[redacted]

Name:

National Committee for Agriculture, Fisheries and Food of the Australian Academy of Science

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Which of the following best describes your situation?

Research and academia

Are you responding on behalf of an organisation or industry body?

Yes

Who are you responding on behalf of?

National Committee for Agriculture, Fisheries and Food of the Australian Academy of Science

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How would you like to respond?

a. Answer discussion paper questions via the online survey

What are the opportunities to reduce emissions and build carbon stores in agriculture and the land? What are the main barriers to action?

Opportunities: • Access to high quality science: All opportunities to reduce emissions and build carbon stores depend upon access to high quality science covering a broad spectrum of expertise. • Research into total production systems: Shifting research from single commodities to the total production system offers significant opportunities to lift production efficiency e.g. by exploring the relationship between crop genotype, environment, soil structure and biology and the crop management system. • New research around GHG emissions, especially nitrification: The exploration of microbial diversity associated with plant roots has revealed a strong relationship between the soil microbiome, crop history, plant nutrition, and disease incidence. Current production systems largely ignore these relationships, which are now known to have a major impact on crop health, GHG emissions and nutrient use efficiency. • Methane reduction: The deployment of novel compounds and feed additives (e.g. 3-NOP, synthetic bromoform, Asparagopsis seaweed) to reduce enteric methane from ruminants is a major opportunity

that can be enabled by addressing: 1. The availability and scalability of production of these additives. 2. The lack of delivery options suitable for extensive grazing systems, where most enteric methane originates. 3. Potential reductions in productivity, which limit the overall effectiveness of these products. Barriers: • Lack of coordination: Strong coordination between federal, state and other agencies supporting agricultural research is required to optimise research and farm-to-fork pathways. • Methane reduction: A coordinated national program to develop locally appropriate methods to reduce methane is needed. • Seaweed farming: Knowledge gaps concerning the potential of seaweed farming to capture and sequester carbon include quantification of atmospheric carbon dioxide entering sea water where the seaweed bed is and quantification of the organic carbon from the same seaweed system that enters long-term storage. • Confidence in soil carbon capture proposals and soil carbon credit schemes: Auditing procedures can be significantly affected by weather events such as La Nina/ El Nino cycles. Research is required to validate soil carbon capture methodology and auditing procedures associated with soil carbon credit schemes.

How can we progress emission reduction efforts whilst also building resilience and adapting to climate change?

Emissions reduction: Emissions reduction efforts can be progressed by better monitoring emissions and the impacts of GHG mitigation strategies. This includes: 1. Improving the accuracy of GHG inventories. 2. Improving methods for measuring GHG emissions from animals at a range of scales. 3. Maintaining more accurate national inventories of livestock numbers (refer to Fordyce et al., 2021, https://doi.org/10.1071/AN20342). 4. Improving the measurement and monitoring of GHG emissions from fertiliser application, particularly through nitrification. It should be noted that carbon sequestration in different systems is not sufficiently robust to provide reliable assessments of opportunities. This issue is particularly relevant to soil carbon sequestration and auditing procedures associated with carbon credit schemes in natural pasture systems, which occupy almost half of Australia's land use. Resilience and adaptation: The 'new normal' of prolonged heat, in addition to longer dry conditions, affect crop physiology and productivity, for which many of our varieties and farming systems are not adequately adapted. Research to build resilience in crop and pasture productivity and associated soil health must focus not only on adaptation to extreme events (flooding, fire, worsening drought) but also on the impacts of new, higher baseline temperatures and projected longer dry periods between rain events under 'new normal' conditions. Ongoing research into and adoption of management practices that aim to mitigate the impacts of climate change on animal welfare and production is required. Such practices include developments in infrastructure (shade), nutrition and genetics for heat-resilient animals.

Are there initiatives or innovative programs underway that could be applied or expanded on at a national scale?

National, coordinated priority research is required at scale to prepare farming systems for the 'new normal' conditions. This is of particular concern in tropical and sub-tropical crop and pasture systems to address the adaptation of commercial plant varieties and farming systems (including protected and semi-protected cropping as well as broadacre cropping and pastures) to the increased heat and extended dry intervals between rain events expected under a 2-degree global temperature rise. Research efforts should address the entire production system, as opposed to focusing only on specific aspects of the agricultural production system. Further research into the validation of the impacts of proposed measures (e.g. soil carbon capture) and standards in auditing of carbon credit schemes would build confidence in such proposals and support their long-term viability.

How can the Australian Government bring together existing effort and new initiatives into one coordinated plan?

There is the recurring problem of lack of effective coordination of research investment across the full agriculture and food sector. This issue was raised in the PMSEIC review, 'Australia and Food Security in a Changing World' (https://www.chiefscientist.gov.au/sites/default/files/FoodSecurity_web.pdf). This review recommended establishing an Australian Food Security Agency to 'provide the basis for a national approach to addressing food security challenges.' A mechanism for providing national coordination of research effort would effectively link

existing national and regional funding and investment activities. National coordinated priority research at scale is required to prepare farming systems for the 'new normal' conditions of higher mean temperatures and changing weather patterns in addition to resilience in the face of extreme weather events.

What are the most important options to be further adopted or supported, looking in the short and the longer-term?

Ensuring accurate measurement of emissions across the production system and developing reliable estimates of carbon sequestration in the diverse Australian environments is key to identifying the best options. Cheap and accurate measurement methods would foster assessment and prioritisation of both short- and long-term strategies. Further research on improving and validating the impacts of proposed options such as soil carbon capture and standards in the auditing of carbon credit schemes would build confidence in such proposals and support their long-term viability.

What are the practical solutions to increase uptake?

Strong technology delivery paths are needed.

How do you see the agriculture and land sectors contributing over the medium and longer-term? What are the opportunities to deliver emission reductions in parallel with wider goals?

No response.

How can the Australian Government better support agriculture and land sectors to:

a) drive innovation

b) build capacity

c) ensure the system enables emissions reductions

Driving innovation: To help drive the delivery of innovations, Australia needs a regulatory environment that is evidence-based and addresses quantifiable risks and hazards. This regulatory framework should recognise the experience and information that can be gained from the deployment of new technologies, and have sufficient flexibility to adapt in response to new information on risks. At present, these principles are not always applied. For example, genetically engineered crops are subject to onerous regulation despite over 30 years of safe use of the technology, and this has severely hindered development of new applications. Where possible, consistency with international regulatory frameworks should be strived for. A key recommendation of the Decadal Plan for Australian Agricultural Sciences 2017–26 (Australian Academy of Science, https://www.science.org.au/support/analysis/decadal-plans-science/decadal-plan-agricultural-sciences-2017-2026) was to "establish a national agricultural research translation and commercialisation fund, to invest in promising agricultural discoveries and fast-track their commercialisation into new and improved Australian products and services in domestic and international markets." This has been partially achieved in the form of Agricultural Innovation Australia and investment funds such as Grain Innovate. However, these would benefit from coordination and availability of funds to support cross-sector activities. The STEM staff shortage that pervades so many areas is a serious limitation to ensuring development and delivery of innovation for the agricultural sector. As we shift to an analysis of the full production system, highly diverse skills are needed from both the traditional areas including

breeding, agronomy, soil science, pathology, as well as engineering, computing, remote sensing, artificial intelligence and climate modelling. Building the skills base and drawing qualified people into the agriculture sector should be a priority. Some options for achieving this have been proposed in other reviews (such as the PMSEIC review, https://www.chiefscientist.gov.au/sites/default/files/FoodSecurity_web.pdf).

What new initiatives could the Australian Government design that would support emissions reduction and carbon storage in agriculture and land and help ensure a productive, profitable, resilient and sustainable future for the sectors?

There are a variety of initiatives the Australian Government can pursue in support of these aims. This includes: 1. Establishing a research translation and commercialisation fund, as outlined by the Decadal Plan for Australian Agricultural Sciences (https://www.science.org.au/support/analysis/decadal-plans-science/decadal-plan-agricultural-sciences-2017-2026). 2. Supporting international collaboration, such as through ACIAR, CGIAR and the FAO. Australia has a long history of dealing with agricultural production under difficult and resource-limited conditions. Yet, the issues and problems we are facing are not unique to Australia. There are many international programs tackling similar issues, and supporting these efforts would be valuable to both Australian producers and overseas partners. 3. Validation of impacts of proposed measures by the Australian Government. 4. Greater government oversight over carbon credit scheme auditing to build confidence and support the long-term viability of such schemes.

A consistent and trusted approach for assessing and reporting emissions is often raised as a barrier to reducing emissions. Is there a role for the Australian Government in addressing this concern, and how can producers and land managers be supported?

This is an international issue and linking with overseas research programs would be beneficial. Cheap and reliable methods for measuring intake, GHG emissions and carbon sequestration under different production systems and environments are still lacking. To achieve consistent and long-term carbon sequestration, scientific evidence is required to validate and support the management of agricultural systems (e.g. cropping and pastures), aquaculture and livestock.

What skills, knowledge and capabilities do you think producers and land managers need to implement change? What information and data would help them make decisions about emissions reductions and sustainable land management in the short and longer-term?

The role of professional agronomists in the implementation of change is critical. Agronomists are frequently a major conduit for technical advice to producers and land managers, often as private consultants. Accredited professional development and training for agronomists, along with undergraduate education in agronomy and changing agronomic practice for emissions reduction and sustainable land management, are essential to provide producers and land managers with ongoing, updated expert advice.

Do you have any additional views or feedback that you would like to include in your response?

No response.

Is your response confidential?

No

Do you agree to your response being published on our website?

Yes

I have read and understood the privacy notice and consent to the collection, use and disclosure of my personal information as outlined in the privacy notice.

Yes

Confirm that you have read and understand this declaration.

Yes
