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Stimulating private sector extension in Australian agriculture to increase returns from R&D

Research Report C:
The advisory and extension system (National and State)

June 2018

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About the project

Stimulating private sector extension in Australian agriculture to increase returns from R&D is a 3-year project to research, develop and test models to build the capacity of the commercial and private sector in delivering R&D extension services to Australian producers.

Led by Dairy Australia, the project is a collaboration involving nine partner organisations including six Research and Development Corporations (RDCs): Dairy Australia, Meat & Livestock Australia, Cotton Research & Development Corporation, Sugar Research Australia, Australian Pork Limited, Horticulture Innovation Australia; as well as the Victorian and NSW governments, and the University of Melbourne.

The project is funded by the partners and the Australian Government's Department of Agriculture and Water Resources as part of the Australian Government's Rural Research and Development for Profit program.

The project is in response to the trend towards increasing roles for industry and private services in delivering agricultural extension. This represents a shift away from traditional, government-funded extension services over the past 20 years. Currently the extent of private sector involvement in extension varies across industries, depending on product markets, policy settings, regional issues and industry demographics.

The private sector is now a well-used information source for producers, however there is scope to enhance the capability of the private sector in delivering extension. Improving the capacity of private extension service providers will contribute to on-farm productivity gains and profitability.

Companion reports

This report provides a summary of findings from research into farmers' demand (and willingness to pay) for agricultural advisory and extension services (information, advice and support). It is one in a series of four research reports from national surveys of farmers and advisers prepared for the project "Stimulating private sector extension in Australian agriculture to increase returns from R&D."

- Report A: Farmer demand
- Report B: Advisory services
- Report C: The advisory and extension system (this report)
- Report D: Farmer and adviser networks
- Report E: Research results: Focus groups and surveys of farmers and advisers
- Report G: Trial 1: The Processor Trial
- Report H: Trial 2: The Precision Agriculture Trial
- Report I: Trial 3: The Advisory pathways Trial
- Report J: Trial 4: The Knowledge system Trial
- Report K: The four private advisory sector engagement trials: the co-innovation framework and cross-trial results

Background: Australia's evolving agricultural extension system

Over time, the means and mechanisms by which Australian farmers access and receive their information, advice and support has changed markedly. This is largely because there has been:

- Changes to the role of government and their investment in and coordination of agricultural extension services in each State of Australia. (*Hunt et al., 2012; Hunt et al., 2014*)
- Variation in the way Australia's rural Research and Development Corporations have invested in and positioned extension functions.
- Variation in the extent to which a range of private providers have engaged in extension functions and the business models of agricultural service firms.
- Technological change in society, particularly, information and communication technologies.

Terminology

The term 'advisory and extension system' or 'advisory services' refers to the set of organisations and people that enable farmers to develop farm-level solutions by establishing service relationships to produce knowledge and enhance skills (Birner, et al, 2009. The need for co-ordination and collaboration amongst different advisory services and organisations in improving the impact from R&D investment is well recognised internationally.

Executive Summary

Australia's agricultural advisory and extension system is made up of a number of public, private, industry and not-for profit organisations and their practitioners. It is constantly evolving with changes in farmers' needs, services available and technological changes.

The Australian agricultural extension system is becoming increasingly privatised (Figure 1). The degree of privatisation varies by sector and jurisdiction, depending on factors such as product markets, policy settings, regional factors and industry demographics. Co-ordination and co-operation between public, private and industry service groups is needed to deliver the best outcomes on farm (see Klerkx and Nettle, 2013; Nettle, 2013; Nettle et al 2017).

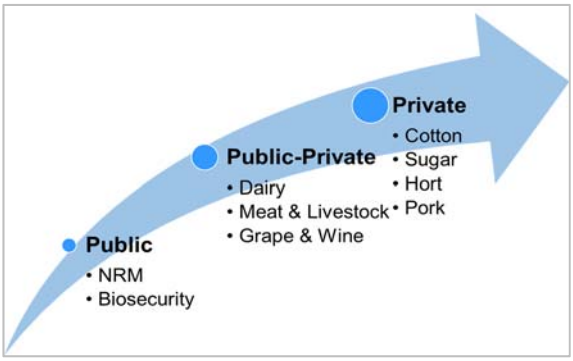


Figure 1: The Australian agricultural extension system is becoming increasingly privatised

This study has identified an ambiguity for farmers and advisers about how to access information and support at a time when there is growing demand for new knowledge and practices. There is a trend towards less direct and meaningful interactions between farmers, advisers, researchers and their institutions. This results in limited opportunities to collaborate and network across industries and localities.

Different sources of market failure in the Australian agricultural extension system have been identified from the study, including:

1. Acceptance of the private sector in extension roles
2. Trust and credibility issues amongst different sources of advice
3. Affordability and perceived value of paying for advice
4. High costs for the private-sector in staying up to date
5. Limitations to advisory sector business growth

Further, Australia's 'risk status' from privatisation was assessed based on criteria in the international literature (Kidd et al., 2000; Labarthe, 2005; Klerkx et al., 2006). Three issues are considered current risks (Table 1).

Table 1: Australia's 'risk status'

Current risk	Low current risk
• Limited engagement of advisory services in complex innovation • Environment given lower priority in farming systems information and advice • Discontinuity in service provision due to funding mechanisms	1. Narrow specialisation of advisers 2. Prevalence of top-down technology transfer models and less focus on building farming capability 3. Unwillingness to share purchased knowledge 4. Exclusion of farmers due to inability to pay

The agricultural knowledge and information system therefore requires active governance and management to:

- enable farmers access to advice and information that will help them in their land management decisions,
- to engage farmers and key stakeholders (such as researchers, government, private-sector advisers and the community) in negotiating agricultural practices and the information, advice and support needed.

Research methods

In seeking to better understand the advisory and extension system the research team was interested in issues in the advisory and extension system related to:

- Farmers' and advisers' engagement with research and RD&E.
- Collaboration and coordination amongst private and public organisations.
- Advisers' capacity to fulfil extension roles.
- The role of government.

The findings reported here are drawn from two activities undertaken to better understand the advisory and extension system in Australia:

- Four regional forums with farmers and advisers held in 2016 in Queensland, New South Wales, Victoria and South Australia (143 participants).
- National surveys of farmers (1003 responses) conducted in 2016 and advisers (655 responses) conducted between 15 December 2016 and 17 February 2017.

The regional forums used a focus group approach to discussing current key issues and priority areas for private sector involvement in agricultural research, development and extension. They were run by the University of Melbourne's Rural Innovation Research Group. Forums included at total of 143 farmers and advisers across a range of enterprises including sheep, beef, dairy, horticulture cropping, cotton pork and poultry farms.

An appreciative inquiry approach[1] was used to

- identify trends, issues and gaps related to the current system of agricultural advice and extension
- highlight potential opportunities or actions for improving and/or transforming the situation positively.

The focus was on the role of the private sector role to improve returns from R&D on-farm. In considering the services and systems needed to meet future challenges and opportunities we posed the question: *"Will business-as-usual meet the needs of Australian agriculture?"*

The national surveys explored and quantified the extent to which the issues identified in the focus groups were reflected across a broader population of farmers and advisers. The respondent sample information and key results from farmers and advisers from the survey were reported in Summary Reports A and B.

Research question

The specific research question in relation to the advisory/extension system was:

RQ1 What are the broader implications of shifts to the private sector in agricultural extension [what is not covered; where is engagement thin and what are the emerging impacts]?

[1] 'Appreciative inquiry' is a method for collecting and analysing information to support systemic change. Focusing on what is working well and why and not just identifying market and systems failures can assist build collaborative intent toward desired change (https://appreciativeinquiry.case. edu).

Findings

The findings reported here are combined from the results of focus group discussions and the national surveys of farmers and advisers. The results provide an important base-line for monitoring trends and results from interventions targeted at improving the advisory and extension system.

Further reading
Fact Sheet 2: Regional Forums
http://rirg.fvas.unimelb.edu.au/__data/assets/pdf_file/0011/2374724/Fact-sheet-forums.pdf

The findings relating to the advisory and extension system fell within six themes:

1. Diversity of farmer sources of information, advice and support.
2. Farmer participation in extension projects.
3. Uncertainty about the private sector role and paying to be involved.
4. Advisory business income sources.
5. Engagement with the research community.
6. Collaboration.

Diversity of farmer sources of information, advice and support

In Australia, no single provider has the monopoly on providing information, advice or support to farmers (see Summary report A). The main sources included:

- Product re-sellers/farm-input suppliers (a source for 85% of farmers; main source for 20%).
- Research and development corporations (a source for 72% of farmers; main source for 14%).
- Farmer owned information/advice groups and organisations (a source for 69% of farmers; main source for 11%).
- Governments (a source for 64% of farmers; main source for 10%).
- Independent (fee-for-service) advisers such as. farm management consultants, agronomists, specialist/technical advisers (source for 63% of farmers; main source for 32%).
- Processing companies that farmers supplied (a source for 53%; main source for 7%).

The use of different sources of information, advice and support varied by farm size. For example, smaller farms tended to use product resellers/farm-input suppliers and government agencies as a main source of information, advice and support; larger farms (>$501,000 average gross farm income) tended to use independent (fee-for-service) advisers.

The diversity of source organisations and advisers is a significant finding and highlights the role of government, industry and research organisations in harnessing this diversity and foster a well-connected RD&E system to support farm decision making.

Participation in extension projects

More than half of farmers (69%) said they were not currently participating in extension programs or projects. Of the different industries, vegetable growers (45%) and dairy farmers (41%) had the highest involvement. Those more likely to be involved with extension projects were older farmers (those over 40) with a tertiary qualification, earning between $1-5M average gross farm income and with between 1-2 additional decision makers involved in the business. Changes to the funding, delivery and 'branding' of extension efforts may explain why so many farmers reported not participating in extension projects or programs.

Uncertainty about private sector and paying to be involved

While around one third of farmers endorsed the quality of non-government extension services (33%) and felt they are effective in delivery (32%), only 18% were willing to pay to be involved with

agricultural extension programs delivered by non-government organisations. The results were not consistent however, with some farmers within a single sector polarised between agree/disagree with the role and payment of non-government extension service providers.

Key decision makers in the business were more likely to disagree that they would be willing to pay to be involved in extension programs (34% sole decision makers or with one other (32%), this was also the case for those from lower earning farms (45% $0-$50k annual gross income). Females were significantly more likely to 'disagree' that the non-government sector were able to effectively deliver agricultural extension services (22% vs 10% Males) and that they would be willing to pay to be involved in extension programs (36% vs 26% Males)

Cotton, cropping (grains), mixed cropping and grazing were significantly more likely to agree that the private-sector could effectively deliver than the average of all enterprises with dairy, beef, horticulture more likely than the average to disagree regarding effective delivery. The sugar cane growers were more polarised, being significantly more likely than the average to both agree and disagree.

Associated with this could be perceptions of paying for advice more generally, with between 39-46% of farmers unsure (neither agreeing or disagreeing) that paying for advice would be beneficial, profitable, of value, help identify new opportunities or provide more control in farm decisions (Figure 2).

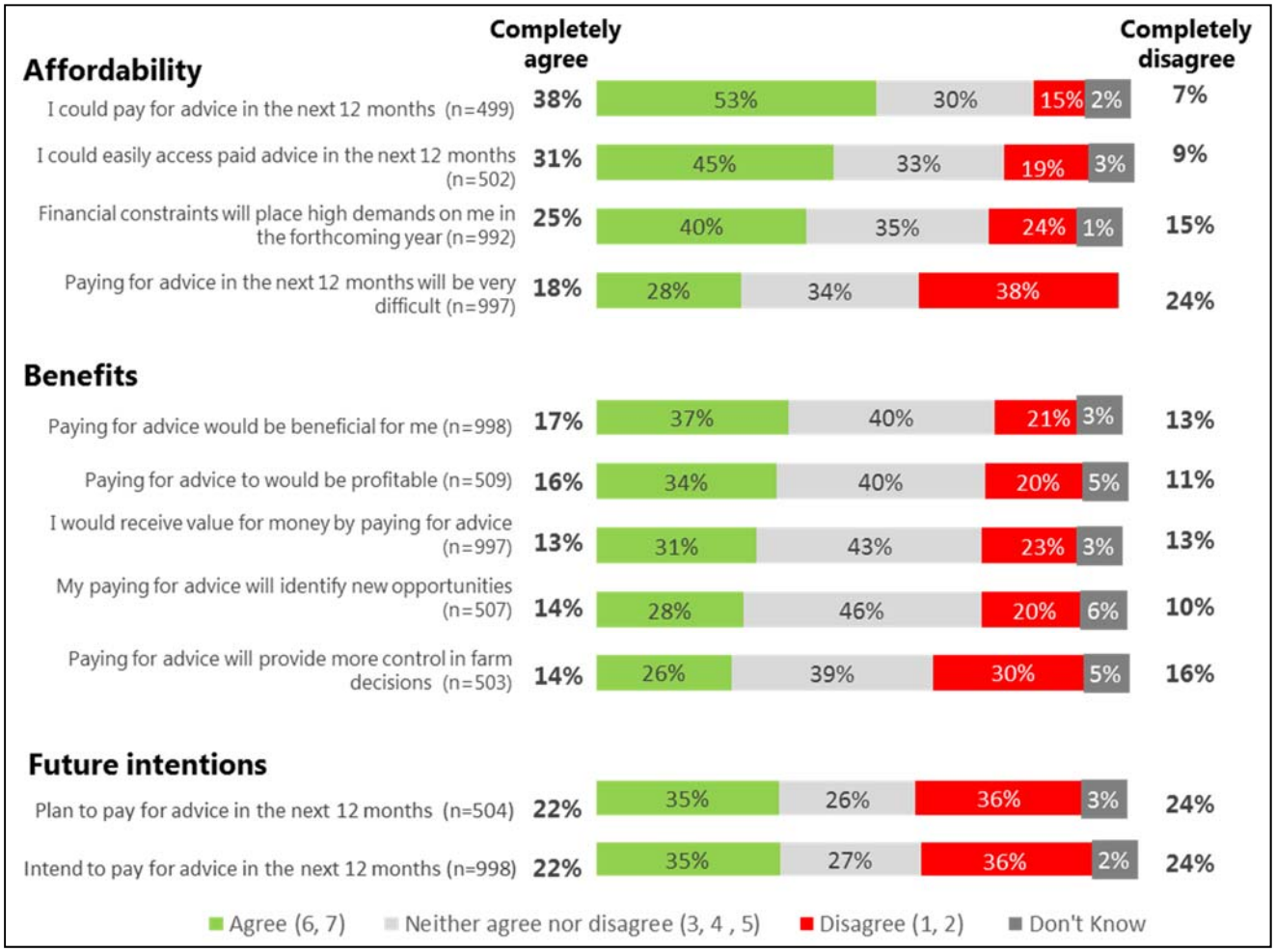


Figure 2: Farmers attitudes towards paying for advice

Income sources of advisory and extension services

Private advisory businesses reported a range of income sources, including from farmers, government, industry (i.e. RDC's), private company/co-operative, and non-government organisation (NGO)/other.

Advisers in private (consulting), sole operator and private (commercial) organisations gained most of their income direct from farmers (average 85% of these advisers). These groups were less likely to receive income from government than the other types such as industry and NGOs (34% of consulting advisers; 12% commercial advisers). The exception was sole operators who received on average, 39% of their income from government. 'Commercial' advisers (product resellers/farm input suppliers) were significantly less likely to obtain industry funding compared to other types (13% noted this funding source).

The private sector is less involved in the RD&E system

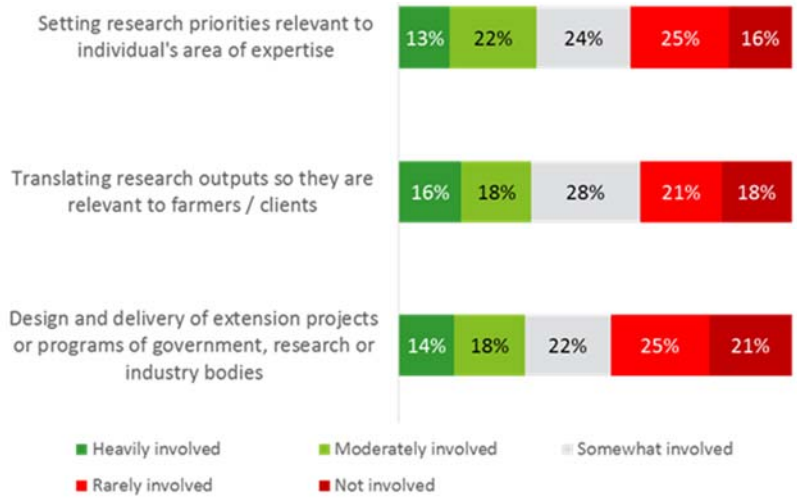
Both farmers and advisers are engaging with researchers/research organisations, but both groups desire more interaction.

On average, 80% of *farmers* had at least one interaction with agricultural researchers/research organisations in the past 12 months, yet 50% of farmers said they would like a little or a lot more interaction with researchers/research organisations than now.

On average, 68% of advisers said they were engaging at least quarterly with researchers/research organisations.

However, on average, 46% of advisers said they were rarely or not involved currently in the RD&E system (Figure 3). *Private sector* service providers were less likely to be directly involved than others (i.e. industry, government).

Figure 3: Current level of engagement of advisers in the RD&E system



Advisers in industry and public organisations were significantly more likely to be heavily involved in the design, development or delivery of extension projects or programs for government, research or industry bodies (33% and 28% 'heavily involved' respectively). People in industry organisations were also significantly more likely to be involved or consulted in setting research priorities related to their area of expertise (33% 'heavily involved').

Private commercial advisers (product re-sellers/farm input suppliers) and sole operators were significantly less likely to be involved (37% and 32% 'not involved' respectively). And when it came to delivering training or extension programs/projects, private-commercial and private-consulting advisers were significantly less likely than other advisory organisations to be directly engaged by government or industry to provide this service (40%-39% respectively 'not involved' within the past 12 months).

Advisers expressed a strong desire for greater involvement with the RD&E 'system.' In particular, they wanted to:

- Be kept up to date on extension projects (72% a lot more/some more).
- Have an input into research priority setting and translation of research to meet client needs (66% a lot/some more).
- Be involved in design, development and delivery of extension projects (63% a lot/some more).

(see summary Report B).

Collaboration

There is some willingness amongst advisers to collaborate/ coordinate services with others. Most advisers were likely to collaborate with public and farmer-owned organisations.

Advisory organisations are interested in partnerships with RD&E organisations. Almost all (88%) organisation leads said they were interested in partnerships with RD&E groups to support farm productivity (60% extremely interested; 28% moderately interested). (Figure 6)

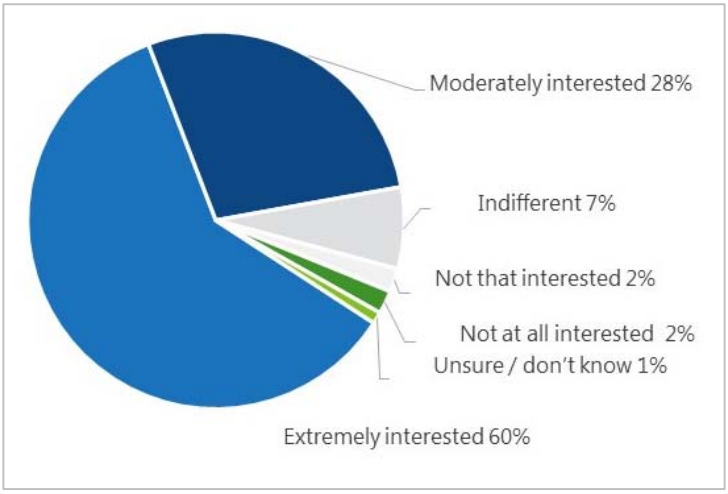


Figure 4: Advisory organisations are interested partnerships with R&D organisations

Advisers were uncertain about collaborating with the private sector, e.g. commercial advisers (farm input providers/product re-sellers), independent (fee-for-service) advisers and private companies.

Most advisers were likely to collaborate with Public and Farmer-owned organisations. However, advisers were polarised when it came to collaborating with Farm input providers / product re-sellers, Independent (fee-for-service) advisers and private companies. (Figure 5).

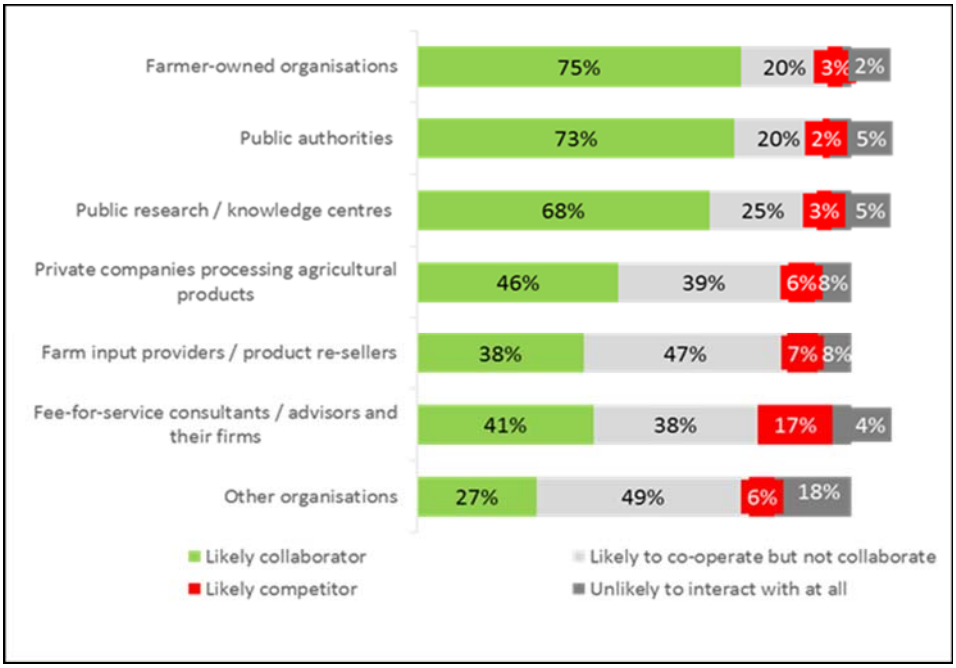


Figure 5: Advisers willingness to collaborate or co-operate with other organisations (on-line responses only, n=265) employee advisers and sole operators

State differences in farmer's perception of the advisory and extension system

Each state of Australia differs in their policies, strategies and resourcing of agricultural extension and this can vary by sector. Whilst there has been an evolving trajectory of privatisation of extension in each state, the pace of change and the extent of privatisation is inter-related with the extent to which industry funding bodies (RDC's) support extension capacity for their sector within the state; and, the model of private sector engagement for extension delivery they support.

The national farmer survey provided an opportunity to examine differences between states in key areas such as knowing where to go for information, advice and support; and the interaction with research. Overall, when controlling for e sector, the State has minimum effect. The sector in which farmers were associated had a greater effect on knowing where to go for information, advice and support than the state (Table 2).

Table 2: Degrees of agreement with the statement "I always know where to get the information or advice that I need" by sector and state within sector; P-values for each sector are for comparisons of proportions by state within that sector

Sector and state (number of respondents)	1 (completely disagree) to 3	4 or 5	6 or 7 (completely agree)
Cropping/mixed (P=0.126)			
QLD (16)	19% (3)	50% (8)	31% (5)
NSW (23)	26% (6)	35% (8)	39% (9)
VIC (14)	7% (1)	50% (7)	43% (6)
WA (24)	13% (3)	38% (9)	50% (12)
Horticulture (fruit) (P=0.177)			
QLD (20)	5% (1)	40% (8)	55% (11)
NSW (29)	10% (3)	41% (12)	48% (14)
WA (14)	21% (3)	50% (7)	29% (4)
Sheep/beef (P=0.701)			
QLD (40)	20% (8)	45% (18)	35% (14)
NSW (24)	33% (8)	33% (8)	33% (8)
VIC (27)	22% (6)	41% (11)	37% (10)

Table 2 shows that whilst there are some sectors in which different states have a skew to a particular response (e.g. In Cropping/mixed farming in WA there are a greater proportion of farmers agreeing that they always know where to go for information advice and support than in Vic, NSW, Qld), the difference is not significant. The distributions of agreement do not vary significantly in the sector across the states than could be explained by chance.

Using the same techniques we found a signifcant difference between states for cropping/mixed farming related to their intention to pay for advice to improve farm productivity in the next 12 months (Table 3).

Table 3: Degree of agreement with the statement "I intend to pay for advice to improve my farm productivity in the next 12 months" for cropping/mixed farming by state; P-values are for comparisons of proportions by state within that sector

	1 (completely disagree) to 3	4 or 5	6 or 7 (completely agree)
Cropping/mixed (P=0.033)			
QLD	31% (12)	38% (15)	31% (12)
NSW	26% (23)	17% (15)	56% (49)
VIC	33% (14)	28% (12)	40% (17)
SA	43% (15)	29% (10)	29% (10)
WA	22% (8)	16% (6)	62% (23)

With respect to farmers use of different people and organisations for information, advice and support, it was the cropping/mixed farming sector which displayed significant differences by state in the use of government (Table 4).

Table 4: Percentages of farmers who sought out or used information, advice or support from various sources in cropping/mixed farming by state; P-values shown in the last row for each sector are for comparisons of proportions by state within that sector

Sector and state (number of respondents)	Farmer-owned information, advice and support organisations	Government*	Independent (fee-for-service) advisers	Processing companies	Product re-sellers / farm input suppliers	Research and development corporations
Cropping/mixed						
QLD (41)	71% (29)	68% (28)	76% (31)	56% (23)	93% (38)	83% (34)
NSW (88)	77% (68)	70% (62)	73% (64)	55% (48)	85% (75)	78% (69)
VIC (44)	77% (34)	84% (37)	75% (33)	57% (25)	89% (39)	93% (41)
SA (35)	83% (29)	40% (14)	71% (25)	46% (16)	89% (31)	80% (28)
WA (39)	87% (34)	67% (26)	79% (31)	51% (20)	92% (36)	85% (33)
P value	0.454	**0.002***	0.937	0.868	0.753	0.272

*significant difference between states

Discussion and conclusions

The Australian agricultural extension system is becoming increasingly privatised with a diversity of providers of information, advice and support from the private (commercial), private (consulting), industry (RDC's), farmer-owned and operated groups and the processing sector. The degree of privatisation varies by sector and the differences between farms predominantly relate to the sector the farmer is from, rather than the state they are located

There is ambiguity for farmers about how to access information and support at a time when there is growing demand for new knowledge and practices. There is a trend towards less direct and meaningful interactions between farmers, advisers, researchers and their institutions. This results in limited opportunities to collaborate and network across industries and localities. The need to co-operate, co-ordinate and network this diversity to support the best outcomes on-farm is required (see Klerkx and Nettle, 2013; Nettle, 2013; Nettle et al, 2017).

Five sources of market failure in the Australian agricultural extension system

Drawing on the market failure frameworks suggested by Mullen *et al* (2000), Pannell and Marsh (2013) and Chudleigh (2017 - Appendix B), there is evidence of market failure in the current agricultural extension system in Australia which relate to the processes of privatisation.

Farmers seek new opportunities, but they are not fully confident in where to go or how to access information, advice and support they need to make the most of opportunities. Some farmers are less connected to research and services than others unless they pay directly for them. Because extension services are not immediately identifiable and well aligned to important collective outcomes in agriculture (i.e. productivity, sustainability), information and advice from different sources becomes disconnected or conflicts with whole farm management. This has the potential to result in perverse outcomes, such as reduced productivity.

The sources of market failure identified from this study reflect information/communication failures which are of 'public good character' (Mullen *et al.,* 2000; Chudleigh, 2017- Appendix B). Five sources of market failure in the Australian agricultural extension system are identified:

1. Affordability and perceived value of paying for advice**:** International studies have identified affordability of services for some farmers as an issue and have suggested alternative funding models for advisory services are required (Klerkx et al., 2006; Labarthe et al., 2013ab). In Australia, greater effort to promote the value of advice and include the private sector in RD&E is an alternate strategy. Information and communication failure may be contributing to the high proportion of farmers who are currently not convinced of the advantages and benefits of paying for advice. Some producers may be happy with their current source of information and advice and hold negative attitudes toward the value of using fee-for service advisers. However, this research identifies a sizeable group of farmers (approx.. 40%) who remain to be convinced of the benefits (Figure 2). While greater effort is needed to market the value of advice and include the private sector in RD&E, fee-for service advisers are not the only role to be considered in an improved advisory and extension system. Alternative funding models for advisory services may also be needed given the importance of tailored advice in key decisions of farmers which relate to public good (land-use, farm structural adjustment, succession planning and starting out farmers).

2. Trust and credibility issues amongst different sources of advice: It takes time to build farmers' trust in, and value from, advisory services and it will be eroded by negative reputations. Farmers still place greater trust in government information and services, even if the value or benefit is perceived as lower when compared to independent (fee-for-service) advice. Although government and industry may be perceived as competing with the private sector, to the contrary, the study found the role of industry and government to be substantively different. For example, government involvement is mainly public good oriented (environment) and advisers work with a much larger range of industries, making it difficult to specialise or provide detailed tailored services that the private sector may provide. Continued withdrawal of government investment in providing information, advice or support or in working with providers and industry to address issues could negatively affect the reputation (quality and value) of advice provided by the private sector.

3. Acceptance of the private sector in extension roles: The lack of acceptance of the private sector in extension roles in some sectors, and the unwillingness to pay for advisory/extension services provided by the private sector is related to the identity of 'extension' in the farming community and a lack of transparency in the sources of funding of 'extension'. Some farmers pay for advice from a particular group of advisers but this does not necessarily translate to wide acceptance of their role in extension. Government and industry can be clearer about the purpose, quality, effectiveness and trustworthiness of the engagement of the private sector in extension management and delivery.

4. Costs in staying up to date in the private-sector: The transaction costs of training and the business impacts for advisers to consider and embark on re-training or developing new business areas, such as in digital agriculture services or developing knowledge around complex innovation, is currently not

accounted for by the RD&E system. The issue is reflected in the higher engagement of government and industry compared to the private sector in professional development and is indicative of a form of exclusion of the private sector in operating in the RD&E system, in particular sole operators. The current business models of advisory firms are therefore an important consideration for having a more engaged advisory sector. For instance, whether knowledge and services are provided through fees on an hourly or hectare basis or built into the price of product sales/services. Advisers in larger organisations may benefit from in-house professional development opportunities but most private-sector advisers are limited in their ability to engage with new knowledge or changes to their advisory practices unless appropriate signals, incentives or cost recovery options are provided. The importance of providing support to private sector advisers to engage in professional development and new areas of advice has been confirmed in recent studies in the Australian context (Nettle et al., 2018) and reflect findings from an EU study of 227 advisory organisations (Prager et al., 2016).

5. Limitations to advisory sector business growth: Whilst there may be no barrier to starting an advisory business there are limitations to growth and renewal of small-medium sized advisory businesses and the private sectors ability to bear the costs of training new graduates/entry-level advisers. Whilst this may be considered as a general issue of structural adjustment, in Australia these businesses provide important services to the geographically spread farming population in which these advisers may often be one of few sources of advice available. As demand from farmers increases these small-medium businesses will need to consider models to expand their services

These sources of market failure provided insight to areas for action by government, including through industry.

Are risks from privatisation being realised?

Using evidence from the international literature, the Australian agricultural extension and advisory system was assessed in terms of reported risks from privatisation (Kidd et al., 2000; Labarthe, 2005; Klerkx et al., 2006). These include risks associated with:

a. Limited engagement of advisory services in complex innovation
b. The environment given lower priority in advisory services
c. Discontinuity in service provision due to funding models for extension
d. Narrow specialisation by advisory services
e. Top-down advisory methods (technology transfer)
f. Unwillingness to share 'purchased' knowledge among farmers
g. Exclusion of farmers due to inability to pay/other risks being realised

Limited engagement in complex innovation

Assessment: Risk

- Advisers responding to the survey had a large role in production/day-to-day farm management decisions of farmers. Farmers used a range of providers (including researchers) and preferred interactive forms of learning. But they need new skills and capabilities and access to a range of expertise to make complex farm management decisions, respond to emerging challenges or assess new opportunities. This is particularly the case for decisions related to farm expansion/contraction, digital agriculture, planning for climate extremes or modifying farm systems related to market signals (e.g. animal welfare, nutrient use on-farm or new markets).
- If the importance of the agricultural knowledge system is only considered from the perspective of demand and purchase of advice, it will be increasingly difficult for farmers to respond to emerging challenges or assess new opportunities as the market for advice largely concerns current knowledge and systems.

- Privatisation poses a risk to farmers ability to manage complex decisions, respond to challenges and assess new opportunities unless the functions of extension and engagement of the private sector equally focus on:
  - the whole farm system in coordination of advice
  - the capacity of the knowledge system to support adaption to emerging challenges.

Environment given low priority in farming systems

Assessment: Risk

- Although 30% of advisers described their area of work as inclusive of environmental topics, only 7% nominated this as a main focus of their advice. Further, with the government taking most responsibility for environment advisory services and the private sector focussing on productivity issues, there is the potential for opportunities to be missed related to joint benefits for the environment and farm productivity when considered from a whole farm system perspective. In general, greater integration of environment and productivity issues are required across the advisory system.

Discontinuity in service provision

Assessment: Risk

- A privatised environment carries the risk of discontinuity in service provision due to changes in funding mechanisms.
- Currently Australia has a balance in the overall public-private investment related to farmer information, advice and support services. However, advisers and farmers alike report business risks from changes to, and discontinuity in, policy and funding of projects, programs and services. This is further complicated for advisers who work with more than one industry or RDC and provide services for different levels of government. These advisers report varying levels of sophistication in pricing, contracting and engagement in extension. These issues require a level of cross-sectoral engagement to address. Expecting advisers to cover the full costs of professional development which have both a public and private interest is an issue also raised.

Narrow specialisation

Assessment: Low current risk

- International literature identifies a risk of specialisation in advisory topics that flows from the ease of marketing of services. There is evidence in Australia of specialisation of advisory services and from time to time a focus for advisory topics. However, the current diversity of providers minimises the risk from specialisation related to information sources and topics.

Top-down technology transfer

Assessment: Low current risk

- Privatisation can bring a risk of increased prevalence of top-down/technology transfer approaches and reduced focus on building farm capability. The Australian agricultural RD&E system remains in the long-challenged paradigm of the linear model of innovation in which research is considered to have a value in its own right and by transferring this knowledge to end-users, will deliver benefit (Godin, 2006). However, there are signs in Australia of a commitment to open, bottom-up and interactive approaches to innovation *(Tuomi, 2002; Chesborough, 2003), even if this is not reflected in the current funding or investment models (Nettle et al, 2013).* Australia has a prevalence of farmer-centred RD&E approaches, farmer training opportunities and self-directed learning platforms for farmers and advisers.

- The current risk to a re-emergence of technology transfer approaches is rated 'low', given the prevalence of adviser interest and involvement in group facilitation and support to learning. However, it presents an emergent risk in an environment of continued pressure to reduce costs and investors not recognising the importance of these approaches for agricultural innovation. This highlights the need to consider, investment in farmer training opportunities and collaborative platforms for advisers, researchers, farmers and others.

Unwillingness to share purchased knowledge

Assessment: Low current risk

- Privatisation carries a risk of a reduction in the exchange of information between farmers, who do not want to share their 'purchased' knowledge.
- In Australia, knowledge exchange tends to be less in some farming sectors, such as the intensive horticulture and intensive livestock industries. Additionally, larger farms tend to be less involved in knowledge exchange options as a source of information, advice and support. However, overall Australian farmers indicate a strong interest in shared learning opportunities so the current risk of an unwillingness to share purchased knowledge is considered low.

Exclusion due to inability to pay

Assessment: Low current risk

- In a privatised advisory environment, there can be a risk that some farmers will be excluded due to their inability to pay for advisory services given their farm size or business stage.
- There is limited evidence that Australian farmers are currently excluded from access to services due to privatisation. Two important features of the Australian advisory scene are the diversity of advisers supporting the range of farms and farmers contributing levy funds to RDCs. Currently, those farmers who are not able, or are unwilling, to pay can access advisory services provided by industry and commercial providers (product re-sellers/farm input suppliers) who service small farms and often target specific farm types.
- Farms starting out are a group that may benefit from, but currently do not pay for, individualised advice.
- The study suggests a further 28% of farmers would use the private sector for fee-for-se5rvice advice if there were effective promotion of the benefit and value farmers receive.
- Overall, some risks of privatisation are being realised in Australia and the next section discusses how weaknesses in the system related to RD&E and investment in extension may be contributing to these risks.

Weaknesses in Australia's extension and advisory system

Individual advisers cannot necessarily address constraints to private-sector advisory engagement in RD&E nor necessarily improve the perceived value and benefit from advice. Constraints that relate to the system of extension and advisory services (Birner et al, 2009 p 348) include:

a. Institutional arrangements and governance structures.
b. Advisory and extension models/capacity.
c. Co-ordination of advice.
d. Innovation and advisory techniques.
e. Pipeline thinking in RD&E

Institutional arrangements and governance structures

Similar to the UK, the Australian situation suggests that in the 'sum of its parts', the advisory and extension system provides information on all relevant topics to farmers, including smaller farms

(Prager 2017). Compared with a single integrated service, this diversity gives farmers a rich set of options from which their particular needs are more likely to be met (Garforth, et al., 2003 pg 322).

On the other hand, it is not only access to, and quality of, services that is important. It is also important to have cohesion across services to limit the opportunity for conflicting information or advice. Australian private sector advisers are less likely to be involved in key activities of RD&E where they have a role in providing input to priorities and translation of information. There is therefore some evidence for fragmentation (Kidd et al., 2000) in which there are weak networks, but also potential lock-in with strong but limited networks of advisers and farmers that industry relies on (Hermans et al 2015).

In these situations, it is suggested that supportive policies of government and industry, at both national and regional levels, can:

- Encourage cohesion (e.g. increase awareness of advice and services provided by other organisations).
- Build the capacity of potential service providers for participation in RD&E co-ordination and co-operation so to 'best fit' local circumstances (Birner et al., 2009, p 343).

Many people in industry and government may consider current levels of cooperation and interaction to be sufficient. However, a UK study (Prager 2017), suggests it is hard to judge the quality of cooperation; or whether the 'right' input is being achieved; or if there are adequate knowledge exchanges.

This study provides evidence that there is an issue with the current institutional and governance structures related to extension and advisory services in Australia:

- More than 20% of private sector advisers report looking for a lot more involvement in key RD&E activities.
- Industry and government are the main groups obtaining professional development and training related to extension.

One cause could be the lack of clear policy or directives for agricultural sectors to maintain capacity and engagement of the farm advisory and extension sector as there is in the EU.

Advisory and extension capacity

Private-sector advisers responding to the survey were typically from small and medium sized enterprises (<10 employees). They have a higher proportion of 1:1 advice and a lower ratio of farms per adviser compared with commercial (farm input) or government and industry providers. This is a similar finding to the EU study of 227 advisory organisations (Prager 2016). The prevalent business models of these advisory organisations reduce their ability to voluntarily participate in opportunities to engage with RD&E. It also severely limits their ability to engage in professional development whilst needing to earn an income, irrespective of their interest in doing so. This is particularly the case for sole operators. Further, there are limited incentives for accreditation or becoming members of professional association with 58% not involved.

When it comes to areas of new knowledge, complex innovations and emerging challenges, there is a case for supporting their involvement in professional development and capacity building activities rather than expecting these costs to be internalized in their business, or that benefits are purely captured by their business. In these, cases there would be public interest (related to productivity, innovation and future skills) to invest in and build advisory and extension capacity.

Co-ordination of advice

The solution of fragmentation is not necessarily to bring all advice 'under one roof' (Garforth et al., 2003, p 330). However, Australian advisers and farmers want to be more connected with research and

the RD&E system. Effective methods are needed to involve a broader range of advisers in aligning messages related to the whole farm system and in informing RD&E priorities.

- Australian farmers seek new opportunities in farming which require new skills and capacities but they don't always know where to go for information and advice. In this environment, co-ordination is likely to achieve system benefits. Further, commercial advisers (farm input providers/product resellers) need to be better engaged; currently they are not as well connected to RD&E activities but are used by 85% of farmers for information, advice and support. Government also needs to be involved. As a trusted source of information for farmers, not having government involved at all, would be detrimental to the credibility of the advice available.

- Whilst government and industry organisations are best positioned to support the coordination of services, it is important to recognise co-ordination requires new capacities. International authors describe this as 'inter-professional capacity' (Phillipson et al., 2016). It refers to the ability of advisers to distinguish between, and work with, different practitioners such as a fee-for-service adviser relative to a commercial adviser (a farm input retailer/product reseller). The government and industry need to have the capacity to consider or assess 'relational agency', 'interactional expertise' and 'deference/referral behaviour' of advisory services (ibid) so they can prioritise partnerships with those advisory organisations that are most able to work with other advisers and organisations. This has also been recommended by Labarthe et al., (2013 and Hunt et al., (2014).

Innovation in advisory techniques

International studies report that duplication of advisory methods (e.g. one-to-on advice, groups, training, etc.) is prevalent, despite the diversity of advisory and extension service providers in many countries (Nettle et al, 2017). This has been described as a failure of (intermediation or lack of recognition of different forms of intermediation practice (Cerf et al., 2017). The diversity of practices need to be harnessed to achieve a broader reach and depth of support to the farming population. In Australia, the contracting of services with tight control on advisory approaches may therefore limit any benefits from engagement of a range of private sector providers. Harnessing the strengths of different advisory organizations will require an understanding of the particular intermediation practices of organizations with respect to their farming clients.

Pipeline thinking

The impact of Australia's advisory and extension system will be limited by narrow conceptions of 'what extension is', particularly the historical approaches of research-led innovation and research to end-users which positions the advisory sector as a conduit of research to farmers, rather than as a partner in innovation, along with farmers and research as reflected in open innovation or co-innovation approaches (Chesborough, 2003).

To address some of these weaknesses, action research trials were conducted as part of the project to trial co-innovation approaches with the private sector in key areas including: engaging advisers in the processing sector; advisory capacity in precision agriculture; new entrant pathways into extension and advisory roles; and ways to engage private sector advisers in research priority setting, translation of research outputs and extension delivery.

Results of these trials are reported in Reports G, H, I J and K.

Project publications

Nettle, R. 2017, Workshop paper: farmers adopting and farmers benefitting from R&D – where are we now? University of Melbourne

Nettle, R., Klerkx, L. Faure, G., Koutsouris, A. 2017, Governance dynamics and the quest for coordination in pluralistic agricultural advisory systems, The Journal of Agricultural Education and Extension, 23:3, 189-195, DOI: 10.1080/1389224X.2017.1320638

Nettle, R., La, N., Smith, E.: Milestone Report 3, University of Melbourne.

Paschen, J. A., Reichelt, N. King, B. Nettle, R., 2017, Enrolling advisers in governing privatised agricultural extension in Australia: challenges and opportunities for the research, development and extension system, Journal of agricultural education and extension http://dx.doi.org/10.1080/1389224X.2017.1320642

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Appendix A: Survey response tables

Table a: Attitudes toward non-government sector services

	Agree	Neither agree nor disagree	Disagree	Don't know
The non-government sector are able to effectively deliver agricultural extension services (n=999)	32%	52%	12%	4%
I feel that the quality of non-government sector agricultural extension services are high (n=998)	33%	52%	11%	5%
I would be willing to pay to be involved with agricultural extension programs, where they are managed or delivered by a non-government sector organisation (n=999)	18%	52%	28%	2%

Table b: Willing to pay for non-government services by industry

	Beef	Cotton	Dairy	Grain	Hort (Fruits)	Hort (Veg)	Mixed crop	Pork and poultry	Rice	Sheep	Sugar cane	Other
Agree	15%	24%	14%	21%	27%	26%	21%	18%	8%	20%	14%	8%
Neither agree nor disagree	44%	64%	54%	63%	42%	39%	55%	38%	58%	54%	43%	75%
Disagree	40%	8%	28%	15%	27%	35%	24%	38%	33%	26%	39%	17%
Total (n)	179	50	81	170	107	23	76	60	12	142	87	12

The organizational and personal characteristics had effects on adviser's involvement in key research development and engagement activities (Tables 3 and 4). In particular, factors significantly influencing the involvement in setting research priorities included type of organisation, professional association membership, and gender. Likewise, the attending government or industry information sessions was significantly different between males and females advisers. Number of staff, type of organisation, education, experience and professional association membership had significant effects on the engagement in translating research outputs to farmers and clients and design, development or delivery of extension projects. In addition, gender and age each had a significant effect on these two activities, respectively (Tables 3 and 4)

Table c: Characteristics of advisers not involved in key RD&E activities

		Set research priorities	Attend government or industry information session	Translate research outputs to farmers/ clients	Design, develop or deliver of extension projects
Number of staff providing services				*	*
	1-5 people	38	11	47	47
		31%	30%	40%	35%
	6-10 people	23	9	26	24
		19%	24%	22%	18%
	11-20 people	15	2	13	15
		12%	5%	11%	11%
	21-50 people	10	4	8	13
		8%	11%	7%	10%
	51-100 people	13	3	4	9
		10%	8%	3%	7%
	101-500 people	11	3	9	9
		9%	8%	8%	7%
	More than 500 people	14	5	11	17
		11%	14%	9%	13%
Type of org. (Q6)		*		*	*
	Public org.	39	6	24	26
		31%	16%	20%	19%
	Private org.	60	23	67	79
		48%	61%	56%	58%
	Industry org.	7	3	11	7
		6%	8%	9%	5%
	Farmer systems groups	0	1	3	3
		0%	3%	3%	2%
	Farmer rep. org.	5	2	4	7
		4%	5%	3%	5%
	NGO/ NFP	10	3	9	12
		8%	8%	8%	9%
	Other	4	0	2	3
		3%	0%	2%	2%

		Set research priorities	Attend government or industry information session	Translate research outputs to farmers/ clients	Design, develop or deliver of extension projects
Business model (Q7)					
	Consulting / FFS	24	8	27	29
		40%	35%	40%	37%
	Commercial company	33	14	38	44
		55%	61%	57%	56%
	Other	0	0	0	1
		0%	0%	0%	1%
	Both	3	1	2	5
		5%	4%	3%	6%
Education				*	*
	Certificate 2/3	5	3	3	6
		3%	6%	2%	4%
	Certificate 4 or Diploma	20	10	23	26
		13%	21%	16%	15%
	Bachelor	71	16	64	73
		47%	34%	46%	43%
	Graduate diploma/ masters	36	11	31	35
		24%	23%	22%	21%
	PhD	6	4	6	11
		4%	9%	4%	7%
	Other	13	3	13	18
		9%	6%	9%	11%
Years of experience				*	*
	0-5	38	15	37	37
		25%	32%	26%	22%
	6-10	22	5	22	24
		15%	11%	16%	14%
	11-15	16	6	19	20
		11%	13%	14%	12%

		Set research priorities	Attend government or industry information session	Translate research outputs to farmers/ clients	Design, develop or deliver of extension projects
	16-20	14	3	10	19
		9%	6%	7%	11%
	21-25	12	4	11	11
		8%	9%	8%	7%
	26-30	13	2	9	10
		9%	4%	6%	6%
	More than 30	36	12	32	48
		24%	26%	23%	28%
Member of a professional association		*		*	*
	APEN	7	2	4	5
		5%	4%	3%	3%
	Ag Institute of Australia	5	3	8	12
		3%	6%	6%	7%
	Other	50	12	41	51
		33%	26%	29%	30%
	None	89	30	87	101
		59%	64%	62%	60%
Age					*
	18-29	26	9	23	22
		17%	19%	16%	13%
	30-39	23	6	25	31
		15%	13%	18%	18%
	40-49	38	11	36	41
		25%	23%	26%	24%
	50-59	36	14	29	36
		24%	30%	21%	21%
	60-69	22	6	21	31
		15%	13%	15%	18%
	70 or older	6	1	6	8
		4%	2%	4%	5%
Gender		*	*	*	
	Male	90	22	81	109

		Set research priorities	Attend government or industry information session	Translate research outputs to farmers/ clients	Design, develop or deliver of extension projects
		60%	47%	58%	65%
	Female	61	25	59	60
		40%	53%	42%	36%

* $p<0.05$

Advisers seeking more involvement tended to be those aged 30-50 and in smaller (less than 10 employees) within private or public organisations (rather than industry or farmer organisations) and with mainly commercial interests, although consulting organisations were also interested in more involvement. Advisers in NSW and Victoria tended to show greater interest in increased involvement relative to the other states. We did not observe significant association between the organisational and individual characteristics with these engagement activities, except for the correlation of organisational business model with discussion/input around research priorities (Table 40)

Table d: Characteristics of advisers seeking more engagement in the RD&E system

		Discussion/ input around research priorities	Invitations to be kept up to date on extension programs and projects	Translation of research outputs	Involved in design, development and delivery of extension projects/ programs
Age					
	18-29	13	19	11	12
		15%	16%	13%	13%
	30-39	20	25	15	22
		23%	21%	17%	24%
	40-49	23	33	28	26
		26%	28%	32%	29%
	50-59	17	26	21	19
		20%	22%	24%	21%
	60-69	12	12	10	11
		14%	10%	11%	12%
	70 or older	2	2	3	1
		2%	2%	3%	1%
Number of staff providing services					
	1-5 people	16	24	19	22
		21%	23%	25%	27%
	6-10 people	16	19	14	14
		21%	18%	18%	17%
	11-20 people	4	10	7	6
		5%	10%	9%	7%
	21-50 people	11	9	6	7
		14%	9%	8%	9%
	51-100 people	9	13	13	15
		12%	12%	17%	19%
	101-500 people	11	14	11	10
		14%	13%	14%	12%
	More than 500 people	9	16	7	7
		12%	15%	9%	9%
Type of organization (Q6)					

		Discussion/ input around research priorities	Invitations to be kept up to date on extension programs and projects	Translation of research outputs	Involved in design, development and delivery of extension projects/ programs
	Public organization	26	38	27	31
		33%	36%	35%	38%
	Private organisation	32	42	30	28
		41%	40%	39%	34%
	Industry organisation	10	13	9	9
		13%	12%	12%	11%
	Farmer systems groups	4	4	6	4
		5%	4%	8%	5%
	Farmer representative organisation	0	1	1	2
		0%	1%	1%	2%
	NGO/ NFP	4	5	3	6
		5%	5%	4%	7%
	Other	2	3	1	2
		3%	3%	1%	2%
Business model (Q7)		*			
	Consulting / FFS	6	10	9	8
		19%	24%	30%	29%
	Commercial company	21	27	18	17
		66%	64%	60%	61%
	Other	1	1	0	1
		3%	2%	0%	4%
	Both	4	4	3	2
		13%	10%	10%	7%
Location					
	Queensland	17	17	15	14
		20%	15%	17%	15%
	New South Wales	27	34	22	28
		31%	29%	25%	31%

		Discussion/ input around research priorities	Invitations to be kept up to date on extension programs and projects	Translation of research outputs	Involved in design, development and delivery of extension projects/ programs
	Victoria	23	36	27	25
		26%	31%	31%	27%
	Tasmania	2	3	1	2
		2%	3%	1%	2%
	South Australia	11	19	16	14
		13%	16%	18%	15%
	Western Australia	6	7	7	7
		7%	6%	8%	8%
	International office	1	1	0	1
		1%	1%	0%	1%

* p<0.05, as compared with other responses combined

Table e: Features of advisory organizations who are extremely interested in partnership with RD&E (n=

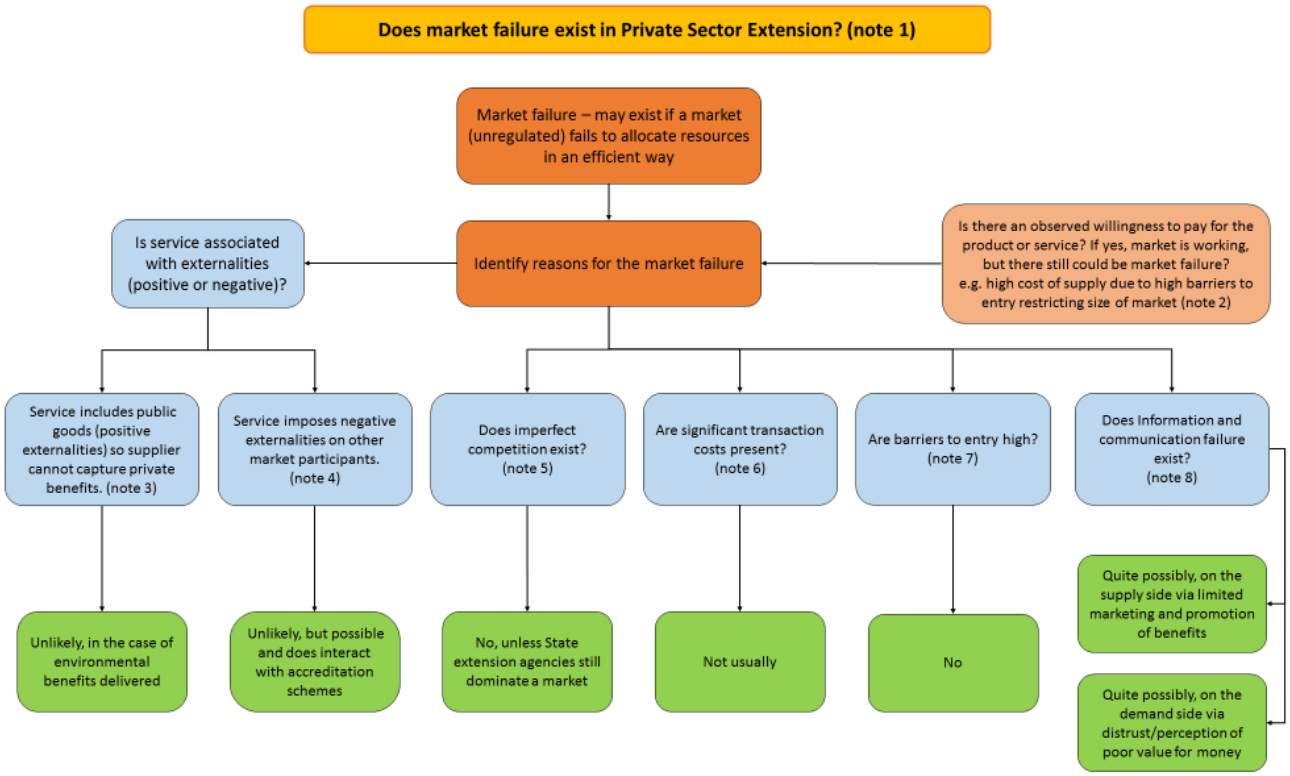
		Remaining sample	Extremely interested in partnership with RD&E (n=
Client enterprise			
	Adviser focus on particular farm enterprise types	108	152
		93%	87%
	Have no focus	8	22
		7%	13%
	Number of clients among those with focus (mean (s.d))	3.4 (2.4)	3.6 (2.3)
Type of organization (Q6)			
	Public organization	3	9
		3%	5%
	Private organisation	103	143
		89%	82%
	Industry organisation	5	10
		4%	6%
	Farmer systems groups	2	2
		2%	1%
	Farmer representative organisation	1	4

		Remaining sample	Extremely interested in partnership with RD&E (n=
		1%	2%
	NGO/ NFP	1	5
		1%	3%
	Other	1	1
		1%	1%
Location			
	QLD	21	28
		18%	16%
	NSW	45	53
		39%	30%
	VIC	32	50
		28%	29%
	TAS	4	2
		3%	1%
	SA	10	27
		9%	16%
	WA	3	7
		3%	4%
	NT	1	1
		1%	1%
	ACT	0	2
		0%	1%
	International office	0	4
		0%	2%

Appendix B: Market failure analysis (farmer and fee-for-service advisers) (Chudleigh, 2017)

Specifically related to fee-for-service advisers (rather than commercial providers such as product resellers that provide advice as part of product sales or service packages), the following framework was used to examine the issues associated with fee-for-service private sector engagement in terms of a) demand from farmers; b) provision of extension services by fee-for-service providers and c) their connection to the RD&E system.

Figure a: Market failure analysis



Notes:

1. Diagram focuses on the market for private sector services (fee for service), and not commercial advisers where the exchange/payment of for services can be more complex.
2. Demand side (producers) may be limited due to small farm sizes or inadequate ability to pay for advice. No case for intervention and let farm structural change occur. Also, the trend in farm businesses using advisers shows that the market is growing; it would be useful to plot the trend in farm businesses using private sector extension services over time.
3. Positive externalities: Do exist with current advisory services as many management changes include both private and public benefits. Some producers may internalise the public benefits delivered by advisers (long term right to farm etc.), but it is unlikely such is taken account of in perception of value for money in employing an adviser. Could be fruitful ground to explore further.
4. Negative externalities: Tied up with accreditation argument where a rogue adviser could damage reputation of others; this was particularly relevant during the 1990s when managed investment

schemes in agriculture were prevalent. The negative eternality argument is different to information failure.

5. Imperfect competition and crowding out: Crowding out by State Government services could still exist in some States to a degree. Worth exploring further.
6. Transaction costs: Depends on how defined in advisory services, but generally would be covered by adviser in fee for service and in long-term capacity building by producer.
7. Barriers to entry: Should not be considered significantly harder in establishing advisory services than in any other business. Competition and market niche both must be considered in start-ups, and expansion thereafter is a standard business decision.
8. Information and communication failure: May be one source of market failure to be further explored and may be significant. On the supply side, maybe advisers don't do enough in providing information on the advantages and benefits of using their services; on the demand side, some producers may be happy with their current source of information and advice and may have pre-formed ideas of the poor value of using advisers. This may also be relevant to some RDCs as to the value of including private consultants in the RD&E chain.