

# Supporting dairy business managers to manage for future climates

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Dairy Businesses for Future Climates project\_Milestone Report

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## TABLE OF CONTENTS

1.0	Dairy Business for Future Climates project Background.....	2
1.1	Aims and methods of the DBfFC project.....	2
1.2	Definition of ‘supporting dairy business managers for future climates’? .....	4
2.0	Supporting transitions and operations of DBfFC dairy business development options.....	4
3.0	Mapping out farmer support needs for the dairy industry and policy community.....	7
3.1	Support Need: Accessing quality extension and advisory services .....	7
3.1.1	Support context .....	7
3.1.2	Possible support responses.....	7
3.2	Support Need: Upskilling of dairy business managers.....	7
3.2.1	Support context .....	7
3.2.2	Possible support responses.....	8
3.3	Support Need: Adapting to climate change as business risk management.....	8
3.3.1	Support context .....	8
3.3.2	Possible support responses.....	9
3.4	Support Need: Access to a flexible and skilled on-farm workforce .....	9
3.4.1	Support context .....	9
3.4.2	Possible support responses.....	10
3.5	Support Need: Maintenance of social license to operate .....	10
3.5.1	Support context .....	10
3.5.2	Possible support responses.....	10
3.6	Support Need: Maintaining personal and family health and wellbeing .....	11
3.6.1	Support context .....	11
3.6.2	Possible support responses.....	11
3.7	Support Need: Maintenance and improvement of regional infrastructure .....	11
3.7.1	Support context .....	11
3.7.2	Possible support responses.....	11
4.0	Conclusions .....	12
	REFERENCES .....	13

## 1.0 Dairy Business for Future Climates project Background

### 1.1 Aims and methods of the DBfFC project

The 'Dairy Business for Future Climates' (DBfFC) research project was developed with an understanding that the Australian dairy industry is facing a particular combination of challenges – a challenge set that is similar to the dairy industry in New Zealand. Sargeant and Paine (2015) describe the New Zealand dairy industry as pursuing increased agricultural productivity in the context of: climate change and predicted greater seasonal variability; pressure from local and international communities relating to environmental stewardship, animal welfare, health and safety and employment regulations; and substantial price volatility from global commodity markets. Competition for natural resources in the Australian context is also likely to increase, particularly with regards to scarcer water resources in a generally hotter and drier climate and farming land competing with other land use pressures such as urbanisation. Responding to such challenges need to include identifying and integrating the right management changes in farm systems for each unique farming situation while anticipating capability gaps at the industry and farm scale so that agricultural services can adapt their provision of supports according to these new challenges (Sargeant and Paine, 2015).

The DBfFC research project set out to explore how different dairy farm systems in the dairy regions of Gippsland, South Australia and Tasmania may perform under predicted climate changes out to 2040. There are lots of predictions about climate change but relatively little empirical research into understanding the possible impacts on farming systems and how they could be adapted (Rickards 2013). In particular, this research is filling a knowledge gap about the impacts, opportunities and trade-offs on profit, risk and people from dairy intensification and climate change adaptation strategies.

A participatory and transdisciplinary approach was adopted combining integrated modelling (biophysical and economic), social research and farmer knowledge to identify dairy farm management responses and innovations that maintain dairy business profitability while building operational resilience for business optimization under more variable and changed climatic conditions. (Please see Table 1 for an inventory of the methods used). The integrated modelling has produced scientific knowledge about the (predicted) performance of a single farm under projected future climates and examined the impact of extreme climatic events on the farm and business system. However, on its own this knowledge does not represent what a farm-business manager might do or plan for given the perceived and actual threats and impacts of future climatic and other factors. Knowledge about what might be desirable or feasible in adapting dairy business management to future climates has been provided by farmers and consultants as collaborators in this research. Therefore DBfFC has provided insights into possible futures so that dairy business managers and the dairy industry can be informed about different pathways of change.

A case study farm was selected in each dairy region based on it operating as a profitable dairy business and included both dryland and irrigated farm systems. These 'case study' farms were selected as broadly representative of other farms in each of the regions with the intention that other dairy business managers in each region could relate to the research findings. Three farm contrasting development options were defined for modelling by regional working groups (RWGs) made up of farmers and dairy industry consultants located in each case study region. Broadly, three different

development options for dairy businesses were devised (although there were regional differences amongst these broad categories of Intensify, Adapt and Simplify) as representing relevant systems.

1. The 'Intensified' option included pasture grazing at a higher stocking rate and additional supplementary feeding (+irrigation in Tasmania/no grazing in South Australia)
2. The 'Adaptive' option - reorganising resources for tactical responses to change with fewer cows and greater milk production per cow (+ irrigation in Tasmania)
3. The 'Simplified-self-reliant' option aimed to reduce the need for purchased fodder

The social science component of the DBfFC project involved 5 key inputs throughout the research process:

1. Providing leadership to assist with the integration aspects of the project
2. Capturing existing knowledge and experiences from experienced farmers and industry consultants within the dairy industry about how dairy farmers have coped with/adapted to climate challenges that have already occurred;
3. Developing the dairy business development options based on discussions with expert farmers and industry consultants to produce baseline data regarding the social needs and implications for each option i.e. skills, supports, labour, health and wellbeing;
4. Contributing to the analysis of the development options by facilitating a joint analysis process across the science groups, project steering group and regional reference groups (Regional Working Groups) focusing at the farm and regional scales,
5. Developing an understanding of the implications and challenges for the dairy industry as a whole in terms of supporting dairy farmers and responding to change under future climates as an industry. The methods used to conduct the social science component are summarised in Table 1.

**Table 1: Matrix of the project's multiple methods used**

Case Study Regions	CENTRAL GIPPSLAND (VICTORIA) FLEURIEU PENINSULA (SOUTH AUSTRALIA) NORTH WEST (TASMANIA)			
Development Options	1 Case Study Farm per region Intensify Adapt Simplify			
Methods	Consultations with and feedback from a Project Steering Committee			
	Consultations with and feedback from Regional Working Groups in each case study region			
	Climate modelling	Biophysical modelling	Economic modelling	Social research methods
Tools	Historical climate records - SILO Long Paddock (1975-2013) Predictions of future regional climate (2040)	DairyMod SGS model	Spreadsheet budgets @Risk (Palisade v.7)	Semi-structured farmer interviews (19) Focus Groups (7) Extreme Climate Events survey (38) NVivo software v.10 (qualitative data analysis)
Data Outputs	Historical (1975-2013) – wet decade and dry decade 2040 future climate scenarios – high, medium, low.	Pasture/forage supply Pasture utilization Purchased feed Hay/silage production Milk yield and milk solids Nitrogen and irrigation requirement	Revenue Expense Profit Net present value Internal rate of return Net Cash Flow Peak Debt	Social dimensions of climate change adaptation (report) Farmer expert-assessment of development options and adaptive capacity Farmer expert-assessment of past exposure (previous 5-10 years) to extreme climate events
Integration Outputs	Integrated Vulnerability Assessment per case study region and across regions Summaries of Integrated Vulnerability Assessments – regional stories			

**1.2 Definition of ‘supporting dairy business managers for future climates’?**

Transitioning and operating dairy businesses into the future in the context of climate change and dynamic market forces will rely on the skills and knowledge of managers and operators, as well as their broader social networks. For example, the existing social networks of dairy business managers (e.g. peer-based producer groups), their professional relationships with high quality agricultural service providers (e.g. agronomist consultants, input suppliers, financiers, employment agencies, solicitors, vets, insurance agents), and good access to community services and connections with industry related organisations (e.g. Regional Development Programs - Dairy Australia, local governments, public and private research organisations) will all be important in sustaining and enhancing the adaptive capacity of dairy businesses. Engaging with peers, professional services and industry-based organisations will assist dairy business managers in accessing resources, participating in opportunities for learning and mentoring and finding new ways to manage risk in a supportive, networked environment. At a more strategic level, the social, economic and environmental sustainability of the dairy industry will continue to need to be under-pinned by national, state and regional policies that support the range of skills development and support services needs of a diverse farmer population.

**2.0 Supporting transitions and operations of DBfFC dairy business development options**

Key findings from the assessment of human and social dimensions of the development options indicated that no single development option identified in any region could be considered superior to the others - all options had certain strengths and weaknesses. Dairy business managers in the DBfFC project identified a complex range and sequence of opportunities, vulnerabilities/risks and dependencies for each development option at the farm and regional scale. Refer to Tables 2-4 for a summary of the opportunities, vulnerabilities/risks and dependencies.

**Table 2: Towards an ‘intensification’ trajectory for dairy businesses: opportunities, vulnerabilities and dependencies**

<b>Intensified (2040)</b>	<b>Opportunities</b>	<b>Vulnerabilities</b>	<b>Dependencies</b>
<p><b>Gippsland</b> – producing more milk with more feed, infrastructure and labour</p> <p><b>South Australia</b> – targeting premium milk price, adapting to hotter temperatures by housing cows with a mixed ration</p> <p><b>Tasmania</b> – infrastructure invested aimed at managing wet conditions, further irrigation investment</p>	<ul style="list-style-type: none"> <li>&gt; Capacity to take advantage of economies of scale and favourable operating conditions i.e. high milk prices, low feed prices</li> <li>&gt; Employment opportunities: these systems demand more staff</li> <li>&gt; Investment in a permanent feed-pad can add operational flexibility in response to variable seasonal conditions</li> <li>&gt; May be attractive to dairy manager/owner who operates a mature dairy business</li> </ul>	<ul style="list-style-type: none"> <li>&gt; May be exposed to greater variability (high and lows) in profit making over the mid to long term under variable climate conditions</li> <li>&gt; Significant investment in infrastructure may result in ‘lock-in’ effects, reducing flexibility of farm system</li> <li>&gt; Risks to personal and family health due to potentially high stress levels</li> <li>&gt; Greater effluent concentrations to manage</li> <li>&gt; Risk of the withdrawal of the social licence to operate due to public concerns for animal welfare</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Requires high equity levels and/or the ability to take financial risks</li> <li>&gt; Reliant on accessing staff with specialised skill sets</li> <li>&gt; Reliant on knowledge of global situation – milk &amp; fodder prices, climate patterns</li> <li>&gt; Reliant on affordable grain supply</li> <li>&gt; Reliant on affordable irrigation water (Tasmania)</li> </ul>

**Table 3: Towards an ‘adaptive’ trajectory for dairy businesses: opportunities, vulnerabilities and dependencies**

Adaptive (2040)	Opportunities	Vulnerabilities	Dependencies
<p><b>Gippsland</b> – adapting to drier summer conditions using home grown fodder</p> <p><b>South Australia</b> –improved milk returns with increased labour, conserved feed and changed pasture species, minimal additional investment</p> <p><b>Tasmania</b> – more irrigation investments for summer production, off-farm agistment to manage through winter wet</p>	<ul style="list-style-type: none"> <li>&gt; Flexibility in adjusting farm system to maximise seasonal conditions eg. Weather, input costs</li> <li>&gt; Maximises per cow production</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Constant need for sound decision making and planning abilities to adjust operations seasonally to take advantage of conditions</li> <li>&gt; Adaptive management requires persistent scanning of seasonal &amp; global parameters to take advantage of dynamic conditions</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Reliant on accessing skilled staff</li> <li>&gt; Financial capital required to invest in farm equipment</li> <li>&gt; Need to have self-efficacy in seeking knowledge to supplement knowledge gaps</li> <li>&gt; Reliant on knowledge of global situation – milk &amp; fodder prices, climate patterns</li> <li>&gt; Reliant on affordable grain supply</li> <li>&gt; Reliant on affordable irrigation water (Tasmania)</li> <li>&gt; Reliant on quality local agistment services (Tasmania)</li> </ul>

**Table 4: Towards a de-Intensification trajectory for dairy businesses: opportunities, vulnerabilities and dependencies**

Simplified (2040)	Opportunities	Vulnerabilities	Dependencies
<p><b>Gippsland</b> – reduce exposure to inputs costs, strong focus on home grown fodder</p> <p><b>South Australia</b> – grazing as much pasture as possible to reduce input costs and minimize exposure to supplement prices</p> <p><b>Tasmania</b> – smaller herd, lower inputs costs, simple system, reduced production per cow</p>	<ul style="list-style-type: none"> <li>&gt; Operating a less complex system i.e. less stress</li> <li>&gt; Possibly less labour required</li> <li>&gt; Possibility of stabilizing annual profit making over the mid to long term by generating a consistent income</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Greater reliance on making own decisions</li> <li>&gt; Reduced capacity to take advantage of favourable operational conditions i.e. high milk price, low feed costs</li> <li>&gt; May limit farming succession if not able to financially support additional family members or share farmer</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Need high level skills in pasture management, budget management and general farm operations</li> <li>&gt; Likely to be viable only if servicing a relatively low debt with medium to high equity levels</li> <li>&gt; Likely to be an attractive option for a farmer transitioning towards retirement</li> <li>&gt; Reliant on affordable irrigation water (Tasmania)</li> </ul>

The complex range and sequence of opportunities, vulnerabilities/risks and dependencies identified for each development option means that dairy businesses for future climates are likely to develop in multiple ways and responses by business managers to a changing climate will vary from business to business. Therefore the future pathway for each dairy business manager will be an individual decision and will be influenced by the unique set of farmer skills, risk tolerance, business goals and available resources within a social-ecological regional context i.e. the support needs will differ in accordance to different risk profiles of farm/business managers and farming context. This finding aligns with a general understanding of adaptive capacity as: *inherent in people, places and networks; therefore, there are no generic and generalizable solutions, but rather, opportunities and support for learning individually and in groups are required* (Nettle et al., 2015:853). Therefore support systems designed to assist in business decision making and actions around climate change adaptation on dairy farms will need to be flexible, tailored and diverse.

Such complexity and range of perceptions are to be expected given the differences in dairy farm systems that currently exist, together with the diverse resource bases (soil, water, aspect, slope, finances, infrastructure, skill level and social attributes), business goals and risk profiles of managers. However, DBfFC expert farmer participants did share some key common views about the sorts of skills and supports that would be required to transition to and operate the broader categories of ‘intensified’, ‘adaptive’ and ‘simplified-self-reliant’ dairy systems. These suggested supports were captured in a Questionnaire on Extreme Climate Events (2014-2015), during focus group sessions with expert farmers and regional working groups (2014-2015) and in nineteen semi-structured interviews with individual farmers across the three case study regions (2014). These are summarised below in Table 2.

**Table 5: Summary of Support Needs of Dairy Business Managers Identified from the DBfFC Project**

\* Dot points shaded in blue are support needs that are common across all development options

Development Option	Support needs
<b>Across all development options</b>	<ul style="list-style-type: none"> <li>• Skills development (training and learning) for managers in business risk management including: financial risks (e.g. seasonal and annual budgeting), biophysical risks (e.g. farm water planning) and social risks (e.g. employing dairy workers)</li> <li>• Specific support for on-farm climate change adaptation measures, for example precision irrigation technologies and summer pasture management</li> <li>• Training to upskill managers in agronomy and/or access to high quality agronomists particularly for maintaining high quality pastures and summer cropping (home-grown feed)</li> <li>• Accessing and learning about the latest technological innovations to support precision agriculture</li> <li>• Improved weather forecasting that is delivered in a more timely fashion to enable planning (e.g. longer term trends in rainfall, sunlight hours and temperature ranges, crop species suitable for warmer conditions)</li> </ul>
<b>Intensified</b>	<ul style="list-style-type: none"> <li>• Access to high quality nutritionists and/or training to upskill managers in devising herd feed plans based on supplementary and pasture feeding systems</li> <li>• Banking and financial advisory services that assist in managing economic risk and fluctuating finances (income, assets, prices)</li> <li>• Mechanisms to manage stress and maintain healthy relationships amongst dairy managers and their families and communities</li> <li>• Access to skills and knowledge on human resource management for dairy workforce development i.e. Occupational Health and Safety requirements, payroll systems</li> </ul>
<b>Adaptive</b>	<ul style="list-style-type: none"> <li>• Access to high quality nutritionists and/or training to upskill in devising herd feed plans based on supplementary and pasture feeding systems</li> <li>• Decision making support through peer networks (e.g. discussion groups) or advisory services (e.g. private consultants, input suppliers) in order to deliberate on the best way to mobilize and recombine farm resources to take advantage of current and future operating conditions</li> </ul>
<b>Simplified-Self-Reliant</b>	<ul style="list-style-type: none"> <li>• Investment in extension and knowledge management programs that focus on pasture management for primarily pasture-based dairy businesses (e.g. Feeding Pasture for Profit program)</li> </ul>

While dairy farm business managers identify the need for support for adaptation to future climates, the DBfFC project has found that dairy business managers are generally aware of climate challenges and are confident in their ability to adapt to incremental changes in average climate conditions i.e. future climate variability was assumed to be incremental, foreseeable and manageable. However there was little evidence to indicate that ‘surprising change in climate’ i.e. extreme weather events, is well anticipated by dairy business managers despite having experienced the consequences of extreme weather events over the past five to ten years.

## 3.0 Mapping out farmer support needs for the dairy industry and policy community

The following support needs and responses are based on the social research findings of the DBfFC project, input from project steering committee members and substantiated by drawing upon industry documents and relevant research papers.

### 3.1 Support Need: Accessing quality extension and advisory services

#### 3.1.1 Support context

The agricultural extension system in Australia has undergone major shifts over the past two decades. The changing system features less service provision by the public sector and more service provision by industries and the private sector. Primary producers rely on accessing knowledge and information from a range of sources including: state agencies, local government, industry organisations, commercial farm input suppliers, the finance sector, education sector, processing companies and private individual rural consultants. As farm systems become more finely tuned and sensitive to change, there is greater reliance by farm business managers on accessing timely and relevant information, R&D outputs and advice to make better strategic and tactical decisions on-farm.

#### 3.1.2 Possible support responses

- R&D providers working closely with both the public and private agricultural extension and advisory sectors to ensure information and knowledge is up-to-date and packaged effectively for extension and advisory practitioners to ensure a quality service to dairy farmers
- Continued public funding and support for RD&E activities targeting on-farm climate change adaptation strategies
- Policy directives that promote ongoing professional development of agricultural extension and advisory practitioners
- Developing a national professional development program for the agricultural extension and advisory sector in coordination with the education and training sector to ensure the services match the knowledge and information needs of dairy farm managers and owners
- Developing quality assurance processes to regulate the quality of agricultural extension and advisory services
- Specific training for service providers (agronomists, agricultural consultants, bankers) to assist farm managers with farm business risk plans and their implementation.

### 3.2 Support Need: Upskilling of dairy business managers

#### 3.2.1 Support context

Dairy business managers in the DBfFC project identified that different skill sets would be required for each particular business development option considered in the project. However it was generally thought that future dairy farming skill sets will need to be both broad (e.g. human resource management, financial management) and specific (e.g. pasture management for dryland or irrigated systems, nutrition management in relation to a particular feed base).

Limited access to knowledge and reduced opportunities for skill development on the part of dairy business managers is likely to reduce the adaptive capacity of dairy businesses and therefore constrain transitions to other systems in response to dynamic operating conditions. This highlights the importance of dairy business managers actively participating in the knowledge economy to meet

the evolving needs of farm businesses, the dairy industry and the wider community through accessing adult learning opportunities, procuring expert knowledge through multiple channels (e.g. extension programs, private consultants and digital resources) and being a part of knowledge production processes (e.g. participating in R&D projects).

### **3.2.2 Possible support responses**

- Developing a nationally coordinated learning curriculum for adaptive capacity of dairy businesses in Australia to ensure education and training institutions deliver across a range of topic areas (e.g. operational risk management, business risk management, on-farm people management including Occupation Health and Safety compliance, pasture and nutrition management, biosecurity management etc.)
- Industry support for maintaining peer-to-peer knowledge and practice networks through producer groups, online communities, on-farm demonstrations etc.
- The high self-efficacy for adaptation combined with the perception that climate change is not an immediate threat to incremental adaptation over time, appears to be a significant opportunity to build adaptive capacity of dairy businesses through raising awareness and developing knowledge within the dairy industry of potential impacts of future climates which could be supported by:
  - participatory research that engages dairy business managers in social learning for adaptation similar to the Dairy Business for Future Climates project
  - communication of current climate change research and development in participatory and deliberative learning forums (e.g. farmer discussion groups and communities of practice)
  - provide opportunities for skills development of dairy business managers through local, formal and informal training (e.g. in climate science and farming, managing livestock health and extreme weather events, adaptation strategies)
  - improving weather forecasting (e.g. regional scale forecasting, short-medium term, more accurate rainfall predictions with longer term rainfall trends, sunlight hours and temperature ranges, soil water dynamics)
  - improving and extending the communication of locally relevant weather information

Delivery of these supports to the dairy farming community would assist in strategic business planning and inform tactical decision making in response to both seasonal and longer term climatic and other factors.

## **3.3 Support Need: Adapting to climate change as business risk management**

### **3.3.1 Support context**

The DBfFC project modelled business transition stages through 'wetter' and 'drier' periods. The timing of a farm system change is critical. Moving from one system to another may succeed or fail depending on climatic conditions throughout this phase. The early transition years can be a period of high debt exposure, and if coupled with unfavourable climate conditions, businesses may not be as viable as they could be under more favourable climatic and other operating conditions. There is a need to recognise business 'start up' periods and business 'transition' periods as a risky time for dairy businesses. Although insurance companies have tended to have little influence on Australian farm decision making with most agricultural insurance products focused on the cropping industry as index-based insurance products, banking sectors may be more likely to insist on a climate change risk management strategy in the future as part of the criteria for approving the financing of dairy farms in

the context of long-term financing extending into forecasted changes in regional climates (Eckard, 2008). As noted by the National Rural Advisory Council (2012),

*A key challenge for industry and governments is to increase awareness of insurance options as part of a broader role in building capacity to manage risks. This could include ensuring that agricultural training programs include modules on the full range of farmer risk management options (including index-based insurance) (NRAC, 2012:36).*

### **3.3.2 Possible support responses**

- Industry investment in assisting dairy business managers to identify where changes may be needed to their longer-term strategies through provision of integrated whole farm and strategic business plan development for dairy businesses
- Encourage and incentivise adoption of business risk management strategies by dairy business managers as a proactive tool rather than drought and emergency response relief as a reactive tool.
- Supporting Public-Private Partnerships with industry in rural Research, Development and Extension, in particular in the areas of climate information and decision support tools, data provision and regional climate modelling to help dairy farmers manage on-farm risks better. (NRAC, 2012:36)
- Provide income support strategies such as tax concessions for farmers seeking to increase the resilience of their businesses as they transition from one system to a more adaptable/flexible system. Similar support strategies could be made available for 'new entrants' to agriculture for a five year period thus providing a risk buffer in the business establishment phase.
- New initiatives could provide incentives for dairy business managers to enrol in business management courses focusing on business risk, including climate risk, precision agriculture and data driven tools. The incentives may include subsidized course fees.
- Service providers (agronomists, agricultural consultants, bankers) could be trained in assisting farm managers with developing strategic farm business plans and their implementation.
- Milk processors could provide data and support to current dairy businesses and prospective dairy farm investors around income projections and local costs of production to provide a regional profile of the industry as part of risk management planning (Bridge, 2014)
- National policies supporting the expansion of both niche and high volume domestic and international markets for dairy products to increase the business opportunities for dairy farmers
- Ensure that there are effective water markets in place to facilitate adaptation and increase water productivity (Stewardson et al., 2014)
- Fund future research that explores the context, drivers and capacities of agricultural producers who have set up their own successful niche marketing and processing businesses to promote examples of sustainable business models and successful risk management
- Develop planning regimes that support the protection of strategically important land resources for food and fibre production to ensure dairy businesses can expand through land purchasing/leasing

## **3.4 Support Need: Access to a flexible and skilled on-farm workforce**

### **3.4.1 Support context**

Dairy business managers reported that finding quality, skilled and flexible on-farm labour to support milking operations, farm management or technical and agronomic problem-solving is challenging. This

is due to: the diversity of skill sets required to run an effective dairy business; the current dynamics of the dairy workforce (e.g. reliance on casual labour provided by international travellers, seasonal workers) making it difficult to recruit, retain and invest in the training of farm staff and, competition for labour in dairy regions with other non-agricultural industries e.g. mining, retail and business sectors etc.

### **3.4.2 Possible support responses**

- Regional and industry policies supporting regional dairy workforce development through incentives, investments, professional development opportunities and industry standards
- Review the Pastoral Award to ensure it continues to match the requirements of the dairy industry and is set at a competitive rate to attract/retain employees, particularly in times of high unemployment (ADIC, 2014)
- (ADIC, 2014)
- Classify agriculture and related tertiary courses under the National Priority band for Commonwealth HECS-HELP assistance to encourage students to undertake formal education in agriculture (ADIC, 2014)

## **3.5 Support Need: Maintenance of social license to operate**

### **3.5.1 Support context**

The 'Intensified' options across the DBFC project regions were considered risky by farmers in terms of the potential to trigger a withdrawal of the social license to dairy farm (operate) based on societal concerns for animal welfare and environmental issues. It is thought that the general public have an expectation of dairy cows grazing in open, green paddocks and not confined to sheds in large numbers. The environmental risks identified by farmers in this study were related to on-farm management of increased effluent as a source of pollution that must be carefully managed to reduce the risk of contaminating local waterways. The dairy industry faces a potential risk in terms of maintaining a responsible, transparent and ethical public image if community expectations and concerns are broadly apparent and not addressed. It is apparent that managing the public reputation of the dairy industry is a national strategic focus for Dairy Australia considering the current project work that focuses on industry reputation management including projects on the industry's sustainability framework, the mobilisation of key influencers of community views and attitudes through consistent messaging, managing supply chain, food safety and integrity issues and the development of an industry issues management framework (Dairy Australia, 2016). Academic researchers, Williams and Martin (2011), also foresee that Australian farmers will be managing social license issues on a more regular basis considering public expectations of natural resource managers are greater and more diverse in areas of concern.

### **3.5.2 Possible support responses**

- Publicly promote the dairy industry's environmental and animal welfare standards (international, national, industry standards) and ethical/environmental performance to strengthen its social license to operate
- Integrate land and water policies for a more comprehensive approach to supporting natural resource management in the agricultural sector and avoid contradictory policy directives
- Provide dairy farmer levy-subsidised programs for on-farm nutrient testing and management plans to keep waterways clean (ADIC, 2014)
- Support ongoing engagement between agribusiness, the community sector and government/s to address common-interest social license issues

### 3.6 Support Need: Maintaining personal and family health and wellbeing

#### 3.6.1 Support context

Supporting farming family health and wellbeing is important considering farmers are generally getting older, relying more on family members for extra labour and experience high incidences of injuries, illness and premature death as a sector (National Centre for Farmer Health, 2014). Dairy business managers involved in the DBfFC project also referred to the challenges of: managing personal stress; maintaining healthy relationships in response to operating an intensified dairy system as a result of the need to rely on family members for on-farm work; and the need to strike a work-life balance in the face of productivity challenges.

#### 3.6.2 Possible support responses

- Developing an industry-recommended directory of region-based support services (e.g. physical fitness programs, short courses in stress management, personal and financial counselling, education opportunities)
- Ongoing funding of the National Centre for Farmer Health to continue raising the awareness of the importance of health, safety and general well-being (ADIC, 2014)
- Fostering supportive social networks in regional communities through sporting clubs, hobby groups including holding community events that promote community health and wellbeing and showcasing social supports services available etc.

### 3.7 Support Need: Maintenance and improvement of regional infrastructure

#### 3.7.1 Support context

Farm systems do not operate in isolation. Therefore, regardless of what physical, financial, social, human and natural capital a farm might have, dairy businesses are reliant on the development and maintenance of regional infrastructure (physical capital) such as regional road networks, electricity and communications networks, irrigation delivery systems and local milk processing sites. Peak dairy industry representative and service bodies have acknowledged the critical role that regional infrastructure plays in enabling dairy regions to operate and rural communities to prosper. A lack of regional and industry infrastructure across Australia has been reported as a constraint on the development of the dairy industry at the national level (Dairy Australia, 2013).

#### 3.7.2 Possible support responses

- Government funding for strategic regional infrastructure projects beneficial to agriculture and regional communities - this could include improving the road network to deliver dairy products to multiple markets.
- Local Government to maintain and improve the efficacy of local infrastructure and services including roads, bridges, telecommunications, waste and energy services in accordance to the needs of a growing industry (Bridge, 2014)
- Water initiatives to support efficient water use and responsive irrigation management using monitoring and supply technologies i.e. precision irrigation (both on-farm and water suppliers) (Stewardson et al., 2014)
- Support NRM projects with the purpose of linking ground water and surface runoff with farm water use, access and storage - this is to support sustainable water planning for environmental health outcomes and water security for the agricultural sector (National Primary Industries Research, Development and Extension (RD&E) Framework, 2011)

## 4.0 Conclusions

A flexible, customised and diverse skills development support services system is critical for enabling dairy business managers and owners to develop their adaptive capacity in order to plan and respond to climate change and socio-economic dynamics. This will be reliant on leadership from government and industry in terms of developing institutional capacity to assist dairy business managers in farm management transitions and funding and delivering these support services. Key areas of support identified by farmer experts and substantiated through industry documents and research papers include:

- accessing quality extension and advisory services
- upskilling of dairy business managers in both general and specialised knowledge and skills
- adapting to climate change as business risk management
- access to a flexible and skilled on-farm workforce
- maintenance of social license to operate
- maintenance of personal and family health and wellbeing
- maintenance and improvement of regional infrastructure

While dairy farm business managers identified a set of support needs in relation to climate change, in this study they also demonstrated a general sense of confidence in their ability to adapt to climate change. This is based on the perception that any change will be incremental and manageable based on their previous adaptation successes. This could mean opportunities for enhancing the adaptive capacity of dairy business managers are missed or not fully pursued if there is little incentive to seek new information, or trial new approaches. The need to support the trialling of new approaches and avoid 'template' thinking is critical in the context of farm scale impacts from an increasing number of system shocks from various directions and scales i.e. commodity markets, weather systems, community expectations and governance and political decision making. A key difference between those dairy business managers that will strive to adapt to system changes and those that will not, is an understanding of their farm systems and the operating environment as a dynamic interaction requiring novel adjustments and practice change, as opposed to relying on inflexible rules of thumb and customary practices. These system shocks at the farm and industry scale are more likely to require individual and collective action that requires both immediate and long term responses across a number of drivers of change. The challenge therefore becomes how to integrate and coordinate support across the rural sector to enable a comprehensive sequence of responses to occur at different time scales.

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