WAARC, a state government funding initiative to catalyse agricultural research in northern Western Australia

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Abstract
There is broad agreement that research and development is an investment in the future viability and success of an industry. This view has underpinned the establishment of the Western Australian Agricultural Research Collaboration (WAARC). This Western Australian (WA) state government initiative is designed to foster collaboration among WA's participating research organisations (DPIRD, CSIRO, Grower Group Alliance and the universities of Curtin, Murdoch and WA to support WA-centric new projects and research capacity building. WAARC is seeking to support longer-horizon research developing and integrating new areas of science with potential for industry application and to enhance early-career development opportunities for researchers. Its creation is a response to the diminution of a consolidated research capacity in WA. The WAARC initiative currently comprises six program of work, all of which are potentially relevant to the sustainable intensification of agricultural production in northern Australia. Of these, the Northern Agriculture program focuses exclusively on developing research and research capacity in this region. The objective of the program is to increase the Gross Value of Production through intensification of agriculture by 2030 focusing on sustainable growth of irrigated agriculture and the northern beef industry. A key priority in the Northern Agriculture program is the integration of irrigated agriculture and beef production. Growth in agriculture in northern WA focuses on intensifying the cattle industry and optimising irrigated agriculture, ensuring that this is achieved in a way that is environmentally and socially responsible. A related key priority is capturing economic benefit of growth by First Nations' pastoral and related enterprises.

Introduction

In the north of Western Australia (WA), there is strong potential for further development of the agricultural sector, particularly through capitalising on existing resources for irrigated agriculture near Kununurra in the eastern Kimberley region. This region has a geographic advantage for trade with south-east Asia, but its remoteness, climate extremes and low population density have proved challenging for sustaining the workforce required to deliver the research. The WAARC Northern Agriculture program, launched as part of the WAARC initiative by the WA Government, focuses on supporting longer-horizon research projects and fostering collaboration across WAARC's research partner organisations; DPIRD, CSIRO, the Grower Group Alliance and the universities of Curtin, Murdoch and WA. The Northern Agriculture program is developing new opportunities for investment in new projects and capability-building activities to support the agricultural

industry in northern Australia. The program aims to support irrigated agriculture and beef production in northern WA to achieve sustainable growth while ensuring environmental and social responsibility. It is envisaged that this will be achieved through the strategic development of projects with research partners and industry, and by providing leverage to extend other research activities. An emphasis on benefiting First Nation enterprises through economic empowerment and knowledge sharing further underscores the program's inclusive vision. WAARC is developing its governance structure, which has ongoing financial support through funding from each of the partner organisations.

Methods

The review paper draws on insights from secondary data sources, including project reports, official documentation and published literature, as well as contributions from individuals currently involved in the WAARC initiative. It also incorporates case studies of similar initiatives in comparable regions. The review further considers research on agricultural research collaboration and governance models. The aim of the review was to consider the opportunities, challenges and governance issues in agricultural research when implementing a collaborative model for research in northern WA, with a focus on identifying best practices and actionable recommendations.

Results and discussion

Benefits of collaboration

Cross-organisational collaboration is a foundational characteristic of the WAARC initiative, and WAARC encourages a collaborative culture by having a minimum of three partner organisations participating in its funded research activities. A key aim of WAARC is to develop the next generation of researchers, based and focussed in WA, in a way that builds connections with the agricultural industry so that they are better prepared to identify and address emerging challenges. Enabling early-career researchers to develop relationships through projects that link universities with more industry-facing organisations and producers is expected to result in more solution-focused and impactful research (Strycharz et al. 2022). Inter-organisational collaboration is needed to address complex challenges facing agriculture through integrating multidisciplinary expertise, sharing resources, fostering innovation and focusing on industry issues. If coordinated well, research collaboration will enhance the scalability and impact of research outputs, improve funding opportunities and prevent duplication of efforts, thereby increasing efficiency (Jones et al. 2021). Collaborative efforts support knowledge exchange, capacity building and stakeholder engagement, and ensure that research aligns with farmers' needs, industry demands and policy priorities. By fostering collaboration between research institutions and industry, WAARC aims to build capacity and projects with a higher level of collaboration, thereby delivering actionable solutions to agricultural challenges facing WA.

Collaborative research in northern WA

Applying a collaborative research model in northern WA to build research capacity and invest in novel areas of research (e.g. precision agriculture, water-efficient irrigation and sustainable livestock systems) provides significant opportunities to increase sustainable agricultural production. However, human capital and expertise are a significant limitation in northern WA, as it is for most of rural Australia. Conducting research activities in this region also presents additional unique and significant challenges, including harsh climatic conditions, which can be favourable to pests and disease, water scarcity during the dry season, and limitations in soil fertility and pasture quality. The working conditions in this region also present unique health and safety considerations that further complicate experimental work and data collection. Additionally, balancing profitability with sustainability, especially for First Nation enterprises, requires nuanced approaches to ensure economic and social viability. Under these conditions, investing in research tends to entail higher operational costs, longer development timelines and less certain outcomes.

There have been several previous, but ultimately fruitless, efforts to develop collaborative research initiatives to meet the needs of the northern WA agricultural sector. These efforts were initiated in various iterations across the organisations represented in WAARC but lacked the resources to break away from business-as-usual research structures to generate broad collaboration and longevity. However, these proposals contributed to the

foundations and momentum for the current WAARC and its Northern Agriculture program. At a national level, supporting agriculture in the north of Australia across WA, Northern Territory (NT) and Queensland has been a central mission of the Cooperative Research Centres for Northern Agriculture (CRCNA). Running from 2017–2027, the CRCNA has been responsible for the establishment of a broad range of research projects across Australia's north, including WA regions, in particular, the Pilbara and Western and Eastern Kimberley.

Having agricultural researchers regionally located in the north of WA (and Australia generally) is important to expedite research activities into industry adoption. Locally based researchers experience greater immersion in local contexts, allowing for deeper engagement with communities, stakeholders and ecosystems. This proximity can foster trust with local groups, including First Nations, and enable more responsive, adaptive research methodologies tailored to the region's unique challenges, allowing quicker uptake by local industry as barriers to adoption are identified through co-design and local networks/relationships. A fly-in fly-out (FIFO) model can reduce long-term costs and allow researchers access to peers, mentors, expertise as well as specialised research facilities and broader resources based in urban centres.

The FIFO model has been widely adopted in other industries of the WA economy in the north and other regions to ensure the supply of highly specialised and credentialled experts through to low-skilled workforce (McKenzie & Hoath 2017). The resources sector has the economic capacity to fund both well-organised FIFO logistical process as well as offer attractive financial compensation for the more unorthodox work roster. Public institutional employment models and conditions, however, are often neither flexible enough nor resourced sufficiently to enable the FIFO model to operate from the major city centres. The challenges are similar for rural-based staff to work for parts of the year in the region during the field season and another region/office in the off-season, despite primary producers and other parts of the industry moving to this model. For example, many of the current generation of broadacre farmers are now opting for a Drive-in Drive-out (DIDO) lifestyle with many working between large city centres on the coast and their inland rural properties, while those in the north of WA do the same over the wet season. Nevertheless, these FIFO/DIDO approaches risk limited continuity and weaker relationships with local stakeholders, are higher in cost, and may contribute to a less nuanced understanding of regional dynamics, which could undermine the effectiveness and relevance of research outcomes. Balancing these models requires careful consideration of the project's objectives, regional needs and resource allocation, with no clear preferred model due to the substantive pros and cons for each (McKenzie & Hoath 2017).

WAARC is expecting to play a key role in supporting targeted research activities and recruiting and providing ongoing support to early-career researchers over and above traditional pathways and funding. Providing additional funding for industry-facing PhDs and supporting appointment and retention of early-career research positions will help to alleviate some staffing shortages in northern WA and foster industry engagement with postgraduate researchers through its PhD research scholarship program, a key objective of WAARC. This program helps to engage early-career researchers who wish to align their research with the Northern Agriculture program goals and potentially build relationships with local industry and remote regions that may not have been available otherwise. WAARC also provides the network of WA-based mid- and late-career researchers, and national connections via CSIRO, who can provide mentoring and support for these WAARC early-career researchers irrespective of the lead partner organisation. The WAARC model (including an 'Agricultural Technologies' program) is seeking to expedite new technologies, such as augmented reality, providing novel solutions for remote research capacity.

Developing governance models

Effective governance underpins successful collaboration. The WAARC management team includes representation from participating organisations and processes such as workshops to ensure broad participation among collaborating partners. In the Northern Agriculture program, the small scale of agricultural research in northern Australia, particularly in the cattle industry, means that the pool of potential research participants is quite small. The WAARC governance structure assists across a range of areas including agreeing on priorities, communication, contracting and an equitable distribution of resources. Australia's Cooperative Research

Centres (CRCs) have a long history of enabling research, and their experiences are valuable in designing and improving WAARC's governance framework.

WAARC currently operates via a memorandum of understanding and a Steering Committee, which meets regularly to review proposed research activities and to provide strategic guidance. These committees are a common feature of joint venture-style structures in WA. The longer-term organisational structure of WAARC is being reviewed and will likely change to a more suitable model for the organisation in the long term. The investment governance structure for WAARC should incorporate a robust framework with clear investment policies, risk management protocols, and accountability mechanisms to safeguard the fund's sustainability and optimise returns for innovative projects and capacity-building initiatives. It must also align with WAARC's funding priorities to support high-level innovative projects and strategic research areas, maximising the impact of the fund's investments. To be successful, WAARC must seamlessly integrate capacity-building initiatives to enhance research capabilities and develop human capital within its organisation and partner entities, as previously outlined. The current structure is designed to support agile decision-making, particularly in fund allocation, while embedding long-term sustainability measures such as financial stewardship, performance evaluations, and strategies to replenish the investment fund. Flexibility is a critical aspect of this framework, allowing WAARC to pivot as needed to address emerging agricultural priorities. For example, recent investments by WAARC in polyphagous species (e.g. shot-hole borer beetle) research have aimed to mitigate damage caused by this insect pest to urban and agricultural trees.

WAARC also plays a pivotal role in future preparedness, ensuring research capabilities are ready to support rapid responses to escalating challenges in northern WA, such as biosecurity threats, environmental concerns or trade market disruptions. However, administrative coordination across the initiative presents unavoidable complexities, which has occasionally slowed contracting and project initiation. Specialist staff have been instrumental in managing these constraints, and further administrative improvements are anticipated as the WAARC initiative continues to mature.

Conclusion

The WAARC Northern Agriculture program exemplifies a strategic approach to addressing regional agricultural challenges through research collaboration. While opportunities abound, addressing the unique challenges of northern WA requires robust partnerships, governance and flexibility. Institutional flexibility to enable work-life balance and the ability to work part-time in the north during favourable parts of the year and in other regions for other parts and/or via a FIFO model need to be considered. The program's focus on integrating irrigated agriculture with beef production demonstrates the potential for scalable and sustainable agricultural models. However, leveraging these opportunities will depend on overcoming logistical barriers, including developing a locally based skilled workforce, and ensuring that First Nations' communities are integral co-beneficiaries.

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