INDEPENDENT ASSESSMENT OF SOCIAL AND ECONOMIC CONDITIONS IN THE BASIN

Independent assessment of social and economic conditions in the Murray–Darling Basin: Key messages from Panel-commissioned research

Technical Report prepared for The Hon. Keith Pitt MP, Minister for Resources, Water and Northern Australia

April 2020

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Publisher:

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Citation:

Sefton, R, Peterson, D, Woods, R, Kassebaum, A, McKenzie, D, Simpson, B & Ramsay, M 2020, *Independent assessment of social and economic conditions in the Murray–Darling Basin: Key messages from the Panel-commissioned research*, Panel for Independent Assessment of Social and Economic Conditions in the Murray–Darling Basin, Melbourne.

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Overview

This short technical report summarises the key messages from each piece of additional research the Panel commissioned in support of our review of social and economic conditions in Basin communities. This commissioned work, along with our extensive stakeholder consultation and our own experience and expertise, informed the findings and recommendations we made in our Final report.

The work summarised in this short technical report does not necessarily reflect the individual or collective views of the Panel, and we made judgements based on various sources and analysis to formulate our findings and recommendations.

From this commissioned work, we have observed important insights into the past, current and future social and economic conditions of, and forces shaping, Basin communities. We have also observed gaps and areas where it is difficult to be certain about the conditions and impacts affecting communities—particularly when it comes to gaining a localised understanding of conditions and the timeliness of data. This is an important finding and underscores how crucial it is to draw on multiple lines of evidence when forming a view, including talking to communities and hearing how they feel their communities are tracking.

The summaries of commissioned work presented here are subject to some limitations and assumptions which are outlined in the separate reports written for each piece of work. These limitations and assumptions are important and necessary to fully appreciate the insights in this short technical report. This is particularly true of the commissioned modelling work by Marsden Jacob Associates (MJA), the Australian Bureau of Agricultural and Resource Economics (ABARES), and Professor Glyn Wittwer from Victoria University. This work is simulation modelling and does not reflect Australian Government policy. The simulation modelling shows what could occur in the future if certain things happen. It is not a forecast or a reflection of what will happen. Note the Panel did not specifically commission the report ABARES delivered.

This technical report covers these commissioned works:

Literature reviews – In the initial phases of our review, we commissioned four literature reviews to help us understand current knowledge and gaps.

Social and economic analysis – As the project progressed, we commissioned additional work looking at:

- social and economic conditions in Basin communities
- modelling scenarios and their impacts on the water market, agricultural industries, and communities.

Case studies on recreational fishing; the rice industry; horticulture below the Barmah Choke; dairy industry; cotton industry; and recreational boating.

This report ends with a reference list.

Section 1

Literature reviews

Caption: © Murray Irrigation

1. Literature reviews

1.1 Literature review: The impacts of water reform

Scope

This literature review focused on previous assessments of social and economic conditions of Basin communities, and Basin water reforms over the past two decades.

The full literature review has more detail and offers a deeper understanding of existing literature on the impacts of water reform on Basin communities.

Key insights

Major trends and drivers for Basin communities:

- The economic value of **agricultural production and irrigated production** in the Basin was steady over the past decade of water reforms.
- **Farm performance and rates of return** in the Basin from 2005–18 were mixed. Factors other than Basin water reform, including commodity prices, input costs, and farm scale and setup, have mainly driven performance and rates of return.
- **Factors other than water reform** are shaping most communities in the Basin. In most cases, water reforms over the past decade have not impacted the trajectory of communities.

Insights on Basin water reform:

- **Water access entitlement, market and planning reforms** have had net positive social and economic impacts in the Basin. Numerous Productivity Commission and National Water Commission reviews give evidence of this.
- **Water recovery** has had mixed impacts, and different methods of water recovery result in different impacts:
  - On-farm irrigation infrastructure investments to recover water provided economic stimulus during construction and have made farm systems more efficient, but have also increased demand for water.
  - Off-farm irrigation investments to recover water are delivering mixed outcomes, but there is minimal evidence available.
  - Buybacks have facilitated on-farm adjustment and increased water use efficiency, but most of the evidence around buybacks is dated and pre-drought.
  - Environmental water recovery is contributing to higher water market prices and increasing risks, particularly during dry and very dry years.
  - There is little available evidence to understand the economic and/or social benefits of environmental watering on amenity, recreation and tourism, as well as for First Nations groups.
- There is little evidence that **targeted assistance programs** linked to Basin water reforms have effectively improved economic and social outcomes for Basin communities or made them more resilient.
- Under current policy settings, **future water recovery will probably cost more than budgeted and water prices will increase with additional recovery.** Regional water availability will shift and it is important that irrigators price these changes into their decisions about the future.

1.2 **Literature review:** Current knowledge of social conditions in the Murray–Darling Basin

Scope

This literature review investigated the factors typically measured to understand the level of wellbeing and resilience of a community and the people living in it, and what information is available about the conditions in Basin communities. This literature review did not assess social conditions but rather aimed to understand how social conditions should be assessed and the information available to do so.

The full literature review has more detail and offers a deeper understanding of measures for community wellbeing and resilience, plus available datasets and information on current social conditions in Basin communities.

Key insights

- **It is important to measure social conditions**. There is growing acceptance that societal progress should be measured based on quality of life, rather than solely on measures of economic growth/production, and that quality of life relies on having positive wellbeing and resilience. Understanding social conditions is important for understanding community wellbeing and resilience.

- **Multiple factors influence quality of life**. The factors typically used to assess a community's wellbeing and resilience are: health of residents (physical and mental); education, knowledge and skills; social capital (the social networks in the community, and how well people support each other); standard of living (e.g. income, cost of living, quality of housing); employment availability and working conditions; quality of built infrastructure and access to services (e.g. roads, health, education, government services); quality of governance, institutions and community leadership; experience of (dis)advantage and (in)equality; citizen participation in community life and decision making processes; security and safety of residents; ability to safely express cultural identity; level of subjective wellbeing reported by residents; environmental health; and economic performance.

- **Knowledge of social conditions in the Basin (at the local level) is poor**. There is almost no available information on Basin communities' aspirations, visions and objectives, or the self-rated challenges they're experiencing. As a result of this poor awareness of what communities in the Basin value most for their wellbeing and resilience, understanding of wellbeing and resilience, and social conditions more broadly, is limited.

- **Basin communities have some issues that are important to them**. Data from the Regional Wellbeing Survey revealed for Basin communities:

    - The top issues that have a positive impact on wellbeing are good social connections and networks, community activities and events, good local facilities and services, good outdoor spaces, and good governance.
    - The top issues that have a negative impact on wellbeing are poor quality services and infrastructure, drought, poor governance and institutions, high cost of living, poor employment opportunities, anti-social behaviour, lack of social connection, negative impacts of water reform, and poor farming conditions.

- **There are knowledge and information gaps.** These gaps include poor understanding of how different aspects of wellbeing and resilience affect each other and how conditions vary among different groups of people (particularly First Nations and those not working in agriculture). Further, available information is not always easy to find, does not always cover the entire Basin, is not always available at the local scale, and is often out of date.

1.3 **Literature review:** Economic policies and conditions in the Murray–Darling Basin

Scope

The Panel engaged the National Centre for Social and Economic Modelling (NATSEM) to investigate the economic policies and conditions in the Murray–Darling Basin. The review focused on literature on economic policy, data and indicators in the Basin as well as the latest theories on place-based policy, including Regional Deals, and reviewed the OECD literature on place-based policies in regional areas.

The full literature review has more detail and offers a deeper understanding of economic policies and economic conditions in Basin communities.

Key insights

- **Larger national grant programs disproportionately benefit areas in the Basin**. This means the amounts going into the Basin areas are greater than expected given an equal per capita allocation. This is probably because many areas in the Basin have higher need per capita, or are drought affected.

- **Audits of grants programs for regional areas show mixed results**. The evaluation and effectiveness of projects is often unclear and not all investments deliver improved outcomes for communities.

- **Economic conditions and trends are driving changes, particularly for smaller towns**. Over several years, the Basin has been transitioning from small towns servicing local farmers, to larger regional centres servicing larger farms. The migration of jobs and workers into cities; the consolidation of agriculture from small farms to larger, more efficient farms; the increase in resource extraction in rural Australia; and the ageing population profile across Australia have left many smaller regional towns in Australia struggling.

- **It is difficult to separate impacts from economic policies and impacts from normal changes in economic conditions**. This is a key knowledge gap. There are many long-run economic influences that may continue regardless of economic policies or interventions.

- **There is reason to be optimistic about farming with improving commodity prices**. ABARES has indicated that food prices in 2015 reached a minimum, and that prices for commodities would increase. The most recent data on commodity prices is relatively consistent with that prediction, with increases across all commodities except for livestock. But drought will severely limit the ability to capitalise on better prices.

- **Drought impacts farmers as well as communities**. There are significant flow-on impacts during drought for agriculture-dependent industries and communities (noting Basin communities vary in their dependence on agriculture).

- **Most areas in the Basin have relatively high levels of employment**. This varies among communities.

- **Data on economic conditions is available but often dated**. Data that is available is usually old by the time it is released, and not as relevant to short term impacts of drought, for example. It can also be challenging to model and understand changes at the local level, so it is difficult to understand conditions in specific small communities.

- **Data on businesses in the Basin is also difficult to obtain**. Businesses are core to the economics of any area because they employ locals and bring people into an area, but there is limited information on business profitability and life cycle. Diversity of business is also crucial to an area's resilience and could be better understood.

1.4 **Literature review:** Wellbeing, resilience and adaptive capacity

Scope

The Panel engaged the CSIRO to look at programs and initiatives that have been implemented in the Basin, to understand what strategies and approaches have the greatest potential to enhance the resilience, adaptability and wellbeing of Basin communities.

The full literature review has more detail and offers a deeper understanding of existing literature on resilience, adaptability and wellbeing.

Key insights

- **Large, rapid and novel changes are inevitable** and will continue to drive Basin community outcomes. As a result, resilience and adaptability are important for communities to survive and thrive.

- **Community engagement is key to success**. Stakeholder engagement that builds new skills and capacity for responding to large and unfamiliar future changes and high levels of uncertainty is critically important. Effective engagement approaches allow diverse stakeholders to work cooperatively and find new ways of seeing and understanding problems and solutions.

- **It's necessary to understand community values, social and economic systems, and physical and regional strengths** to know how communities can adapt and respond to shocks. The types of decision that communities must make in response, not just the impacts, are important to understanding how policies and programs can support effective solutions.

- **The literature review identified five areas of opportunity** for improving wellbeing, resilience and adaptability:

    - **Invest in resilience and adaptation planning at scale**. Looking at resilience and adaptation planning across a range of scales, including the local catchment level up to state and even national levels, is both a need and an opportunity.

    - **Recognise no one is in charge of community resilience and adaptation**. Instead, the focus should be on incentivising distributed efforts and empowering communities and individuals to lead. Existing institutions could adopt criteria that promote resilience, adaptability and wellbeing in their programs and activities—their active support is required, to avoid being lost or drowned out by other competing interests and needs.

    - **Accept and expect large change**. Planning activities in business, government and community sectors could more systematically use scenario planning, including preparing for the greatest plausible change. Program and management goals could be revised and adapted accordingly.

    - **Stay abreast of legal, financial and insurance developments concerning climate change**. Legal and financial due diligence requirements for addressing climate risk are changing rapidly. Communities could turn the associated risks into opportunities, by being informed about and an early actor on these developments.

    - **Learn from and build on adaptation planning in natural resource management**. The most well-developed examples of successful programs for building resilience and adaptive capacity in Basin communities are through natural resource management. But the problems to be addressed go well beyond this sphere.

Section 2

Social and economic research and modelling

Caption: © Murray Irrigation

2. Social and economic research and modelling

2.1 Water market trends and drivers

Scope

The Panel required work on water market trends and drivers. ABARES was just completing a similar scope of work. Rather than commissioning a substantively similar project, the Panel drew on the ABARES report Murray–Darling Basin water markets: Trends and drivers 2002–03 to 2018–19 and commissioned supplementary work to fill key gaps. This work is summarised here. Note the Panel did not specifically commission the main report ABARES delivered.

Key insights

- **The Basin water market is complex and various factors influence it**, including weather, commodity markets and water policy.

- **Water allocation prices are mainly driven by changes in water supply**, and the main factor influencing water supply in the Basin is rainfall. Rainfall was around 17% lower than the long-run average in the southern Basin during the Millennium Drought, and has been 5% lower since 2000. This has led to significantly lower inflows into rivers and dams. Allocation prices increased to unprecedented highs during the peak of the Millennium Drought before declining to near zero following the 2011, 2012 and 2016 floods. Prices have again risen substantially during the latest drought.

- **Recovery has had some impact on the water market**. There has been significant interest in the impact that Commonwealth environmental water recovery has had on water supply and water prices in recent years. While Commonwealth environmental water recovery has reduced consumptive supply, the effect was relatively small compared with the effect rainfall had on supply over the same period.

- **Changes in the demand for irrigation water have been significant** in the Basin since the early 2000s. This is particularly the case in the southern Basin where genetic advances and movements in commodity prices have led to an increase in the demand for water for cotton and almonds and a decrease in demand for water for rice, dairy pastures and grapevines.

- **Modelling indicates higher future water prices in the southern Basin**, assuming 2016–17 levels of water demand, 2016–17 institutional arrangements, and a repeat of the historical climate between 2002–03 and 2016–17. The estimates suggest there could be a change in the distribution of future allocation prices in the southern Basin, with fewer years with low prices and more years with moderate to high prices.

- **The northern Basin shows different trends**. Trading activity across the northern Basin is less substantial than across the southern Basin. This is due in part to the isolated nature of the catchments, fewer water users in each system, and less commodity diversity. These factors mean that markets in the northern Basin are generally less responsive to market shocks, such as fluctuating water allocations, commodity prices, and weather. Groundwater is also an increasingly important water source and is becoming a crucial part of surviving long periods of drought for both town supply and irrigation purposes.

Supplementary work commissioned on trends and drivers

Indigenous water

Water reform has long attempted to allocate a finite volume of water in the Basin across competing users. Despite many centuries of environmental and water management, Indigenous peoples' involvement and voice in water planning and management remains limited. The importance of recognising Indigenous values of water has been neglected since European settlement, and involvement of Indigenous people in water planning and management has been historically limited. There is also limited Indigenous access to water for economic uses. Increasing participation in water planning and management, and increasing access to water for Cultural and economic purposes, is a key reform gap.

The supplementary work identified these options for improvement:

- national Indigenous water reforms to water planning and environmental water governance that provide for statutory water rights
- statutory inclusion of Indigenous values in environmental and water law to ensure holistic management
- fundamental changes to environmental and water governance to include Indigenous values.

More information is available in the full case study.

Urban water

Urban water services range from the provision of potable (drinking quality) water and wastewater services to stormwater management and water recycling. Total urban water consumption is less than 4% of total water consumption across the Basin. The quality of supply is variable, particularly in regional NSW, and some areas have faced urban water shortages, despite planning provisions that prioritise water for critical human needs. Urban water trends and drivers will create risks and opportunities for urban water suppliers in the Basin in the future. The challenges are well known, as are potential solutions:

- implementing remaining National Water Initiative commitments
- making clearer the provisions for critical human water needs in planning processes
- considering opportunities to improve utilities.

More information is available in the full case study.

2.2 Thriving, surviving, or declining communities: socio-economic change in Murray–Darling Basin communities

Scope

The Panel commissioned Dr Jacki Schirmer from the University of Canberra's Health Research Institute to help assess social and economic conditions in the Basin. The report examines whether communities in the Basin have poorer or better than average wellbeing based on various metrics that determine social and economic conditions. It also identifies factors or characteristics that are associated with typically better (or worse) social and economic conditions (e.g. a characteristic might be how 'remote' a community is).

The full report has more information and results and gives a better understanding of the Panel's assessment of social and economic conditions, including key limitations, assumptions and knowledge gaps.

Key insights

- **To understand community wellbeing, multiple dimensions of social and economic conditions must be considered**. This analysis assessed social and economic conditions by examining:
    - how communities self-assess quality of life (overall community wellbeing)
    - population trends, ageing and health
    - the economy, employment and standard of living
    - community and social connection
    - physical amenity
    - access to quality services and infrastructure.
- **The study used a mix of indicators to inform each of the six dimensions of wellbeing**, including both objective indicators and subjective indicators. Objective indicators measure levels of things such as employment and life-years lost due to avoidable ill health and accident, while subjective indicators are a resident's self-assessment of quality of access or standard of living or wellbeing.
- **There are no agreed standards for 'good' or 'bad' social and economic conditions**. As a result, the analysis focuses on comparing areas within, and outside, the Basin. This indicates which communities are doing relatively better or relatively poorer.
- **Available datasets limited the analysis**. The analysis used multiple datasets but they were not always up to date and the lowest reasonable level of disaggregation applicable across them was at the Local Government Area (LGA) level. As such, the term 'community' in this research refers to an entire LGA. This provides an overall indication of conditions but does not pick up the experiences of individual towns in the Basin.
- **Poorer social and economic conditions were most common in more remote communities**. Indeed, remote and outer regional Basin communities were relatively worse than equivalent (that is, remote and outer regional) areas outside the Basin.
- **Inner regional areas typically had similar or better social and economic conditions compared with those outside the Basin**. Inner regional areas account for most of the Basin population, centred in regional cities such as Toowoomba or Albury–Wodonga with diverse economies and large populations.
- **Remoteness, population size, economic diversity and high dependence on agriculture** of any type (whether dryland or irrigation) **were the strongest predictors of negative change in community conditions**.
- **Most remote and outer regional areas need support to improve wellbeing**. While remote and outer regional areas often had stronger community and social connections, they experienced slower population growth, less diverse economies, and felt they had poorer access to infrastructure and services.

2.3 Future scenarios for the southern Murray–Darling Basin

Scope

The Panel commissioned ABARES to model water market scenarios, including potential future prices, trade flows and irrigation sector outcomes. The work is based on ABARES' Water Trade Model for the southern Basin.

The full report has more information and results and offers a deeper understanding of the potential future of the water market under different conditions. The results presented here are a simulation of potential future outcomes under different conditions and do not predict the future.

Key insights

ABARES modelled three scenarios:

- **Current market** – current irrigation development (horticultural plantings), current water recovery under the Basin Plan, and current trade rules and commodity prices
- **Future market** – full maturity of recently established almond plantings, and future water recovery to meet Basin Plan requirements (3,200 GL target) via on-farm infrastructure upgrades
- **Future market (dry)** – same as Future market scenario but with an 11% reduction in water supply and a 3% reduction in rainfall.

Assumptions – Each scenario was modelled using historical water supply conditions from 2005–06 to 2018–19 to give a range of wet and dry years. But the period 2005–06 to 2018–19 was drier than the longer historical record. Scenarios assume the use of current farm capital and technology and do not allow for long term adaptation.

Modelling results show:

- **Higher water prices** – Compared with the current market scenario, allocation prices are estimated to be 28% higher in the future market scenario and 50% higher in the future market (dry) scenario. In the future market scenario, prices are estimated to remain above $200 per ML in eight out of 10 years. Allocation prices in 2018–19 were relatively high, at around $445 per ML, and this same price would be considered an average price under future market scenarios. Larger price increases are modelled in dry years under both future market scenarios.
- **Inter-regional trade limits having a larger effect** – Growth in water demand in the lower Murray due to maturing almonds trees will place greater pressure on inter-regional water trade, more frequently binding trade limits and creating large differences in prices between regions, particularly in dry years.

Caption: © Murray Irrigation

- **Just enough water to maintain horticultural plantings in dry years** – While water supply (including both surface water and other sources such as groundwater) is sufficient to meet estimated demand from horticultural plantings (fruits, nuts and grapevines) in all scenarios, in practice there remains some risk of supply shortfalls within each water year, particularly if future conditions are drier than modelled or trade constraints are tightened.
- **Reductions in water use in some traditional irrigation sectors and regions** – Water use in the dairy and rice sectors is modelled to decrease on average by 14% and 15% respectively in the future market scenario (relative to the current market scenario). In dry years, more significant decreases are predicted for these sectors in order to meet horticultural water demand, with dairy and rice decreasing by up to 55% and 32% respectively. Average water use declines by around 18% in the Goulburn–Broken region and around 7% in the Murrumbidgee in the future market scenario.
- **Impacts on the gross value of irrigated agricultural production (GVIAP)** – GVIAP is modelled to decrease for dairy (by 9%) and rice (by 13%) in the future market scenario (relative to the current market scenario). Fully mature almond plantings would drive a substantial increase in production and gross value (around 23% for both) for the sector. Overall, the total GVIAP across all sectors is modelled to increase on average by 0.8% in the future market scenario and decrease by 4.1% in the future market (dry) scenario.

Caption: Photography by Jason Wilsons

2.4 Modelling variants of the Murray–Darling Basin Plan in the context of adverse conditions in the Basin

Scope

The Panel commissioned Professor Glynn Wittwer from Victoria University to model the impacts of future Basin Plan implementation scenarios. As part of this analysis, Professor Wittwer also reviewed the underlying economic circumstances impacting the Basin (to inform the analysis). Unlike the ABARES market model which focused on water markets and agricultural production, this modelling looks at the wider impacts on communities.

The full report has more information and results and offers a deeper understanding of the wider impacts of different approaches to implementing the Basin Plan. The results presented here are a simulation of potential future outcomes under different conditions and do not predict the future.

Key insights

Economic context:

- During the 1990s, a competitive Australian dollar contributed to an expansion of some sectors in the Murray–Darling Basin, notably wine grapes.
- From the turn of the millennium, two adverse events brought difficulties for agriculture in the Basin: the Millennium Drought and a strong Australian dollar, which diminished returns to agriculture.
- The dairy industry has suffered from a deterioration in the global market.

Modelling approach and results:

- Two scenarios were modelled to show how different levels of expenditure on water recovery compare with investments in human services in the Basin:
    - The first scenario looked at the impacts of $4 billion spent on on-farm and off-farm infrastructure upgrades between 2020 and 2024 to recover almost 500 GL of water for the environment.
    - The second scenario looked at the impacts of spending $1.5 billion on on-farm and off-farm infrastructure upgrades to recover almost 500 GL of water for the environment between 2020 and 2024, and spending $2.5 billion over 10 years on human services in the Basin.
    - Comparing the two scenarios helps to understand how different approaches to recovery and different levels of expenditure generate different returns to society.

Scenario 1 – Investing $4 billion to recover water through on-farm irrigation infrastructure would provide economic benefits equivalent to $2.9 billion to the Australian economy over the period assessed. Professor Wittwer's scenario modelling looks at impacts of recovery across the southern and northern Basins. This result suggests that the long term benefits of managed environmental water, such as improved amenity, recreation and tourism outcomes, would need to provide at least $1.1 billion in long term value to communities inside and outside the Basin in order to deliver a net benefit nationally.

Scenario 2 – Each dollar spent on human services creates four times as many jobs as spending on infrastructure upgrades creates. Consequently, jobs in the Basin rise relative to base by between 1,500 and 1,600 between 2020 and 2024 and thereafter by more than 1,200 if the additional human services spending of $250 million per year continues. The cost to the economy as a whole (the welfare loss) is $0.74 billion, meaning the net economic loss to the Australian economy is smaller than it would be in a scenario involving investment in infrastructure upgrades alone.

2.5 Case studies

MJA compiled some cases studies to support the Panel's understanding and the modelling work ABARES and Professor Wittwer undertook. Each is briefly summarised here.

Recreational fishing

Recreational fishing is a popular activity in the Basin. As of 2018, there are an estimated 500,000 recreational anglers in the Basin. Recreational fishers have a direct interest in water management, acknowledging that improved river flows will deliver better outcomes for fish populations. Recreational fishing in the Basin has an estimated baseline economic contribution of $100 million gross output and $90 million gross value-added per year.

There is clear evidence that changes to river flow regimes directly impact Basin fish populations. Improving water management improves the ability for native fish numbers to increase. This in turn provides greater recreational fishing opportunities. But available evidence suggests that water availability or quality does not materially impact recreational fishing activity. This implies environmental flows may not materially impact on activity.

The full recreational fishing case study is available.

Rice industry in the Riverina

Rice is an opportunistic crop where ricegrowers make planting decisions based on the availability of general security water, allocation prices, and relative crop prices. This means the consumptive pool of water used by rice varies from year to year. The number of farms planting rice has more than halved over the past 20 years due to various factors. As a result, the farmgate economics of rice are changing, and there is likely to be continued pressure on the sector and flow-on impacts for milling.

Under further water recovery and the impacts of climate change, the periods of very low allocation will be longer and deeper than the sector previously experienced. Continued investment in regional mills in their current form will not be sustainable. As a result, it is expected Riverina mill capacity will consolidate, or milling plant and operations will undergo more substantive modification so more extended periods of mothballing can occur.

The full rice industry case study is available.

Horticulture below the Barmah Choke

Horticulture below the Choke is overwhelmingly comprised of perennial plantings and their composition has changed significantly over time. Wine grapes and citrus now represent a smaller proportion of total plantings because these industries restructured in response to market pressures. Large greenfield developments of almonds and, to a lesser extent, olives have emerged, and patchworks of vacant blocks in older irrigation districts have appeared.

Large scale horticulture developments are now reaching the point where further development may impinge on the ability to meet the region's water needs in some circumstances. Under further water recovery and the impacts of climate change, the periods of very low allocation will be longer and deeper than previously experienced. This will place considerable pressure on water needs below the Choke and will see further trade to the region from above the Choke. There are risks that demand may not be met in the future under very dry conditions and peak summer crop needs.

The full horticulture case study is available.

Dairy industry in northern Victoria

Over the past decade, the pool of water available to dairy farmers fell considerably and competition for it increased. Additionally, over this period, milk production fell and milk prices were volatile. There were generally poor conditions across the Victoria, NSW and Queensland sectors. Milk processors have been rationalising capacity and upgrading key sites in response to changing market conditions and transport processing efficiencies. Many of the older, smaller plants in northern Victoria have been closed and mothballed.

The combined impact of falling milk prices and increasing competition for water has most affected dairy farmers who had previously sold water to water recovery programs and now rely on purchasing water on the temporary market. The extent to which the northern Victoria dairy sector will be viable in the future depends on the cycle of milk prices relative to water availability and the scope of dairy farmers to build buffer stocks of fodder in good times. Substantial risks for the sector include longer and deeper periods of reduced water availability and the corresponding periods of weak milk prices.

More risks exist for those dairy farmers with reduced ability to adopt sophisticated fodder systems and attract contracts for domestic milk supply and high-end products. These dairy farmers are likely to be smaller dairy farmers with tighter development footprints. They have less capacity to take on complex managerial and technical farm requirements. They face higher development costs and have less capacity to adjust to sustainable feed systems.

The full dairy industry case study is available.

Cotton industry

Since cotton is usually a higher value crop than alternatives (such as sorghum and rice), cotton prices are usually not a major determinant of the area planted to cotton. The cotton industry will continue to expand or shrink annually in response to available water allocations and temporary water prices.

Available evidence indicates that the cotton sector will rebound when allocations recover. Deeper and longer periods of low allocations and higher temporary water prices than previously experienced will reinforce the importance of diversifying enterprises (as is common for cotton farming businesses). Cotton production will remain more stable in the southern Basin because cotton is likely to outcompete lower value enterprises such as fodder crops and dairy. In contrast, lower-returning enterprises are expected to experience production decreases.

The full cotton industry case study is available.

Recreational boating

Recreational boating activity is associated with 4 million visitor nights and 450,000 day trips per year, with most of the activity occurring during the peak season between September and April. Boating in the southern Basin accounts for approximately 80% of the Basin's boating activity. There is no strong evidence that changing water availability will systematically change recreational boating activity levels and, instead, recreational boating activity is strongly correlated with overall tourism activity.

Recreational boating in the Basin has an estimated baseline economic contribution of $350 million gross output and $300 million gross value-added per year, but all available evidence suggests that this contribution will not be materially impacted by changes to water availability, such as those resulting from increased environmental flows.

The full recreational boating case study is available.

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