regions, primarily in eastern NSW.

Farmers across Australia are strongly encouraged to ensure their region and commodities are represented in the completed project results.

"The new year is a great time to complete the evaluation so that your personalised results can be considered when making decisions on management practices for 2024," said Dr Leonard.

"Ironically when attempting to measure soil connectivity we have found that tech connectivity has been a real barrier," said Dr Julio Pachon, University of Sydney. "In the early responses people were having to restart if their connection was interrupted, and many did not go on to finish the evaluation. We've addressed this issue – now if you get disconnected, just refresh the page and continue to reach your personalised report. This work will really help us build a unique Australian soil connectivity picture."

Access the evaluation at **soilconnectivity.farminstitute.org.au** or by scanning the QR code:

Images: **Emma Leonard**

What we are reading, listening to and watching?

In each edition of the Insights newsletter, AFI staff recommend some of the gems that have caught their eye, sparked their imagination or challenged their thinking. Feel free share your interesting finds with us via info@farminstitute.org.au.

Justin's pick:

The Pine Barrens

Like anyone away from family or friends during the holiday season, I decided this past year to do something that would remind me of home. I reread *The Pine Barrens* by John McPhee, a wonderful narrative nonfiction book about the nature, history, industry, and folklore of the New Jersey Pine Barrens. I had the privilege of growing up in the Pine Barrens, a largely undeveloped corner of the US East Coast dotted by cranberry and blueberry farms within an almost mystic landscape of pine forest, cedar swamps, and tea-coloured streams. The Pine Barrens is actually where the commercial blueberry was domesticated.

Whenever I read this book, it brings me back to my summers working in the cranberry bogs doing every type of job under the blazing sun that keeps a young man's heart on the farm. As an agricultural policy professional, doing things that bring you back to the farm – like a book that evokes memories or going out into country – are what help us approach this work with a greater sense of compassion and duty to the people who farm and the nature in which they work.

So if you're stuck in the city like me, go to the library and get your book. Preferably, you'll read *The Pine Barrens.* You'll learn a lot about cranberry and blueberry production, and even though it was published in 1968 I can assure you that not much has changed in the Pines so you'll have the unique experience of stepping backwards and sideways in time.

Justin Maroccia – Senior Researcher

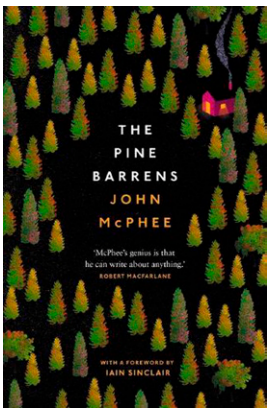
Sally's pick:

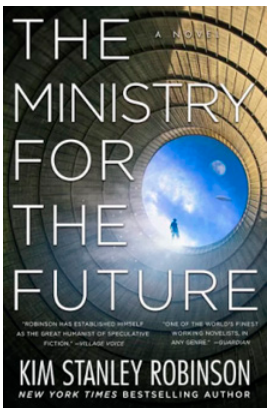
The Ministry for the Future

I recently finished Kim Stanley Robinson's climate fiction (cli-fi) book *The Ministry for the Future.* The book takes as its central idea that a new Ministry for the Future is established under the Paris Agreement with the mission of advocating for the world's future generations as if their rights are as valid as those of the present generation. The book mixes the portents of a quickly deteriorating climate with dramatic actions – both sanctioned and unsanctioned – to mitigate climate change. The book emphasises scientific accuracy and non-fiction descriptions of history and social science, and is classified as hard science fiction.

The book was published in 2020 and already the climate situation seems more drastic than the situation in the book – as if the climate catastrophe has sped up. The book is a very interesting and complicated (and long) read. It is ultimately optimistic, in my opinion possibly far too much so, but I like the idea that humanity can act together in such a productive, if unlikely, manner.

Sally Beech – Designer and Editor





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