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

Research Report Summary D:
Farmer and adviser networks in the Australian extension system

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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 programme.

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 the farmers' demand (and willingness to pay) for agricultural advisory and extension services (information, advice and support). It is one in a series of five reports 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
Report D: Farmer and adviser networks (this document)
Report E: The professional development needs of farm advisers
Report F: Research data tables, focus groups and surveys of farmers and advisers (additional information)
Reports G-K: Engaging the private sector – Reports on action research trials and cross-trial analysis.

Executive Summary

This research report outlines findings from a social network analysis conducted with the data from the national farmer and adviser surveys (see companion Reports A, B, C) to examine farmer and adviser networks. The main purpose of the social network analysis (SNA) is to better understand the opportunities for the public and private sectors to collaborate in extension service delivery at a sectoral or state scale.

The social network analysis:

- Mapped the current capacity in agricultural extension and collaboration between private and public sectors.
- Identified the types of advisers who work with farmers in the Victoria, New South Wales and Queensland.
- Identified the main types of advice and support provided and the range of specialist advisory services that are available in each of the three states.

Farmer networks

The analysis indicates that –whilst independent consultants and product resellers were the main source of information, advice and support for farmers, sheep farmers rely less on private sector sources with government a main source for 11% of sheep farmers compared to dairy (10%) and cotton growers (6%). RDC information, advice and support is used as a main source by 23% of sheep farmers and 20% of cotton farmers but only 10% of dairy farmers. Dairy farmers are the greatest users of processors as their main source of information, advice and support (10%) compared to sheep farmers (6%) and cotton growers (0%). Farmer owned information or 'other' sources (not specified) were the least used sources of information across all three of the dairy, sheep and cotton sectors. This pattern makes it very important to consider opportunities that enable industries to work together to effectively engage with the private sector. The implications of these trends include that farmers who are most dependent on government sources of information will be most affected as these sources are phased out and devolved to the private sector; differences between industries reflect the relative strength of RDC's and processors in cotton and dairy compared to sheep as providers of information; and more support and training by RDC's and/or government will be needed for private sector consultants as farmers reliance on them increases in the future.

Adviser networks

Across the three States of Victoria, NSW and Queensland, advisers responding to the national survey reported private sources (35%), industry sources (23%) and public sources (15%) as their primary source of information. There was insufficient information to identify whether some sources identified by 27% of advisers were in either the public or private domain and further work is needed to better understand these sources. There was a similar overall pattern in each of the three States that showed that the three most commonly mentioned sources for keeping up to date (i.e. own farming clients, RDCs and technical experts) represents at least 60% of primary sources used by advisers to support their advisory practice.

Of Victoria, NSW and Queensland Victoria has the greatest diversity of specialists providing advice and support for farmers.

Opportunities for collaboration

The information sources nominated by advisers has been used as a proxy for the trust they place in different sources of information and an indicator of their likelihood of preferring them as collaboration partners.

The data from Victoria, Queensland and NSW suggests that advisers will most likely be willing to collaborate with their own private sector farming clients and industry research and development corporations. With these groups three times more likely to be chosen as collaboration partners than the public sector. The findings suggest that

opportunities to collaborate with farmer-owned organisations and adviser networks are currently underdeveloped but could provide important collaboration opportunities in the future.

Given the significance of the private sector as a source of information for farmers across all states and in each of the three sectors, investors in RD&E need to consider what approaches are needed to ensure that independent consultants and product resellers are able to collaborate effectively within each industry as well as with the public sector. This could require the development of new public-private partnerships.

The significance the private sector in supporting dairy, sheep and cotton farmers in all states creates a strong imperative for RD&E investors to engage private sector advisers and resellers in key activities such as priority setting, translating research and the delivery of extension. Many independent advisers and product resellers have replaced public extensions services as the 'front line', and are highly aware of the needs and challenges facing farmers. RDCs need to collaborate closely with private sector providers of information and advice in developing methods and approaches that are tailored for them as well as farmers. Opportunities to develop relationships and trust need to be prioritised and resourced.

Background

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 that facilitate the production of 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.

Research methods

The main purpose of the social network analysis was to identify opportunities for the public and private sectors to collaborate in extension service delivery.

The social network analysis sought to address two main research questions:

1. To what extent are farmers using private sector advisers as a source of information, advice and support?
   Based on location and industry are farmers more or less likely to be using particular sources of information, advice or support?
2. To what extent are public and private sector advisers engaged in extension roles?
   How likely are public and private sectors to co-ordinate or collaborate in service delivery?
   What self-reported gaps in capacity to deliver extension services can be identified?

The social network analysis drew upon data collected from the National Farmer and Adviser Surveys 2016. Focussing on three sectors (dairy, cotton and sheep) in three states (Qld, NSW and Vic), social network analysis methods were used to:

- Map the current capacity in agricultural extension and collaboration between private and public sectors.
- Identify the types of advisers who work with farmers.
- Identify the main types of advice and support provided and the range of specialist advisory services that are available in each of the three states.

The farmer survey received 1003 responses and the adviser survey received 655 responses. More information about the farmer and adviser surveys is available in Report Summaries A, B and C.

For the farmer and adviser surveys social network data and GIS data were combined to map current capacity in agricultural extension and collaboration between private and public sector services as well as to identify differences between States and agriculture sectors with respect to information sources they are using to support their businesses.

Social network analysis

Social network analysis (SNA) identifies how network participants, (individuals or groups), are connected to each other (de Nooy et al., 2005). Being socially connected underpins opportunities to share information, knowledge and develop social bonds (ibid). The focus on relationships provides understanding about how the sharing of resources, both tangible and intangible, can become more effective and efficient.

As a methodology, social network analysis (SNA) is focused on relationships within groups, communities and organisations rather than the attributes of individuals (Scott, 2013, p. 3). Social network analysis applies graph algorithms to create sociograms that are network models. The models contain nodes that represent individuals and lines between them that represent a relationship for a specified purpose. In the case of the farmer and adviser survey, the nodes represent participants who provided data about their networks and what sources of support they use in their farming businesses. To help visually (and statistically) make sense of the network, nodes and lines may be colour

coded to identify different network attributes (for example what group each node belongs). A relationship between nodes shown as a line is relevant only for a specific relational question and cannot be generalised beyond this.

The study design allows the social network metrics to can be used in the future for longitudinal comparison if social network analysis is applied to similar farmer and adviser networks.

The report is presented in two parts – the first is focused on farmer networks and the second part focuses on adviser networks. A key overall finding from the social network analysis is that the private sector, particularly independent consultants and product resellers have become a very important sources of information, advice and support for the dairy, sheep and cotton sectors across Victoria, NSW and Queensland.

Adviser typology

An adviser typology was developed to aid the analysis of the different roles of the public and private sectors in providing advice, support and information. Three sectors of advisory services were identified: public/government, private and industry (public/private) (Table 1).

Table 1: Adviser typology justification

Public/private/Industry	Advisory service type	Key features	Adviser survey responses (n=655) (balance = other)
Public	Government	Including Commonwealth; state agriculture, primary industry or environment departments; local government or catchment bodies.	N=117
Industry (public-private)	Research and development corporations	Levy based organisations such as: SRA, Dairy Australia, Meat and Livestock Australia, Horticulture Innovation, Australian Pork Limited, GRDC, Cotton RDC	N=45
Private	Independent fee-for-service advisers	Farm management consultants, agronomists and specialist advisers such as veterinary surgeons crop specialists, breeding specialists) Includes sole operators.	N=276
	Product re-sellers/farm input suppliers	Farm input suppliers such as for fertiliser, seed, feed merchants and companies such as Elders and Landmark. Commercial interests	N=144
	Farmer-owned information, advice and support organisations	Local productivity services or farming systems groups such as Birchip Cropping Group (BCG), in which farmers pay membership fees.	N=26
	Processing companies /supply chain	Processing companies for meat, milk, grains, etc. Commercial interests.	Included above
	Non-government or community organisation	Not for profit	N=33

Results: farmer networks

The social network analysis findings across the three states suggest that farmers in NSW have greater reliance on private sector independent consultants and product resellers, compared to their counterparts in Queensland. In NSW, there is also limited, but ongoing, reliance on government agencies, as sources of primary information.

Victorian sheep and dairy farmers have a preference for using RDC sources as well as independent consultants and product resellers. Nevertheless, some Victorian dairy and sheep farmers continue to rely on government as their primary source of information, support and advice.

There is a moderate use of processors by dairy farmers in Victoria but only one sheep farmer identified a processor as their main source of information. A comparison of primary sources used by cotton growers and sheep farmers between New South Wales and Queensland suggests that use of RDC sources is greater in Queensland but there is least reliance on government, processors, farmer owned or other sources in this state. Across the three sectors of dairy, sheep and cotton, the private sector – particularly independent consultants and product resellers – is the main source of information, advice and support for farmers who responded to the National Farmer Survey 2016. Seventy percent of dairy farmers and 72% and cotton growers used the private sector as their main source of information, advice and support. In contrast, sheep farmers rely less on private sector sources (53%) and are slightly greater users of government sources (11%) compared to dairy (10%) and cotton growers (6%).

RDC information, advice and support are used as a main source by 23% of sheep farmers and 20% of cotton farmers but only 10% of dairy farmers.

Dairy farmers are the greatest users of processors as their main source of information, advice and support (10%) compared to sheep farmers (6%). No cotton grower respondent to the survey uses processors as a primary source of information, support and advice.

The least used sources of information across all three of the dairy, sheep and cotton sectors is farmer owned information or 'other' sources (not specified).

Further work is needed to understand more about why farmers and growers are using private providers of information, advice and support including how and why they enter into, and retain, these relationships.

Dairy farmer networks

Across all states, the most used primary source of information for dairy farmers is independent consultants (35%) then product resellers (29%). Combined, the private sector represents 80% of the most commonly used private sources of information.

Table 2: Number of dairy farmer respondents in each Sate

DAIRY Participants by State	No. of farmer respondents
NSW	4
QLD	3
SA	8
TAS	7
VIC	59
TOTAL	81

Example network: Social network model of Victorian dairy farmers' main sources of information, advice and support

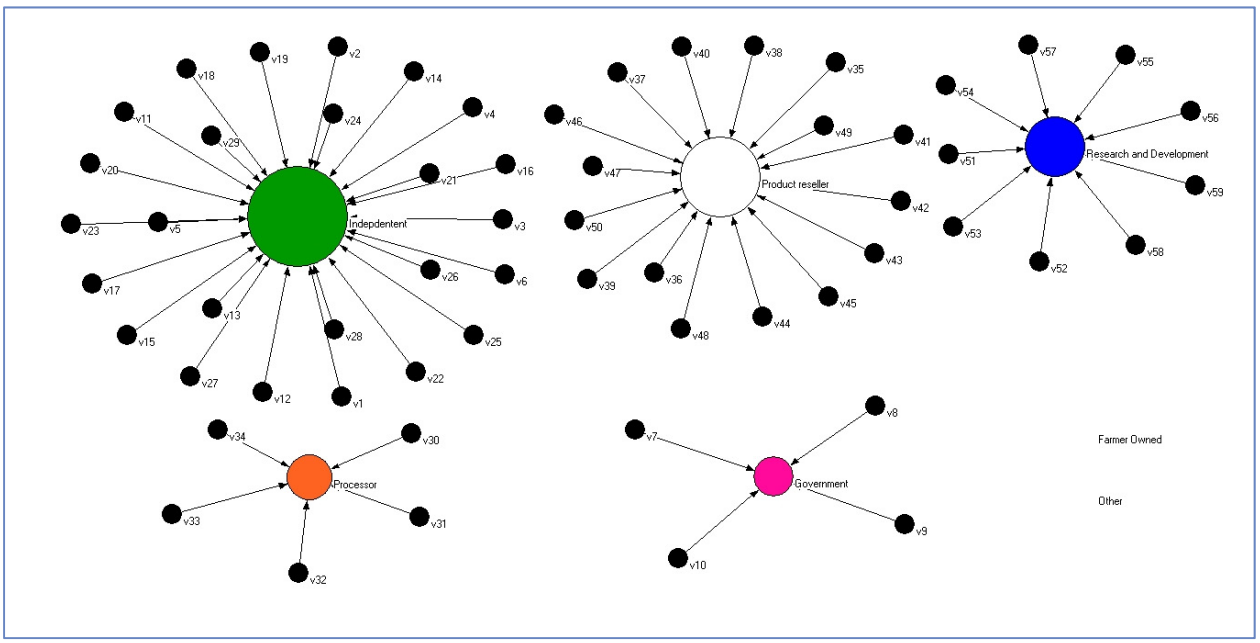

Figure 1: Primary sources of information for dairy farmers in Victoria

Key Network Statistics	
Number of respondents: 59	Density: 0.01
Number of vertices (n): 66	Average Degree = 1.8
Total number of lines: 59	

Dairy farmers Victoria	●	Farmer Owned	●	Government	●	Processor	●
Research and Development	●	Independent	●	Product Reseller	○	Other	●

Table 3: Percentage comparison of main sources of primary information, advice and support used by dairy farmers in Victoria, New South Wales and Queensland (total of 66 respondents)

Source	VIC	NSW+QLD
Public (government)	8%	0%
Public-Private (research and development)	12%	0%
Total public and RDC's	20%	0%
Independent	40%	30%
Product sellers/farm input suppliers	30%	30%
Processing companies	10%	40%
Farmer owned information	0%	0%
Private sector combined	80%	100%

A comparison of main information, advice and support sources used by dairy farmers in the three States of Victoria, New South Wales and Queensland shows that 20% of Victorian dairy farmers still rely in government extension services or the dairy industry RDC as their main source. No dairy farmer from New South Wales or Queensland cited government or RDC as their main source (however only 7 dairy farmers responded from these States). In Victoria 80% of the dairy farmer respondents rely on private sources with half of them relying on private consultants, nearly 40% on product resellers and over 10% on processors. In NSW and Queensland 30% of dairy farmers rely on consultants, 30% rely on product resellers and 40% rely on processors as their main source of information, advice and support,

Sheep

About half of (53%) sheep farmer respondents across all states rely on private sector information sources provided by independent advisers/consultants, product resellers and farmer-owned sources. RDCs are a main source of information, advice and support for 23% of sheep famer respondents. In contrast 11% nominated the public sector 'government' and 6% nominated processors as their main source of information, advice and support with respect to their farming businesses.

Table 4: Number of sheep farmer respondents in each Sate

Sheep Participants by State	No. of farmer respondents
NSW	52
QLD	12
SA	12
TAS	11
VIC	35
TOTAL	123

Example network: Social network model of Victorian sheep farmers' main sources of information, advice and support

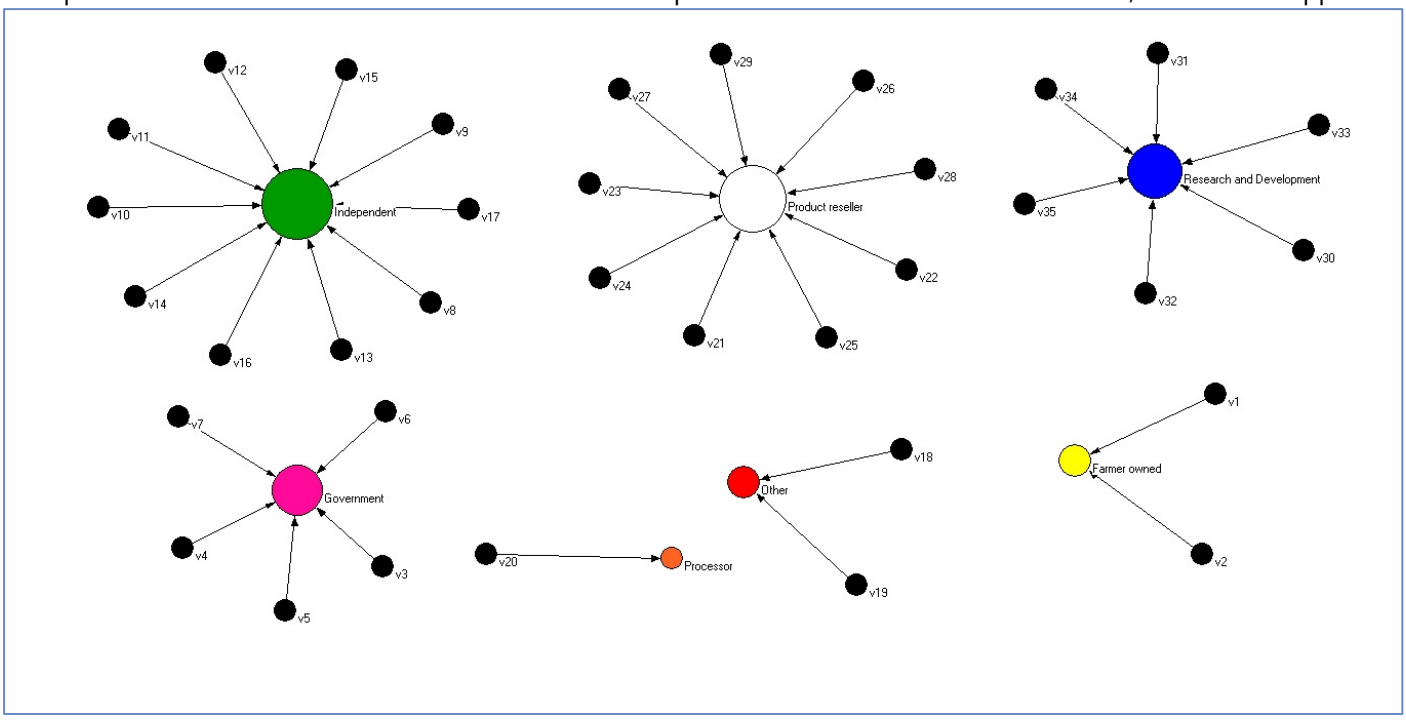

Figure 2: Primary sources of information for sheep farmers in Victoria

Key Network Statistics	
Number of respondents: 35	Density: 0.02
Number of vertices (n): 42	Average Degree = 1.66
Total number of lines: 35	

Sheep farmers Victoria	●	Farmer Owned	●	Government	●	Processor	●
Research and Development	●	Independent	●	Product Reseller	○	Other	●

Table 5: Percentage comparison of main sources of primary information, advice and support used by sheep farmers in Victoria, New South Wales and Queensland (total of 99 respondents)

Source	VIC	NSW	QLD
Public (government)	14%	10%	8%
Public-private (research and development corporation)	16%	15%	42%
Total public and RDC's	30%	25%	50%
Independent	29%	27%	8%
Product sellers/farm input suppliers	26%	21%	25%
Processing companies	3%	10%	0%
Farmer owned information	6%	10%	17%
Other	6%	6%	0%
Total private sector combined	70%	75%	50%

A comparison of main information, advice and support sources used by sheep farmers in the three States of Victoria, New South Wales and Queensland shows that 30% of Victorian, 25% of NSW and 50% of Queensland sheep farmers still rely in government extension services or the Sheep RDC as their main source (note however that the sample of sheep farmers from Queensland included only 12 sheep farmers.) In Victoria 70% of the sheep farmer respondents rely on private sources with 29% relying on independent consultants and 26% on product resellers while only 3% rely on processors and 6% on farmer owned information. In NSW 27% rely on independent consultants and 21% on product resellers; 10% rely on processors and 10 % rely own farmer owned information. In Queensland 8% of sheep farmers rely on independent consultants, 25% rely, 17% on farmer owned information and no respondent relies on processing companies as their main source of information, advice and support,

Compared to dairy farmers, sheep farmers have a significantly greater reliance on public sector and RDC sources of information, advice and support.

Cotton

A total of 50 Cotton growers responded to the National Farmer Survey 2016 with 28 from New South Wales and 22 from Queensland.

Table 6: Number of Cotton Farmer respondents in each Sate

Cotton Growers	No of farmer respondents
NSW	28
QLD	22
Total	50

Overall the private sector combined (independent consultants, product resellers and grower owned sources) provides 70% of primary information for cotton growers.

Example network: Social network model of NSW cotton farmers' main sources of information, advice and support

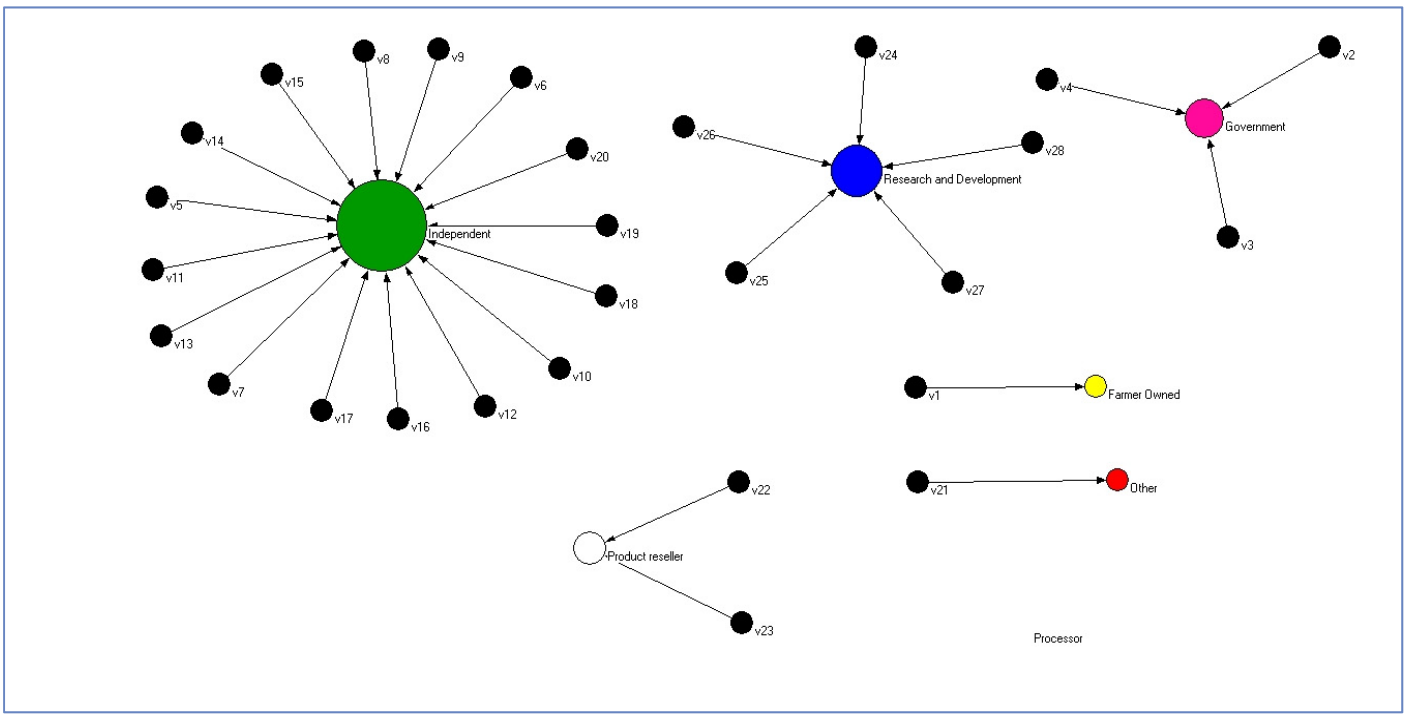

Figure 3: Cotton growers NSW primary sources of information

Key Network Statistics	
Number of respondents: 28	Density: 0.024
Number of vertices (n): 35	Average Degree = 1.6
Total number of lines: 28	

Cotton growers ALL States	●	Farmer Owned	●	Government	●	Processor	●
Research and Development	●	Independent	●	Product Reseller	○	Other	●

Table 7: Summary of main sources of primary information, advice and support used by cotton farmers

Source	NSW	QLD
Public (government)	12%	0%
Public-private (research and development)	18%	22%
Total public and RDC's	30%	22%
Independent	58%	60%
Product sellers	6%	18%
Processing companies	0%	0%
Farmer owned information	3%	0%
Other	3%	0%
Total private sector combined	70%	78%

A comparison of main information, advice and support sources used by cotton farmers in New South Wales and Queensland shows that 12% of NSW cotton farmers rely on government services but no Queensland cotton farmers do so. However, 18% of NSW and 22 % of Queensland cotton farmers rely on the Cotton RDC. In NSW 70% of the cotton farmer respondents rely on private sources with 58% relying on independent consultants but only 6% on product resellers,6% on farmer owned information but none rely on processors. In Queensland 60% rely on

independent consultants and 18% on product resellers. No cotton farmer respondents from Queensland rely on processors or farmer owned information. Overall cotton farmers have a significant reliance on independent consultants as their main source of information, advice and support,

Results: Adviser networks

Advice provided

The main information and advice provided by advisers fell into the following areas: crop production, livestock production, crop and livestock production, whole farm management, farm business management, finance, quality assurance/compliance, environment/NRM, renewable energies, research, rural/community development and other. If an adviser responded 'all equal', this refers to an adviser who does not specialize in any topic but is available to provide advice to any farmer and any question they have

The National Adviser Survey 2016 results for the primary types of advice that advisers provide for farmers in their States is summarised in Table 5 below. The proportions of adviser types are unique in each state with the greatest diversity, or specialisation, of adviser types practicing in Victoria and the least diversity of adviser types practicing in Queensland. This may reflect differences in the range of sectors farming in each state or a limitation of the number of survey respondents that answered this question (118 in Victoria and 56 in Queensland). There are also twice as many advisers who regard themselves as generalist advisers (All Equal) in Victoria (21%) compared to New South Wales and Queensland (both 11%). Livestock and Crop Production advisers comprise approximately 30% of adviser types in Victoria and New South Wales but nearly 50% of all advisers in Queensland.

Table 8: Summary of the primary types of advice and support advisers provide to farmers in Victoria, New South Wales and Queensland

VIC	Type of advice	%VIC	NSW	Type of advice	%NSW	QLD	Type of advice	%QLD
25	All Equal	21	20	Livestock Production	19	18	Crop Production	32
22	Livestock Production	19	15	Other topics	15	11	Other topics	20
18	Other topics	15	14	Crop Production	14	9	Livestock Production	16
15	Crop Production	13	13	Research	13	6	All Equal	11
9	Farm Business Management	8	11	All Equal	11	4	Whole-farm management	7
8	Environment/NRM	7	10	Whole Farm Management	10	3	Research	5
6	Research	5	5	Farm Business Mgt	3	2	Farm Business Management	4
3	Finance	3	5	Environment/NRM	5	1	Finance	2
3	Rural / community development	3	3	Crop and Livestock	5	1	Crop and Livestock	2
2	Crop and Livestock	2	3	Finance	3	1	Environment/NRM	2
2	Agriculture Infrastructure	2	3	Agriculture HRM	3	0	Agriculture Infrastructure	0
2	Whole-farm management	2	1	Quality assurance / compliance	1	0	Rural / community development	0
2	Quality assurance / compliance	2	0	Book keeping	0	0	Quality assurance / compliance	0
1	Renewable energies	1	0	Rural / community development	0	0	Renewable energies	0
0	Other(B)	0	0	Renewable energies	0	0	Other(B)	0
118		**100**	**103**		**100**	**56**		**100**

Key: Relative proportions of advice types in each State

≥20% ≥15% ≥10% ≥5% ≥1%

Advisers' information sources

Information sources used by advisers included their own farmer clients, research and development corporations, technical experts, private companies, farmer-owned organisations, research organisations (Australian and international) and adviser networks, such as the Australia-Pacific Extension Network (APEN).

In Victoria, New South Wales and Queensland advisers are most likely to draw on information sources from their own farmer clients as well as RDCs. These two sources make up 50% of the primary information sources indicated by adviser respondents (shown as a yellow band in Table 5). Technical experts are the next most used source of information (average of 13% across the three states) as are 'Other' sources that were not specified but indicate that each adviser chooses sources of information according to their specific needs and interests. There was a similar pattern across all three states for the sources of technical experts and a slighter greater reliance on other sources in Queensland (shown as a blue band in Table 6). The four top sources of information represent between 70 to 75% of all primary information sources used by all advisers across Victoria, New South Wales and Queensland.

In the next band of primary sources is where most respondents cite public sector organisations including Australian research organisations and other government agencies. For Victoria and New South Wales there is a very similar citation pattern. Queensland advisers are more likely to use private companies although they also cite using government agencies at similar levels as advisers in Victoria and New South Wales.

There is a consistent but limited use of international sources by advisers across all states (4%).

The least used primary sources of information are farmer-owned extension organisations and advisers' network sources (2% each in Victoria and New South Wales) although advisers in Queensland are more likely to be using Farmer owned extension organisations and not be using adviser networks at all.

Table 9: Summary of primary information sources used by advisers in Victoria, New South Wales and Queensland

VIC	Source	% VIC	NSW	Source	%NSW	QLD	Source	%QLD
35	Own farming	30	27	RDC	26	15	Own clients	27
27	RDC	23	21	Own Clients	20	11	RDC	20
14	Technical experts	12	14	Technical experts	14	8	Other	14
10	Other	9	10	Other	10	7	Technical experts	13
10	Australian Research Organisations	9	10	Australian Research Organisations	10	5	Government	9
8	Government	7	8	Government	8	3	Private Company	5
5	International sources	4	5	International sources	5	3	Farmer-owned extension services organisations	5
4	Private Company	3	4	Private Company	4	2	International	4
2	Farmer-owned extension services organisations	2	2	Farmer-owned extension services organisations	2	2	Research organisations	4
2	Adviser networks (e.g. APEN)	2	2	Adviser networks (e.g. APEN)	2	0	Adviser networks (e.g. APEN)	0
117		100	103		100	56		100

Key: Relative proportions of advice types in each State

≥20% ≥15% ≥10% ≥5% ≥1%

Discussion and conclusions

Advisers in all States are relying on a mix of informal and formal sources based on their relationships with farmers and their access to information generated by RDC's and publics sector resources, although the latter to a lesser extent. This could suggest that advisers' connections to sources of public research and development information is weak and needs to be strengthened.

The private sector, particularly independent consultants and product resellers/farm input suppliers, have become a very important main source of information, advice and support for the dairy, sheep and cotton sectors across Victoria, New South Wales and Queensland. Policy makers as well as public-private and private sector stakeholders need to ensure that farmers and growers are being provided with relevant, current and effective advice from these sources.

The public-private sector (research and development corporations) is a moderate to important source of primary information, advice and support, particularly for cotton growers and sheep farmers. More understanding is needed about the extent to which R&D is and will become privatised and what this will mean for primary producers and advisers who rely on this primary source of information. In addition, more understanding is needed about how farmers and advisers interpret privatised research findings in order to adopt and apply new production and business strategies.

The role of the public sector as a source of information for advisers is clearly limited relative to private sector and RDC sources however it continues to be part of the overall mix. More information is needed about why and what support advisers draw from government agencies. Given the increasing complexity of advisory services there is a potential role for government as an independent broker that enables collaboration and coordination between advisory providers. This, for example could include a role in supporting training of new advisers. More understanding is also needed about how advisers can access public research and development information relevant to their businesses.

Comparison of the SNA findings across the three States of Victoria, NSW and Queensland suggests that Victorian sheep and dairy farmers have a preference for using RDC's as well as independent consultants and product resellers. Nevertheless some Victorian dairy and sheep farmers continue to rely on government as their primary source of information, support and advice. A comparison of primary sources used by cotton growers and sheep farmers between NSW and Queensland suggests that use of RDC sources is greater in Queensland and there is least reliance on government, processors, farmer owned or other sources in this state.

Opportunities for collaboration

The information sources nominated by advisers have been used as a proxy for the trust they place in different sources of information and an indicator of their likelihood of preferring them as collaboration partners.

The data for Victoria, Queensland and NSW suggests that advisers will most likely be willing to collaborate with their own private sector farming clients and industry research and development corporations. Private sector farming clients and industry research and development corporations are three times more likely to be chosen as collaboration partners than the public sector. The findings suggest that opportunities to collaborate with farmer-owned organisations and adviser networks are currently underdeveloped but could provide important collaboration opportunities in the future.

Given the significance of the private sector as a source of information for farmers across all states and in each of the three sectors, investors in RD&E need to consider what approaches are needed to ensure that independent consultants and product resellers are able to collaborate effectively with each industry as well as with the public sector. This could require the development of new public-private partnerships.

The significance of the private sector in supporting dairy, sheep and cotton farmers in all states creates strong imperative for RD&E investors to engage private sector advisers and resellers in key activities such as priority setting, translating research and the delivery of extension. Many independent advisers and product resellers have replaced public extensions services as the 'front line', and are highly aware of the needs and challenges facing farmers. Research

and development corporations need to collaborate closely with private sector providers of information and advice in developing methods and approaches that is tailored for them as well as farmers. Opportunities to develop relationships and trust need to be prioritised and resourced.

Remaining Questions

This study has highlighted current and emerging trends in the ways that farmers and advisers are seeking information for their businesses. These trends raise questions that need further examination including:: Why are there different patterns in the main sources used by farmer by sector and by State? For example, is this related to the availability and 'quality' of consultants? Presence or lack of government capability? Sector 'culture' in the preferred use of some sources over others? Why do some farmers continue to use government agencies as their main source of information, advice and support? Is there a 'critical mass' of government capability needed to ensure this public source is able to provide the level and quality of service required?; How can farmer owned sources of information be recognised and strengthened? How does ongoing provision of public sector information sources impact on the private sector and vice versa?

Limitations

The social network analysis was based on survey data so has limited value for explaining 'how' and 'why' questions regarding the relationships that farmers and advisers have with each other and their sources of primary information.

Small data sizes limited the comparison to three States (Victoria, New South Wales and Queensland) for some sectors. For example, there was not enough data for cross-state comparison of dairy respondents in New South Wales and Queensland. The social network data is presented as a 'snapshot' based on survey data collected at a specified point in time and does not reflect the dynamic nature of advisers and farmer's relationships with their main sources of information over time. 'Farmer-owned information' sources also need to be more clearly specified and understood. This is important because demand for farmer-to-farmer learning opportunities are likely to grow as privatisation of advisory services increases and some farmers are unable to afford to employ independent consultants.

Appendix

Definitions of social network terms
Number of network respondents: indicates the number of people who provided data for the social network
Number of vertices (n): indicates the total number of nodes present in the network
Total number of lines: indicates the total number of edges that denote the presence of a relationship with respect to a specific relational question
Density: is defined as a ratio of the total number of ties compared to the total number of possible ties. Density is mainly useful for comparing networks of the same size.
Average Degree: measures the structural cohesion of the network. It is useful for comparing networks of different sizes.

Project publications

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