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# Australasian Agribusiness Review

## 2018, Volume 26, Paper 1

### ISSN: 1442-6951

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## Taking Stock: Identifying the Growing Agricultural Service Sector in Australia<sup>1</sup>

Lucie Newsome<sup>a</sup> and Alison Sheridan<sup>b</sup>

<sup>a</sup> Lecturer, UNE Business School, University of New England, Armidale.

<sup>b</sup> Professor of Management, UNE Business School, University of New England, Armidale.

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### Abstract

In this article we review the literature on the service sector relating to agricultural producers and agribusinesses. The review reveals a significant gap in the literature regarding the 'professional agriculture services sector'. This sector comprises those services accessed by the broader business community, such as legal, financial and marketing services, as well as agriculture-specific professional services such as production benchmarking, information technology that supports farm management, land valuation, machinery services, education providers, agronomy, production benchmarking and farm succession planning facilitation. The identification of this sector provides a launching pad for understanding a hidden area of agricultural employment. Like the broader economy, pressures of global competition coupled with technological innovation, have created demand for professional rather than non-professional workers in the agriculture sector. Whilst official Australian data show employment in agriculture is declining, we argue that employment generated by this sector may be more widely captured in service sector statistics. The identification of the professional agriculture service sector enables a more accurate view of employment trends in agriculture and has application for businesses, government and education providers.

**Key words:** agribusiness, service sector, agriculture, professional

### Introduction

Davis (1956, p.109) first defined agribusiness as 'the sum of all farming operations, plus the manufacture and distribution of all farm production supplies, plus the total of all operations performed in connection with the handling, storage, processing, and distribution of farm commodities'. This definition was novel in the mid-1950s in capturing the whole of the value chain and drawing attention to farm problems in their broader context, and over the last 70 years has evolved with the changing environment. Agriculture now sits within a web of interacting and overlapping science and technology linkages

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<sup>1</sup> The authors acknowledge the input of Professor Garry Griffith and an anonymous referee.

(National Committee for Agriculture, 2017), and agribusiness of the 21<sup>st</sup> century reflects this. In light of the major advances in technology we have seen through the digital revolution, and the emerging fourth industrial revolution (Schwab, 2015), this article outlines what we know about a specific part of the broader field of agribusiness: professional services to agricultural producers. We argue that in a competitive and complex global agricultural environment there are increasing pressures on producers to run efficient and innovative businesses in order to survive, and to meet growing global demand (Eastwood et al., 2012; Valin et al., 2014). In order to mitigate increased risk, agricultural producers are accessing professional services. Additionally, modern producers are more highly educated than previous generations, and agricultural production itself is increasingly being identified as a profession.

Professional services to agriculture have enormous potential as the gross value of Australia's agricultural production in 2014-15 was \$56 billion (Australian Bureau of Statistics, 2017a) and is projected to reach \$60.3 billion in 2016-17 (National Farmers' Federation, 2016). The purpose of this article is to determine what has been examined in academic literature regarding the characteristics of professional services to agricultural producers, and their uptake of these services. We focus on Australia as a case study and incorporate relevant international research. We argue that it is important to define the professional agricultural services sector if we are to fully recognise the value to the Australian economy of the agricultural sector, and, as we are within a regional University with a long history of educating the next generation of agriculturalists, to map the changing employment landscape for our graduates. To this end, we provide illustrative examples of a sample of Australian firms serving agricultural producers, but not necessarily captured by the agricultural employment statistics reported by the Australian Bureau of Statistics (ABS), and provide some thematic analysis of their presentation. It is clear that the 'trusted local' service is an important part of their narrative.

Understanding the characteristics and value of this sector has applications for business, government, the non-government sector and education providers. Academically, this article is an important starting point for further research into the opportunities and constraints for employees and businesses in this sector and for understanding the composition of contemporary employment in agriculture. In practice, this study, by taking stock of where work is flowing, may enable businesses to identify opportunities in this sector and allow for governments to better tailor policies and initiatives relating to agriculture and regional areas.

This article is structured as follows: first, we review the employment figures in the agriculture sector. Second, we review the literature concerning the characteristics of modern agricultural producers and their inclination to seek professional service. Third, we present an outline of the academic literature on professional agricultural services sector and a review of firms providing these services in the Australian context. We propose a framework for representing the breadth of services covered and conclude by identifying further applications of this framework in academic research.

### **Employment Trends in Agriculture: From Manual Labour to Professional Services**

By identifying the professional agriculture services sector, trends in employment in agriculture can be better understood. In this section, we provide some background on the current statistics around agricultural employment, and examine the literature to identify key characteristics of this sector and reasons why agribusiness services are likely to be growing.

Employment statistics reported by the ABS are often cited to show how employment in agriculture is declining, with an often-implicit assumption that it is a dying industry, and in the past decade, particularly in contrast to the resources industry. Contrary to this framing, is the clamoring for agricultural and agribusiness graduates that Australian universities report, and which is recognised by the Australian Council of Deans of Agriculture as a national challenge (Pratley, 2016).

The Australian and New Zealand Standard Industrial Classification (ANZSIC) used by the ABS defines industries in groupings that have been determined to be analytically useful. ANZSIC provides a standard framework under which business units carrying out similar productive activities can be grouped together, with each resultant group referred to as an industry (Australian Bureau of Statistics, 2013). An individual business entity is assigned to an industry based on its predominant activity. The classification system is a useful tool, but does have some limitations as while the economy and business units are evolving, the classification system is not able to adapt as rapidly. The most recent classification encompasses 19 groups: agriculture, forestry and fisheries; mining; manufacturing; electricity, gas, water and waste services; construction; wholesale trade; retail trade; accommodation and food services; transport, postal and warehousing; information media and telecommunications; financial and insurance services; rental, hiring and real estate services; professional, scientific and technical services; administration and support services; public administration and safety; education and training; health care and social assistance; arts and recreation services; and other services (Australian Bureau of Statistics, 2013).

The value of agriculture forestry and fisheries to the national economy has been increasing (Australian Bureau of Statistics, 2017b), and there is clear evidence of the growing productivity of the sector over the past three decades. Employment in the sector as it is currently defined has been declining. From employing 403 000 in November 1984, to a peak of 488 000 in 1988, February 2017 data shows employment in the agriculture, forestry and fisheries sector is down to 298 700. These figures, however, predominantly capture the roles of owner/manager and farm worker, rather than agribusiness professionals. Direct employment in the sector does not capture the full picture (Productivity Commission, 2005). Estimates by the National Farmers' Federation in 2012 suggested that while agricultural production made up 3 per cent of the GDP (A\$48.7 billion) in 2010-11, when the value of all the economic activities supporting farm production through farm inputs is recognised, agriculture's contribution to the GDP averages out at around 12 per cent (or A\$155 billion).

At the same time as we have seen direct employment in the businesses categorized as agriculture decline, employment in professional, scientific and technical services has grown from 259 700 in November 1984 to 1 021 700 in February 2017 (Australian Bureau of Statistics, 2017c). In its annual review of Australian industry, the Department of Industry, Innovation and Science (2016) categorizes services as 'market' and 'non-market' services, with market services defined as those which are sold commercially, while non-market services are those freely provided or with heavy subsidies, such as education and health. The services supporting agriculture fall into the market services category. The growth in services supporting agriculture are captured in the professional, scientific and technical services category, and largely remain hidden as the current standards categorize firms in one industry only. The reduction in public extension services across the states (La Grange et al., 2010), has been countered by growth in market services for clients.

Of the 123 091 agricultural forestry and fisheries business in Australia in 2015 (Australian Bureau of Statistics, 2016), only 47 employed more than 100 staff. The industry data collected by the Workplace

Gender Equality Agency (WGEA) from firms with more than 100 employees provides some further insights. Of the 26 of these which were agricultural companies, 27 480 staff were employed (WGEA, 2016). The remaining small and medium enterprises making up the agricultural sector are largely family owned (National Farmers' Federation, 2017). The majority of these are non-employing businesses (Nicholls and Orsmond, 2015), drawing specialist services as required.

Evidence is presented that there is a sizeable job market in agriculture and more than 4 000 jobs per year are consistently being advertised seeking agricultural professionals (Pratley, 2016). Rimfire Resources monitor online job advertisements in the agribusiness sector and have reported a rising number of roles advertised online since 2014 (Rimfire Resources, 2017). At the same time, the number of graduates being supplied by Australian universities declined significantly and is less than 20 per cent of the number needed to satisfy the job market (Australian Council of Agricultural Deans, 2011; Pratley, 2016). Capacity continues to loom as the most significant issue for the agricultural industry as it endeavors to take advantage of the opportunities created by food security. The industry, including the farm, the service and post-farm gate sectors and in R&D, requires a workforce which is highly educated and highly skilled (Pratley, 2012).

### **Modern Agricultural Producers and their Propensity to Seek Professional Business Services**

Much has been written regarding the characteristics of modern agricultural producers. This literature provides an important starting point for determining their likelihood to access professional services. This section identifies three key factors that contribute to producer demand for professional business services: an increasingly complex regulatory and market environment; increased competition and concentration of producers; and the professionalisation of producers themselves.

Agriculture markets, particularly in the developed world, have become increasingly complex (French, 1989), which has heightened the risk of business failure. Many factors have been identified as contributing to this increased complexity. Pratley (2012) identified that the responsibility for ensuring market quality, supply and for marketing products has shifted from peak bodies to producers. Callanan (2012) and Miller (2005) argue that consumer demands are increasingly complex and markets are less stable. Ortmann et al. (1993) and Fountas et al. (2015; see also Miller, 2005) add technological change as a factor contributing to this complexity and that as agricultural production becomes more technical, producers will seek professional advice. Gray and Lawrence (2001) corroborate this finding, arguing that with increased complexity in agriculture, economic survival depends on producers adopting a strategic approach to their business in order to manage greater risk (Gray and Lawrence, 2001).

The regulatory environment is also increasingly complicated. Producers in Australia are increasingly responsible for meeting regulatory requirements at the same time as governments have retreated from providing subsidies and business support. Producers are now responsible for meeting a range of pesticide and chemical management, occupational health and safety, livestock traceability and biodiversity requirements (Pratley, 2012). Enabling agricultural producers to navigate this complex regulatory environment has been recognised as an opportunity for professional service providers.

Agricultural producers are also facing greater competition both domestically and internationally (French, 1989). Callanan (2012) argued that producers' capacity to survive in this increasingly competitive market will depend upon their access to professional services and deepening stakeholder relationships along the value chain. Storer and Connell (2013) found that, in order to compete, Australian producers will

seek expert market advice. Furthermore, Callanan (2012) argued that successful producers will drive product innovation, whilst Vangelis (2008) found that export competition has increased the uptake of technological innovation amongst producers.

An increasingly competitive global environment has meant that in Australia agricultural production is concentrated in fewer and fewer hands (Gray and Lawrence, 2001). For example, dairy farm numbers have fallen from 15,400 in 1990 to 7267 farms in 2016 (Australian Bureau of Statistics, 2017d), and average farm herd sizes have increased from around 130 to 367 (Australian Bureau of Statistics, 2017d). Additionally, there has been a growth in corporate agriculture, with 12.9 per cent of farms now operating under a corporate structure (National Farmers' Federation, 2016). As producers become fewer it is likely that those that remain become more profitable and professionalised and seek professional advisory services in increasing numbers (Gray and Lawrence, 2001). Ortman et al. (1993) also finds that producers who own larger land masses with higher levels of production are more likely to seek external expert advice.

Davison (1999, p.51) argued that: 'While it was once possible to keep a farm through sheer hard work, changing market places and the unpredictability of world trends means versatility is now the key. Farmers know they need to combine the physical work of breaking the soil with the smart work of research, innovation and good financial management'. Recent studies have supported Davison's assertion, finding that a new generation of family farmers are emerging as globally engaged and highly entrepreneurial (Cheshire and Woods, 2013; Pritchard et al., 2007). Indeed, Soper (1995, p.155) argues that 'farming is a profession'. Brassley (2005, p.236) further argues that modern producers are increasingly educated and technologically competent. Modern producers, we hypothesise, are more likely to seek professional business services.

To summarise, three important indicators of producers' likely propensity to engage professional services are revealed. First, the agricultural market and regulatory environment is increasingly complex. Second, it is more competitive than ever before and production is concentrated in fewer and fewer hands. Third, modern producers are increasingly professional themselves and are likely to see value in engaging other professionals in order to mitigate the risk of operating in this complex, competitive and concentrated market place.

### **The Professional Agricultural Service Sector: What do we know?**

A review of the academic literature on the professional agricultural services sector and a preliminary web search of existing firms reveals a gap in what is known of this sector in academia. This section outlines what our review of academic literature has revealed regarding producers' uptake of professional services by category. Using this literature review and a review of those firms with websites that offer professional services to producers, a framework for understanding the components of this sector is developed.

To start, we undertook an extensive review of the leading agribusiness journals using combinations of keywords related to agribusiness professional services<sup>2</sup>. This search yielded international and domestic

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<sup>2</sup> These keywords were "agribusiness and professional services and/or consultancy and/or accounting and or information technology, and/or financial services", "beef producers and/or wool producers and/or cotton

articles on producers' use of professional services and the professional characteristics of modern producers. The study also benefited from a significant degree of snowballing between articles.

Research that specifically identified a sector of professional agricultural services could not be found. From an internet search we found extensive evidence of firms providing professional services to agricultural producers. Some service firms specialised in agricultural clients and others provided services specifically for agricultural producers alongside services to the broader business community. As a first step in seeking to quantify the nature of these markets services, we have sought to capture the range of services identified and provide examples of firms providing these services. We do not claim this to be an exhaustive listing, but as illustrative of the range of services that need to be recognised.

### **What is a professional service?**

The extensive body of academic literature regarding professionalism provides a launching pad for determining the characteristics of the professional agricultural services sector. The first characteristic that we identify is one often cited in the literature: distinctive knowledge and expertise (see, for example, Anand et al., 2007; Saks, 2012; Teece, 2003; Von Nordenflycht, 2010; Winch and Schneider, 1993). In the context of the business of agricultural production, this expertise must be specialised to the extent that producers will pay a fee to access it, and that it has the capacity to add to the profitability of the agricultural business.

The second key characteristic is that this expertise is gained through higher education. This creates a form of barrier to entry that characterises the professional class (see Evetts, 2014). Membership to professional bodies provides a barrier to entry associated with education and training to other aspects of this service sector, such as veterinarian services (Abbott, 1991; Starbuck, 1992; Torres, 1991). We argue that in the case of services not covered by professional bodies, such as agricultural business consultants, tertiary education serves the purpose of demonstrating expertise, specialist knowledge and providing a basis for which the business can be trusted as having expertise. It is interesting to note that tertiary qualifications feature prominently in the descriptions of those providing the services on most of the agricultural services websites canvassed in this study.

Through expertise and knowledge and the perceived legitimacy they are given through tertiary education, professionals in the agriculture service sector are used by producers to help them effectively manage risk in agricultural production.

Mapping the nature of these specialist services, we identified four categories: agricultural business consultancy services; accounting, legal, banking and financial services; science and technology services; and logistics, marketing, public relations and human resource management services.

### **Agricultural business consultancy services**

There is a significant gap in the academic literature regarding the market for agricultural business consultancy and producers' use of these services. We do know that consultants can increase producer uptake of innovation and spread knowledge from business to business, particularly through production

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producers and/or broad acre farmer and/or dairy and professional services", "rural labour hire and agriculture", "agriculture and (production bench marking) and profitability", "agriculture and traceability and profitability".

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benchmarking (Jack, 2015). We also know that the training and education services provided by consultants are likely to be more valued than services provided freely by government bodies (Eastwood et al., 2012).

Table 1 outlines a sample of services in the Australian market provided by business consultancy firms to agricultural producers. This sample reveals both large, metropolitan-based firms as well as small to medium sized, locally-based firms operate in this market. Gladwin (1989) argued that effective decision making will depend on understanding farmers and their environment. Therefore, we argue that local and specialised, and often tacit, knowledge of producers and their businesses, by consultants will be highly valued. As such local, small-medium sized firms may have advantages in terms of flexibility, responsiveness, connections and knowledge (Pritchard et al., 2012).

**Table 1. Agricultural business consultancy<sup>3</sup>**

<b>Type of service</b>	<b>Example of firm</b>
Benchmarking	Agripath; BJW Agribusiness; Planfarm; PwC; RCS
Financial modelling, budgeting, financial analysis, strategic planning and reviews	AgAsset; Agripath; Belay Consulting; BJW Agribusiness; Catalyst Partners; ConsultAg; GHD; Icon Agriculture; KPMG; Planfarm; Primary Business; Productive Nutrition; Prosper Agri Management; PwC; RCS
Asset management	Catalyst Partners; Corporate Agriculture Australia; GHD
Land sourcing, market entry, lease management and real estate valuation	BJW Agribusiness; Colliers International; Corporate Agriculture Australia; Icon Agriculture; KPMG
Deal valuation, due diligence and feasibility studies	BJW Agribusiness; Catalyst Partners; Corporate Agriculture Australia; GHD; Icon Agriculture; Prosper Agri Management; PwC
Business restructuring	Agripath; RCS
Intergenerational succession planning	AgAsset; Agripath; Belay Consulting; BJW Agribusiness; ConsultAg; Icon Agriculture; Primary Business; Proactive; Planfarm; PwC; Rabobank
Grant writing	Catalyst Partners; Primary Business
Research	Catalyst Partners; GHD
Product and labour market analysis	Agricultural Appointments; BJW Agribusiness; Catalyst Partners; CBH Group; Prosper Agri Management; PwC; Rimfire Resources

<sup>3</sup> See Appendix 1 where websites for these firms are listed.



### Accounting, legal, banking and financial services

Accounting, legal, banking and financial services have long been accessed by agricultural producers. For example, in their 1991 study of crop farmers in the United States, Ortman et al. (1993) found that farm records and budgets were the most useful information in terms of decision making regarding production, marketing, and financial decisions. Additionally, Foltz et al (1996) found that tax preparers and accountants were important sources of financial information. We argue, however, that innovative producers are likely to be accessing these services in more strategic ways than in previous generations. As effective decision making in agriculture requires timely and accurate information sources (Fountas et al., 2006; Magne et al., 2010; Sørensen, 1999), accounting and financial services are becoming increasingly sophisticated to add greater precision to producers' decision making. Storer and Connell (2013) found that in Australia, farmers are seeking off-farm expert financial advice. Within this market, specialist accounting firms service agricultural clients and value add by offering finance and legal services (for example, KPMG and PwC). On the other hand some firms that specialise in professional services to producers and services to business more broadly include some accounting functions in their list of services. Table 2 outlines a sample of firms providing accounting, legal, banking and financial services to agricultural producers in Australia.

**Table 2. Accounting, legal, banking and financial services**

<b>Service</b>	<b>Firm</b>
Management accounting and reporting and taxation	BJW Agribusiness; Catalyst Partners; Farmanco; Planfarm; PwC; PSA Accounting
Company secretariat	Catalyst Partners
Insurance	Elders Insurance; NAB; Rabobank
Banking and finance	K2G; KPMG; NAB; Rabobank; PwC
Legal	PwC; Lavan; Stacks Law Firm; Kingfisher Law
Reporting and regulatory	Catalyst Partners; Corporate Agriculture Australia; GHD; KPMG; PwC
Local management liaison and oversight	Catalyst Partners
Farm management software	Agdata; Agrimaster; Fairport; Farmanco; Practical Systems; Maia Technology

### Science and technology services

Agronomy and veterinarian services have been traditionally accessed by agricultural producers. As such, literature exists on producer uptake of these services. Storer and Connell (2013), for example, found evidence of producers relying on professional agronomic services. Miller's (2005) study of the Australian dairy sector revealed that producers were seeking advice from specialist soil testers, agronomists and veterinarians in response to problems that arose. Foltz et al. (1996) found in their case study of Idaho dairy and potato farmers that there was an increasing reliance on technical consultants to give specialist knowledge and boost profitability. We also know that with a growing awareness of the impact of climate change, farmers are seeking information and services to help them balance increasing productivity with environmental protection (Prokopy et al., 2015). Agronomy services are provided by many specialist agronomy firms with firms that provide other services (Table 3), such as benchmarking



or financial consulting, also adding agronomy to their suite of services (for example, Agripath and Planfarm). Research has also been conducted into the services provided by livestock nutritionists which enable producers to use feed more strategically for improved productivity levels, for example the use of supplementary feeds in the dairy industry (Eastwood et al., 2012).

The 'ag tech' area, however is comparatively under researched, although the possibilities of big data is attracting more service providers to the market. Farm technology has reduced production costs and contributed to growing productivity rates. Additionally, it has led to a decline in the demand for unskilled labour. This technology includes pasture management meters, virtual fencing (Bishop-Hurley et al., 2007), sensor networks (Wark et al., 2007), autonomous spatial livestock monitoring (ASLM) (Trotter et al, 2010), the concept of variable rate fertiliser for pastures (Trotter et al., 2010), walk-over-weighing (Charmley et al., 2006), remote sensing products (Mata et al, 2004), livestock traceability systems (Reid, 2003), automated feeding and drafting systems in the dairy sector (Brewley, 2010), precision agriculture, machinery set up and servicing and data collection and analysis. Watson (2009) reported that almost 20 per cent of dairy farmers in Australia use electronic identification and 15 per cent use computer-assisted feeding in their day to day operations. Mackinnon et al. (2010) also found significant evidence of uptake of agricultural technology with around 10 per cent of herringbone and rotary dairy sheds being fitted with milk meters.

Key to the success of this technology is producers' access to technical training and support. This is likely to be an important component of the professional agriculture services sector. For example, the dairy farmers studied by Eastwood et al. (2012) were highly reliant on their technology provider for learning support. Pratley (2012) argued that research and development will continue to be needed to develop systems and technologies that allow productivity gains to maintain farm profitability and address the needs and opportunities in food security nationally and globally.

**Table 3. Science and technology services**

<b>Service</b>	<b>Firm</b>
Data collection and processing	Outcross; Precision Agronomics; Productive Nutrition; RCS
Global Positioning Systems, digital farm maps and surveillance programs	Farmanco; Precision Agriculture; Trimble
Remote sensing	SpecTerra
Agronomy	AgAsset; Agripath; Agvise Laboratories; BJW Agribusiness; Farmanco; Kalyx; Planfarm; Precision Agriculture
Livestock nutrition	Productive Nutrition
Livestock geneticists	Productive Nutrition
Climate change adaption and environmental impact assessment	GHD; KPMG; PwC
Veterinarian	All State Agricultural Service
Engineering	Agri Machinery; GHD

Farm management information systems (FMIS) is an area that has received attention in the academic literature, as they facilitate access to crucial information for decision making for producers. Sørensen et al. (2010a) defined a FMIS as a planned system for collecting, processing, storing, and disseminating

data in the form needed to carry out a farm's operations and functions. FMIS enable producers to reduce production costs, meet increased demands, monitor and maintain quality and safety and meet regulatory requirements (Fountas et al., 2015, p.40). They may include integrated spatial and historical data, real-time farm data, environmental guidelines and market information. Global Positioning Systems, for example, enable producers to access large amounts of data to inform their decision making around crop management (Stafford, 2000; Tozer, 2009).

### **Logistics, marketing, public relations and human resource management services**

Logistics, marketing, public relations and human resource management are components of the professional agricultural sector to producers from which no research has been found. However, evidence of this sector for the web search was found, as demonstrated in Table 4 below. We argue that this sector is likely to grow as producers are increasingly responsible for the marketing of their own products. Increasing consumer interest in food origins is also likely to contribute to growth in this sector.

**Table 4. Logistics, marketing, public relations and human resource management services**

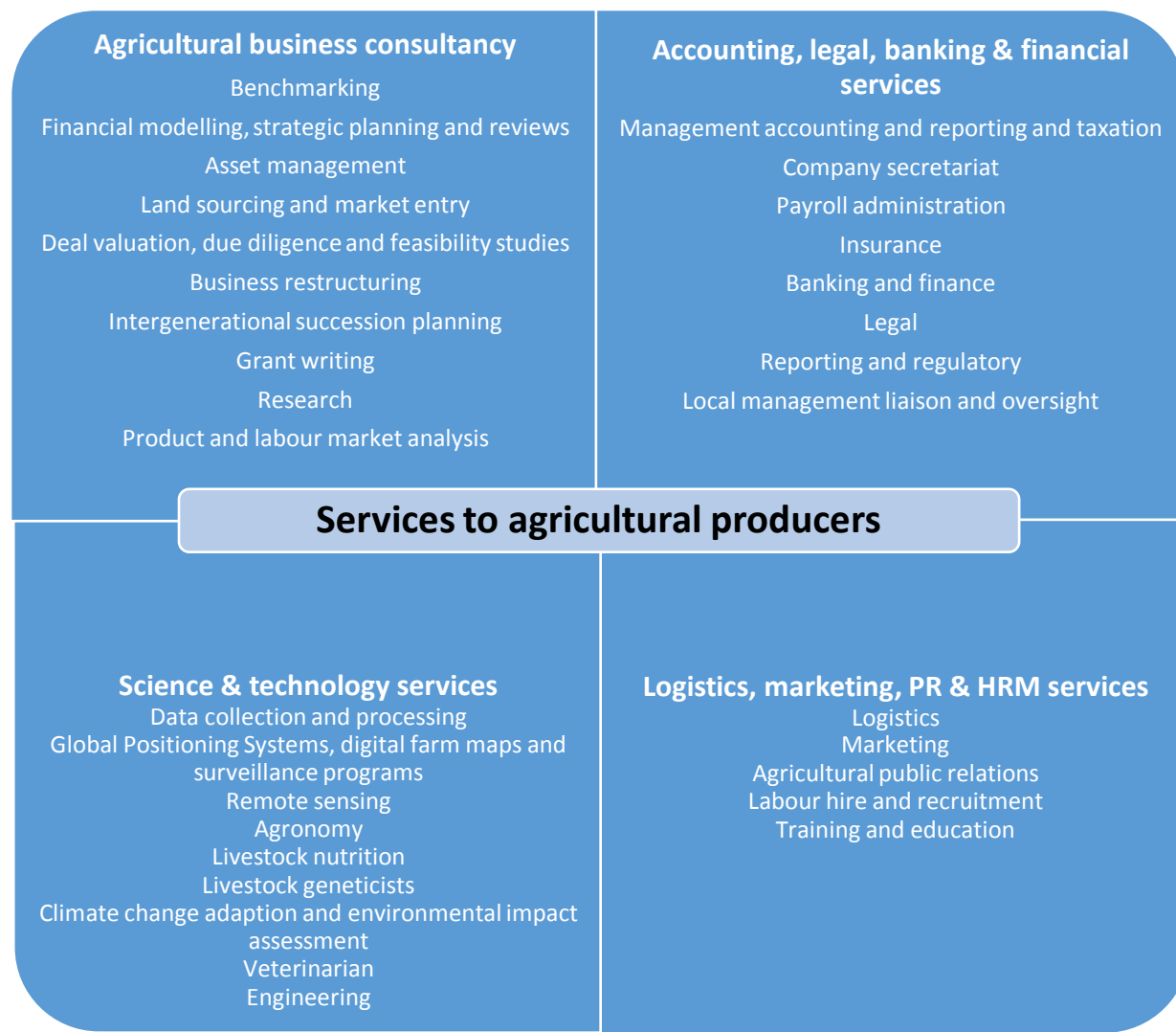
<b>Service</b>	<b>Firm</b>
Logistics	CBH Group; GrainCorp; Louis Dreyfus Company
Marketing	AgAsset; BJW Agribusiness; Cargill; CBH Group; ConsultAg; Farmanco; Glencore Australia; GrainCorp; KG2; Louis Dreyfus Company; MarketAg; Planfarm; Prosper Agri Management
Agricultural public relations	Cox Inall; Seedbed Media; Seftons
Labour hire and recruitment	Agricultural Appointments; Agribusiness Recruitment; Agri Labour; AG Workforce; Rimfire Resources
Training and education	AgAsset; All State Agricultural Service; Charles Sturt University; ConsultAg; Kalyx; MarketAg; Planfarm; Productive Nutrition; RCS; Rural Skills Australia; TAFE NSW; University of New England

### **Categorizing the Professional Agriculture Services Sector**

As a first step in mapping these market services we have identified four broad categories relating to: agricultural business consulting; accounting, legal, banking and financial services, science and technology services and marketing, public relations and human resources services. These are represented in Figure 1.

The framework presented is a necessary first step in understanding the characteristics and value of the professional agricultural services sector. In addition to there being a market for technical professional agribusiness services there is also a shortage of these services. AgriFood Skills Australia (2012) found labour shortages in areas of agricultural and horticultural mobile operators, agriculture technicians and

**Figure 1. The professional agriculture services sector**



consultants, agronomists, environmental scientists and horticulturalists, which is supported by the quarterly reviews of agribusiness employment done by Rimfire Resources (2017).

By applying the framework established for the parameters of the professional agriculture services sector, trends in employment in agriculture can be better understood. Whilst employment in agriculture has largely been categorized as declining, employment in the market service sector appears to have been increasing. We argue that further work needs to be conducted to disaggregate the professional, technical and advisory services to map out the reach of the professional agriculture services sector, and identify the opportunities. There is a growing awareness of how technology and artificial intelligence may replace the traditional services, however the question of who provides the services to support these in future remains unanswered. Will it be the large multinational services, such as the PwCs, or the local, 'trusted' providers? Answers to these questions will have profoundly different impacts on our regional communities.

## Conclusion

Whilst existing academic literature provides important insight into the value of the agriculture sector and the characteristics of modern producers, a gap exists in the identification of an important subsector of agriculture: the professional service sector supporting agriculture. We argue that as agricultural production becomes more competitive and complex, as farms become larger and concentrated in fewer hands and as producers become more professional, they will increasingly seek professional services. These services can be categorized as environmental (including agronomy and climate change services), legal and accounting, business consulting services (including finance, benchmarking and succession planning), science and technology and logistics, marketing and human resources (including public relations and labour hire).

We argue that much of what is captured by ABS data as growth in the service sector may be better identified as growth in the professional agricultural services sector. The identification of this sector has the potential to apply to many areas of analysis and may better inform business decisions, government policy and non-government decision making. For example, this research may inform changes in university curricula to better prepare graduates to seek employment in this sector, including greater cross-disciplinary programs where services dimensions are woven through agricultural science majors, rather than offered as separate majors. New and existing businesses may benefit from understanding the opportunities that this sector represents, and the characteristics of this clientele. Understanding the scale of this sector, and delivering graduates prepared for the changing environment, will be crucial for Australia to maintain its comparative advantage in global agriculture.

## References

- Abbott, A. (1988), *The System of Professions: An Essay on the Division of Expert Labour*, University of Chicago Press, Chicago.
- AgriFood Skills Australia (2012), *Environmental Scan 2012*, accessed August 3, 2017. <http://www.agrifoodskills.net.au/?page=2012Scan>.
- Anand, N., Gardner, H.K. and Morris, T. (2007), "Knowledge-based Innovation: Emergence and Embedding of New Practice Areas in Management Consulting Firms", *Academy of Management Journal* 50, 406–428.
- Australian Bureau of Statistics (2013), *1292.0 - Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 (Revision 2.0)*, accessed May 2, 2017. <http://www.abs.gov.au/ausstats/abs@.nsf/Product+Lookup/39C6552D10C40EB1CA257B9500133CFA?opendocument>.
- Australian Bureau of Statistics (2016), *4627.0 - Land Management and Farming in Australia, 2014-15*, accessed May 2, 2017. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/4627.0>.
- Australian Bureau of Statistics (2017a), *2015-2016 Agricultural Census*, accessed April 27, 2017. [http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/4B070279C6B4969DCA25815500129042/\\$File/australia,%20state%20and%20territory%20summary%20information%20sheets.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/0/4B070279C6B4969DCA25815500129042/$File/australia,%20state%20and%20territory%20summary%20information%20sheets.pdf).
- Australian Bureau of Statistics (2017b), *5206.0 Australian National Accounts: National Income, Expenditure and Product; Table 10. Agricultural Income, Current prices*, accessed April 27, 2017. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5206.0Dec%202016?OpenDocument>.

- Australian Bureau of Statistics (2017c), *6291.0.55.003 Labour Force, Australia, Detailed, Quarterly; Table 04. Employed persons by Industry division of main job (ANZSIC) - Trend, Seasonally adjusted, and Original*, accessed April 27, 2017. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Feb%202017?OpenDocument>.
- Australian Bureau of Statistics (2017d), *Cat 71210 DO001\_201516 Agricultural Commodities, Australia-2015-16*, accessed April 27, 2017. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Feb%202016?OpenDocument>.
- Australian Council of Agricultural Deans (2011), *Higher Education and Skills Training to Support Future Demand in Agriculture and Agribusiness in Australia, Submission to Senate Inquiry*, accessed June 14, 2017. [http://acda.edu.au/resources/SenateEnquiry2011\\_36.pdf](http://acda.edu.au/resources/SenateEnquiry2011_36.pdf).
- Bishop-Hurley, G.J., Swain, D.L., Anderson, D.M., Sikka, P., Crossman, C. and Corke, P. (2007), "Virtual Fencing Applications: Implementing and Testing an Automated Cattle Control System", *Computers and Electronics in Agriculture* 56, 14-22.
- Brassley, P. (2005), "The Professionalisation of English Agriculture?", *Rural History* 16(2), 235-251. doi: 10.1017/S0956793305001494.
- Brewley, J. (2010), "Precision Dairy Farming: Advanced Analysis Solutions for Future Profitability", The First North American Conference on Precision Dairy Management, Toronto, Canada.
- Callanan, B. (2012), "Outlook for Agribusiness: Challenges and Implications for the Financial Sector", *InFinance: The Magazine for Finsia Members*, 42-43.
- Charmley, E., Gowan, T. and Duynisveld, J. (2006), "Development of a Remote Method for the Recording of Cattle Weights Under Field Conditions", *Australian Journal of Experimental Agriculture* 46, 831-836.
- Cheshire, L. and Woods, M. (2013), "Globally Engaged Farmers as Transnational Actors: Navigating the Landscape of Agri-Food Globalization", *Geoforum* 44, 232-242. doi: 10.1016/j.geoforum.2012.09.003.
- Davis, J. H. (1956), "From Agriculture to Agribusiness." *Harvard Business Review* 34(1), 107-115.
- Davison, L. (1999), *The Spirit of Rural Australia*. New Holland, Sydney.
- Department of Industry, Innovation and Science (2016), *Australian Industry Report*, accessed June 24, 2017. <https://industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Australian-Industry-Report.aspx>.
- Eastwood, C., Chapman, D. and Paine, M. (2012), "Networks of Practice for Co-construction of Agricultural Decision Support Systems: Case Studies of Precision Dairy Farms in Australia", *Agricultural Systems* 108, 10-18.
- Evetts, J. (2014), "The Concept of Professionalism: Professional Work, Professional Practice and Learning" in Billett, S., Harteis, C. and Gruber, H. (eds.), *International Handbook of Research in Professional and Practice-based Learning*, Springer International Handbooks of Education, Netherlands. DOI 10.1007/978-94-017-8902-8\_2.
- Foltz, J., Lanclos, K., Guenther, J., Makus, L. and Sanchez, W. (1996), "The Market for Information and Consultants in Idaho Agriculture", *Agribusiness* 12(6), 569-582.
- Fountas, S., Carli, G., Sørensen, C.G., Tsiropoulos, Z., Cavalari, C., Vatsanidou, C. and Tisserye, B. (2015), "Farm Management Information Systems: Current Situation and Future Perspectives", *Computers and Electronics in Agriculture* 115, 40-50. doi: 10.1016/j.compag.2015.05.011.

- Fountas, S., Wulfsohn, D., Blackmore, B.S., Jacobsen, H.L. and Pedersen, S.M. (2006), "A Model of Decision-Making and Information Flows for Information-Intensive Agriculture", *Agricultural Systems* 87(2), 192-210. doi: 10.1016/j.agsy.2004.12.003.
- French, C. (1989), "The Changing Face of Agribusiness", *Agribusiness* 5(3), 217-227.
- Gladwin, C.H. (1989), "Indigenous Knowledge Systems, the Cognitive Revolution, and Agricultural Decision Making", *Agriculture and Human Values* 6(3), 32-41.
- Gray, I. and Lawrence, G. (2001), *A Future for Regional Australia Escaping Global Misfortune*. Cambridge University Press, Cambridge.
- Jack, L. (2015), "Future Making in Farm Management Accounting: The Australian "Blue Book"", *Accounting History* 20(2), 158-182.
- La Grange, R.F., Titterton, M., Mann, E.M. and Haynes, C.M. (2010), "Agricultural Extension: A Review and Case Study in the Tasmanian Dairy Farming Sector", Proceedings of the 4th Australasian Dairy Science Symposium
- Macdonald, K. (1995), *The Sociology of the Professions*. Sage. McKinlay, London.
- Mackinnon, D., Oliver, M. and Ashton, D. (2010), "Australian Dairy Industry: Technology and Management Practices, 2008-09", ABARE-BRS research report 10.11, Canberra, Australia.
- Magne, M., Cerf, M. and Ingrand, S. (2010), "A Conceptual Model of Farmers' Informational Activity: A Tool for Improved Support of Livestock Farming Management", *Animal: An International Journal of Animal Bioscience* 4(6), 842-52. doi: 10.1017/S1751731110000637.
- Mata, G., Henry, D., Gherardi, S. and Smith, R. (2004), "Pastures from Space-Introduction to the Technology on Farm", *Animal Production in Australia* 25, 281-281.
- Miller, S. (2005), *Micro-level Clusters in the Australian Dairy Industry, 3/2005*. School of Management, Victoria University of Technology, Melbourne.
- National Committee for Agriculture, Fisheries and Food (2017), *Grow. Make. Prosper. The decadal plan for Australian Agricultural Sciences 2017-26*, accessed August 3, 2017. <https://www.science.org.au/support/analysis/decadal-plans-science/decadal-plan-agricultural-sciences-2017-2026>.
- National Farmers' Federation (2012), *Farm Facts: 2012*, accessed August 4, 2017. <http://www.nff.org.au/farm-facts.html>.
- National Farmers' Federation (2016), *Annual Review 2015-2016*, accessed August 3, 2017. <http://www.nff.org.au/get/5432.pdf>.
- National Farmers' Federation (2017), *Food, Fibre and Forestry Facts: A Summary of Australia's Agricultural Sector*. National Farmers' Federation, Barton, ACT.
- Nicholls, S. and Orsmond, D. (2015), "The Economic Trends, Challenges and Behaviour of Small Businesses in Australia", in Moore, A. and Simon, J. (eds.), *Small Business Conditions and Finance*, Reserve Bank of Australia, Sydney, 5-31.
- Ortmann, G., Patrick, G., Musser, W. and Doster, D. (1993), "Use of Private Consultants and Other Sources of Information by Large Cornbelt Farmers", *Agribusiness* 9(4), 391-402.
- Pratley, J. (2012), "The Workforce Challenge in Horticulture", *Agricultural Science* 24(1), 26-29.



- Pratley, J. (2016), "Graduate supply for agriculture - a glimmer of hope", *Agricultural Science* 28(2), 13-16.
- Pratley, J. and Copeland, L. (2008), "Graduate Completions in Agriculture and Related Degrees from Australian Universities, 2001-2006", *Farm Policy Journal* 5(3), 1-11.
- Pritchard, B., Argent, N., Baum, S., Bourke, L., Martin, J., McManus, P., Sorensen, A. and Walmsley, J. (2012), "Local – If Possible: How the Spatial Networking of Economic Relations amongst Farm Enterprises Aids Small Town Survival in Rural Australia", *Regional Studies* 46(4), 539-557. doi: 10.1080/00343404.2010.504704.
- Pritchard, W., Burch, D. and Lawrence, G. (2007), "Neither 'Family' nor 'Corporate' Farming: Australian Tomato Growers as Farm Family Entrepreneurs", *Journal of Rural Studies* 23(1), 75-87.
- Productivity Commission (2005), *Trends in Australian Agriculture*, accessed August 3, 2017. <https://ideas.repec.org/p/ris/prodrp/0502.html>.
- Prokopy, L., Carlton, S., Arbuckle, J.G, Haigh, T., Lemos, M.C, Mase, A.S, Babin, N., Dunn, M., Anderson, J., Angel, J., Hart, C. and Power, R. (2015), "Extension's Role in Disseminating Information About Climate Change to Agricultural Stakeholders in the United States", *Climatic Change* 130(2), 261-272. doi: <http://dx.doi.org/10.1007/s10584-015-1339-9>.
- Reid, T. (2003), "Individual Animal Management in the Dairy Industry: Where Have We Come From? Where Are We Going To?", *Wool Technology and Sheep Breeding* 51, 159-160.
- Rimfire Resources (2017), *Agribusiness Update – May 2017 edition*, accessed January 18, 2018. <https://www.rimfireresources.com.au/news/agribusiness-update-may-2017-edition/22067>.
- Saks, M. (2012), "Defining a Profession: The Role of Knowledge and Expertise", *Professions and Professionalism* 1, 1-10.
- Schwab, K. (2015), "The Fourth Industrial Revolution: What It Means, How to Respond", *Foreign Affairs* December.
- Soper, M. (1995), *Years of Change*, Farming Press Books and Videos, Ipswich, UK.
- Stafford, J.V. (2000), "Implementing Precision Agriculture in the 21st Century", *Journal of Agricultural Engineering Research* 76(3), 267-275. doi: 10.1006/jaer.2000.0577.
- Starbuck, W. (1992), "Learning by Knowledge-Intensive Firms", *Journal of Management Studies* 29, 713–740.
- Storer, C. and Connell, J. (2013), "Akubras to Hard Hats: Easing Skill Shortages through Labour Harmonisation Strategies", *Australian Bulletin of Labour* 39(1), 64-87.
- Sørensen, C.G. (1999), *A Bayesian Network Based Decision Support System for the Management of Field Operations. Case: Harvesting Operations*. Ph.D. thesis, Technical University of Denmark.
- Sørensen, C.G., Fountas, S., Nash, E., Pesonen, L., Bochtis, D., Pedersen, S.M., Basso, B., and Blackmore, S.B. (2010), "Conceptual Model of a Future Farm Management Information System", *Comput. Electron. Agric.* 72(1), 37-47. doi: 10.1016/j.compag.2010.02.003.
- Teece, D.J. (2003), "Expert Talent and the Design of (Professional Services) Firms", *Industrial and Corporate Change* 12, 895–916.
- Tozer, P. (2009), "Uncertainty and Investment in Precision Agriculture - Is It Worth the Money?", *Agric. Syst.* 100(1-3), 80-87. doi: 10.1016/j.agsy.2009.02.001.



Trotter, M., Lamb, D., Hinch, G. and Guppy, C. (2010), "Global Navigation Satellite Systems (GNSS) Livestock Tracking: System Development and Data Interpretation", *Animal Production Science* 50, 616-623.

Valin, H., Sands, R., Van der Mensbrugge, D., Nelson, G., Ahammad, H., Blanc, E., Bodirsky, B., Fujimori, S., Hasegawa, T., Havlik, P., Heyhoe, E., Kyle, P., Mason-D' Croz, D., Paltsev, S., Rolinski, S., Tabeau, A., Van Meijl, H., Von Lampe, M. and Willenbockel, D. (2014), "The Future of Food Demand: Understanding Differences in Global Economic Models", *Agricultural Economics* 45(1), 51-67. doi: 10.1111/agec.12089.

Vitalis, V. (2008), "Case study 4. Domestic Reform, Trade, Innovation and Growth in New Zealand's Agricultural Sector", *OECD Journal* 4, 189.

Von Nordenflycht, A. (2010), "What is a Professional Service Firm? Toward a Theory and Taxonomy of Knowledge-Intensive Firms", *The Academy of Management Review* 35(1), 155–174.

Wark, T., Corke, P., Sikka, P., Klingbeil, L., Guo, Y., Crossman, C., Valencia, P., Swain, D. and Bishop-Hurley, G. (2007), "Transforming Agriculture through Pervasive Wireless Sensor Networks", *IEEE Pervasive Computing* April- June, 50-57.

Watson, P. (2009), "CowTime Tracking Survey 2009", report prepared for the Department of Primary Industries Victoria, accessed 30 May 2012. [http://www.cowtime.com.au/edit/Reports/COWTIME\\_TRACKING\\_SURVEY\\_2009\\_REPORT\\_FINAL.PDF](http://www.cowtime.com.au/edit/Reports/COWTIME_TRACKING_SURVEY_2009_REPORT_FINAL.PDF).

WGEA (2016), *Data explorer - Agriculture, Forestry and Fishing Summary for 2016*, accessed June 21, 2017. <http://data.wgea.gov.au/industries/282>.

Winch, G. and Schneider, E. (1993), "Managing the Knowledge- Based Organization: The Case of Architectural Practice", *Journal of Management Studies* 30, 923–937.

## Appendix 1. Websites for firms listed

AgAsset (ND), *Services*, accessed January 17, 2018. <http://agasset.com.au/services>.

Agdata (2018), *Products*, accessed January 17, 2018. <https://www.agdata.com.au/products/>.

Agricultural Appointments (2015), *Agricultural Appointments*, accessed August 4, 2017. <http://www.agri.com.au/>.

Agricultural Risk Consulting Group (2017), *Experts in Agricultural Advisory, Adjustment & Analysis*, accessed May 2, 2017. <http://www.arcgroup.net.au/>.

Agri Labour (2017), *About*, accessed July 27, 2017. <http://www.agrilabour.com.au/>.

Agri Machinery (2018), *Welcome to Agri Machinery*, accessed January 17, 2018. <http://www.agrimach.com.au/>.

Agrimaster (ND), *Products*, accessed January 17, 2018. <https://www.agrimaster.com.au/products/>.

Agripath (2015), *Agripath*, accessed May 2, 2017. <http://www.agripath.com.au/>.

Agvise Laboratories (2018), *Agronomic Information*, accessed January 17, 2018. <https://www.agvise.com/>.

AG Workforce (2017), *AG Workforce: Agricultural Recruitment*, accessed August 4, 2017. <https://www.agworkforce.com.au/>

- All State Agricultural Service (2013), *All State Agricultural Service: Specialists in Cattle Artificial Breeding*, accessed August 4, 2017. <http://www.allstateag.com.au/>.
- Belay Consulting (2013), *We Give You the Edge*, accessed January 17, 2018. <http://www.belayconsulting.com.au/>.
- BJW Agribusiness (ND), *Services*, accessed January 17, 2018. <http://bjw.net.au/>.
- Cargill (2018), *Agriculture*, accessed January 17, 2018. <https://www.cargill.com.au/en/agriculture>.
- Catalyst Partners (ND), *Services for Agricultural Sector*, accessed June 24, 2017. <http://catalystpartners.com.au/home-australian-domestic-clients/services-for-agricultural-sector/>.
- CBH Group (2018), *Home*, accessed January 17, 2018. <https://www.cbh.com.au/>.
- Charles Sturt University (2018), *Bachelor of Agriculture*, accessed January 17, 2018. <http://futurestudents.csu.edu.au/courses/agricultural-wine-sciences/bachelor-agriculture>.
- ConsultAg (ND), *Advancing Agriculture*, accessed January 17, 2018. <http://www.consultag.com.au/>.
- Colliers International (2018), *Comprehensive Property Investor and Owner Services*, accessed January 17, 2018. [http://www.colliers.com.au/services/owners\\_and\\_investors/](http://www.colliers.com.au/services/owners_and_investors/).
- Corporate Agriculture Australia (2010), *Opportunities in Australian Agriculture*, accessed June 24, 2017. <http://www.corpag.com.au/>.
- Elders Insurance (2017), *Farm Insurance*, accessed August 4, 2017. <https://www.eldersinsurance.com.au/farm-insurance>.
- Fairport (1997), *Home*, accessed January 17, 2018. <http://www.fairport.com.au/en/>.
- Farmanco (2016), *Farmanco: Your Complete Australian Farm Advice Company*, accessed January 16, 2018. <https://farmanco.com.au/>.
- GHD (2017), *Agriculture*, accessed July 28, 2017. <http://www.ghd.com/global/services/agriculture/>.
- GrainCorp (2014), *Grain Marketing*, accessed August 4, 2017. <http://www.graincorp.com.au/grain-marketing>.
- Glencore Australia (2018), *Glencore Agriculture*, accessed January 17, 2018. <http://www.glencore.com.au/en/who-we-are/Pages/agricultural-products.aspx>.
- Icon Agriculture (2018), *Our Services*, accessed January 17, 2018. <http://iconagriculture.com.au/farm-management-services/>.
- K2G (2017), *K2G: Data Driven Sales & Marketing for Farmers and Agribusiness*, accessed August 3, 2017. <http://kg2.com.au/>.
- Kalyx (2012), *Welcome to Kalyx*, accessed July 28, 2017. <https://www.kalyx.com.au/>.
- KPMG (2017), *Agribusiness*, accessed July 28, 2017. <https://home.kpmg.com/au/en/home/industries/agribusiness.html>
- MarketAg (ND), *Services*, accessed January 17, 2018. <http://marketag.com.au/services/education-programs/>.
- Planfarm (2016), *The Planfarm Story*, accessed August 3, 2017. <http://www.planfarm.com.au/>.

- NAB (ND), *Agribusiness*, accessed August 4, 2017. <https://www.nab.com.au/business/industry/agribusiness>.
- Outcross (2015), *Precision Livestock Management Consulting, Software and Contracting for the Australian Beef Cattle Industry*, accessed August 4, 2017. <http://www.outcross.com.au/>.
- Precision Agriculture (ND), *Farm Services: A Range of Precision Agriculture Solutions Tailored to Your Farm*, accessed July 28, 2017. <http://www.precisionagriculture.com.au/services-for-farmers.php>.
- Precision Agronomics (2017), *Welcome to Precision Agronomics*, accessed July 28, 2017. <http://precisionag.com.au/>.
- Primary Business (2016), *Our Services*, accessed January 17, 2018. <http://primarybusiness.com.au/services/>.
- Proagrive (2017), *Proagrive: Succession Planning Specialists*, accessed August 4, 2017. <http://www.proagrive.com.au/>.
- Productive Nutrition (ND), *Our Services*, accessed August 4, 2017. <http://www.productivenutrition.com.au/>.
- Prosper Agri Management (2018), *Services*, accessed January 17, 2018. [http://prosperagri.com.au/?page\\_id=32](http://prosperagri.com.au/?page_id=32).
- PwC (2017), *Agribusiness & Food*, accessed August 3, 2017. <http://www.pwc.com.au/agribusiness.html>.
- Rabobank (2017), *Rabobank*, accessed August 4, 2017. <https://www.rabobank.com.au/>.
- RCS (ND), *RCS Products & Services Specifically for Family Farms*, accessed August 3, 2017. <http://www.rcsaustralia.com.au/products/family-business/>.
- Rimfire Resources (2014), *Building People and Business Capability across Agriculture*, accessed August 16, 2017. <https://www.rimfireresources.com.au/>.
- Rural Skills Australia (2018), *About Us*, accessed January 17, 2018. <http://www.ruralskills.com.au/about-us/>.
- SpecTerra (2010), *About SpecTerra*, accessed August 4, 2017. <http://www.specterra.com.au/about.html>.
- TAFE NSW (ND), *Agriculture*, accessed January 17, 2018. <https://oten.tafensw.edu.au/courses-and-careers/teaching-areas/land-and-the-environment/agriculture/>.
- Trimble (2017), *Trimble Agriculture*, accessed August 4, 2017. <http://www.trimble.com/Agriculture/index.aspx>.
- University of New England (2018), *Bachelor of Agribusiness*, accessed January 17, 2018. <https://my.une.edu.au/courses/2018/courses/BAGB>.