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# Factors associated with farmers' use of fee-for-service advisors in a privatized agricultural extension system

R. Nettle<sup>a,\*</sup>, J.M. Morton<sup>b</sup>, N. McDonald<sup>c</sup>, M. Suryana<sup>a</sup>, D. Birch<sup>a</sup>, K. Nyengo<sup>a</sup>, M. Mbuli<sup>a</sup>, M. Ayre<sup>a</sup>, B. King<sup>a</sup>, J.-A. Paschen<sup>a</sup>, N. Reichelt<sup>a</sup>

<sup>a</sup> Rural Innovation Research Group, School of Agriculture and Food systems, Faculty of Veterinary and Agricultural Sciences, University of Melbourne, Building 142, Royal Pde, Parkville 3010, Vict, Australia

<sup>b</sup> Jemora Pty Ltd., PO Box 2277, Geelong, Vict 3220, Australia

<sup>c</sup> University of Southern Queensland, West St, Darling Heights, Toowoomba, QLD 4350 Australia

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### ABSTRACT

The privatization of agricultural advisory and extension services in many countries and the associated pluralism of service providers has renewed interest in farmers' use of fee-for-service advisors. Understanding farmers' use of advisory services is important, given the role such services are expected to play in helping farmers address critical environmental and sustainability challenges. This paper aims to identify factors associated with farmers' use of fee-for service advisors and bring fresh conceptualization to this topic. Drawing on concepts from service ecosystems in agricultural innovation and using the theory of planned behavior to define a plausible directed acyclic graph, we conducted a cross-sectional study of 1003 Australian farmers and their use of fee-for service advisors, analyzing data using generalized ordinal logistic regression models. We defined three categories: farmers who used fee-for-service advisors as their main source of advice ('main source'), farmers who used them but did not consider them their main source of advice ('non-main source'), and farmers who did not use them ('non-user'). The factors most strongly associated with use of fee-for-service advisors (both as 'main source' and 'non-main source') were: the farm being in a growth/expanding business stage; behavioral beliefs that paying for advice provides control and helps identify new opportunities in farming; endorsement of paying for advice from others in the farm business and farmer peers; attitudes relating to the benefit and value for money from advice; and perceived behavioral control related to confidence in accessing advice. These findings can inform strategies to enable use of fee-for-service advisors. For example, they highlight the need to increase the social acceptance of paying for advice and to assist advisors to better articulate the value of their services in terms that farmers view as important. Currently, mechanisms for professionalizing and certifying advisory services are a focus for policy makers in enabling farmers' use of advisors. Our findings indicate that these mechanisms on their own would not necessarily lead to greater use of fee-for-service advice, because use is also based on several social and attitudinal factors in addition to perception of quality. Greater emphasis on the social and attitudinal factors found in this study is required when developing strategies to enable the use of fee-for-service advisors.

#### 1. Introduction

The complexity of farm management associated with new technologies, climate and market volatility (Alexandratos and Bruinsma, 2012) draws attention to the higher levels of farm management skills required and farmers' ability to assimilate and act on information, and draw on external advice and support (Wolf, 1995; Prosch and Jose, 2003; Nettle et al., 2018b). Such farm management advice is increasingly likely to originate from the private sector as there is continual withdrawal of the State from providing advisory and extension services in many industrialized countries such as across the EU, New Zealand and Australia (Knuth and Knieram, 2013; Sutherland et al., 2013; Phillipson et al.,

\* Corresponding author.

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*E-mail addresses*: ranettle@unimelb.edu.au (R. Nettle), johnmorton.jemora@gmail.com (J.M. Morton), Nicole.McDonald@usq.edu.au (N. McDonald), msuryana@student.unimelb.edu.au (M. Suryana), dbirch@student.unimelb.edu.au (D. Birch), nyengo@student.unimelb.edu.au (K. Nyengo), mmbuli@student. unimelb.edu.au (M. Mbuli), mayre@unimelb.edu.au (M. Ayre), kingbj@unimelb.edu.au (B. King), jpaschen@unimelb.edu.au (J.-A. Paschen), reichelt@unimelb. edu.au (N. Reichelt).

2016; Knieram et al., 2017; Prager et al., 2016; Prager et al., 2017; Botha et al., 2008; Nettle et al., 2017). Under privatization, concerns have been raised that farmers may be excluded from receiving farm management support due to an inability to pay for advice (Labarthe and Laurent, 2013) and they subsequently rely on commercial farm input suppliers providing 'free' farm management advice (Ingram, 2008; Sutherland et al., 2013; Prager et al., 2016). The diversity of advisory sources from the public, private, commercial and not-for-profit sectors has however been suggested as an important resource for farmers in stimulating innovation (Garforth et al., 2003). Consequently, the changes to advisory sources under privatization is an issue for progressing agricultural sustainability and there are calls for more research into farmers' engagement with the advisory system (Lioutas et al., 2019; Klerkx, 2020).

Farmers' engagement with the advisory system is commonly viewed through an economic lens of market failure. This view has been a central feature of decisions related to removal of public support of advisory and extension systems in the Netherlands (Klerkx and Leeuwis, 2008), the US (Frisvold et al., 2001; Holloway and Ehui, 2001) and Australia (Mullen et al., 2000). In this conceptualization, farmers' willingness and ability to pay for advisory services is used to consider policies for funding of advisory and extension services other than the full transfer of the service costs to the end user (see Faure et al., 2012 p 470 for a review). Farmers' willingness to pay for advice has been associated with improvements in their farm's profitability or in lowering production costs (Budak and Budak, 2010; Farinde and Atteh, 2009; Klerkx and Leeuwis, 2008; Bonke et al., 2018). Several demographic characteristics have been associated with greater willingness to pay such as: age, gender and education (younger, female farmers and those with higher education attainment) (Budak and Budak, 2010; Foti et al., 2007; Trauger et al., 2010; Charatsari et al., 2011); farms with higher income and purchasing power (Bonke et al., 2018; Hite et al., 2002) and farmers with less access to other extension services (Gidarakou et al., 2008). The production context has also been associated with willingness to pay, with producers of higher-value commodities more willing to pay for advice (e.g. such as in horticulture) (Foti et al., 2007; Charatsari et al., 2011). This is hypothesized to relate to the level of risk in these production systems and the role of advice in risk mitigation (Uddin et al., 2014) as well as areas of farm management that may fall outside farmers' direct expertise, such as in the marketing of commodities or complex animal health situations (Klerkx and Leeuwis, 2008; Alexopoulos et al., 2009).

While these studies go some way in identifying the subset of farmers and the contexts in which paying for advice is more valued, they have not considered the farmers' broader knowledge system, including multiple sources of advice and the use of advisors without directly paying for this advice, such as through contracted or subsidized information and advisory services from agricultural industries or government (Garforth et al., 2003). This broader knowledge system is an important consideration for government and agricultural industries in understanding the functioning of the advisory and extension system, in addressing gaps in advisory services or in contracting fee-for-service advisors in projects to support sustainable agriculture (Birner et al., 2009; Sutherland et al., 2013; Klerkx and Proctor, 2013; Coutts et al., 2019; Cofre'-Bravo et al., 2019). It is pertinent to ask: What influences farmers' use of fee-for-service advisors?

A fee-for-service advisor provides a service as an 'independent entrepreneurial individual, who may work alone or as part of an organisation' (EU SCAR, 2015, p104). The advice is not provided as a co-service of a commercial transaction such as with the sale of physical farm inputs, in which an interest bias on the part of advisor may be implied (EU SCAR, 2015 p104). We refer to these advisors as being 'independent' because the advice, which can be agronomic, technical (e. g. animal health), financial or management-related, is provided for explicit fees (e.g. per hectare, per hour, per service) and is not connected to product sales. Advisors who work for agrochemical companies and who provide advice as part of a package of goods or services are commonly referred to as 'embedded advisors' (Klerkx and Jansen, 2010, p194) or commercial or distributor agronomists (Ingram and Morris, 2007) and feed company nutritionists (Phillipson, et al., 2016).

Fee-for-service advisors can also be contracted in a subsidized arrangement to provide information, advice and support to farmers as part of 'public good' projects (Garforth et al., 2003; Klerkx and Jansen, 2010; Sutherland et al., 2013; EU SCAR, 2015, p111). For instance, in Australia, it is possible for a farmer to use fee-for-service advisors without paying them directly, through the advisor being sub-contracted or subsidized to provide information, advice and support in industry or government programs. Such contract or subsidized arrangements can extend to industry-based projects where there are both public and private interests (Paschen et al., 2017). While these arrangements may be considered to blur the boundaries of fee-for-service advice as being truly independent and client-focused (Sutherland et al., 2013), the distinction from commercial input sales is important to note. Further, such arrangements with fee-for-service advisors have been suggested as important in the progress toward sustainable land use and in farm practice, for example in the tailoring of advice to client situations in regular service contacts and acting as a conduit for key messages (Ingram and Morris, 2007; Ingram, 2008; Klerkx and Proctor, 2013; Sutherland et al., 2013; Knieram et al., 2017; Prager et al., 2016; Nettle et al., 2017; Kinsella, 2018; Nettle et al., 2018b; Hyland et al., 2018). Recently, 'vouchers' for farmers to use independent advisors have been noted as a potential policy option in the EU (EU SCAR, 2015, p108) and is an important consideration for research.

In this paper we refer to fee-for-service advisors as independent advisors (being independent from commercial input sales) where farmers may pay fully, partially or not at all for this advice. In the investigation of advisory systems, it is important to acknowledge the differences in payment models for fee-for-service advice as well as the interrelationship between different advisory types and farmer use of advice.

To date there has been limited assessment of potential determinants of use of fee-for-service advisors outside of studies of willingness to pay and the examination of demographic attributes of paying or non-paying farmers. This is possibly because there is an assumption that farmers can afford to pay for advice or that there is already a strong history of paying for advice following many decades of privatization (Prager et al., 2016). The need to expand the conceptualization of 'use' of fee-for-service advisors beyond the transaction of paying for advice aligns with recent scholarship related to advisory ecosystems and the importance of networks of rural advisory services to advisory system effectiveness (Phillipson et al., 2016; Nettle et al., 2017; Klerkx et al., 2017; Pigford et al., 2018; Lioutas et al., 2019; Cofre'-Bravo et al., 2019). These studies also highlight the social dimensions of advice-seeking and advisory network creation on the part of farmers, however they stop short of explicitly examining the patterns of use of fee-for-service advisors in this broader advisory system context. Where farmers may not be paying directly for advisory services, factors other than willingness and capacity to pay need to be considered to understand farmers' advice-seeking behavior. This includes factors such as attitudes towards products and services (Palacios, 2005), preferences for seeking external advice (i.e. absorptive capacity) (Zahra and George, 2002), farmer perceptions of advisors (Faure et al., 2012), the range of advisory sources to which farmers have access (Garforth et al., 2003), the farmers' perceived importance of different advisory sources (Lioutas et al., 2019) and how farmers build their support networks (Cofre'-Bravo et al., 2019). This requires renewed focus and conceptualization of farmers' use of fee-for-service advisors.

This paper aims to identify the factors associated with Australian farmers' use of fee-for-service advisors, whether they pay directly for this service or not. The study responds to recent calls for research to unravel advisory sub-systems and farmers' advice consumption patterns (Klerkx, 2020) and to contribute to policy discussions related to enabling farmers' advice use, such as through greater professionalization or certification of advisors (Sutherland et al., 2013; EU SCAR,



**Fig. 1.** Directed acyclic graph depicting hypothesized causal pathways between 24 exposure variables of interest and pathways from those exposure variables to use of independent (fee-for-service) advisors. See Table 2 for wording of questions for assessing exposure variables. Boxes indicate components of the theory of planned behavior that informed the structure of the directed acyclic graph.

2015). We drew on the conceptualization of advisory and extension systems as a service ecosystem in agricultural innovation (Pigford et al., 2018; Lioutas et al., 2019) as well as the theory of planned behavior (Fishbein and Ajzen, 2010) for understanding the social and attitudinal dimensions of farmers' decision making in using fee-for-service advisors.

#### 2. Conceptual framework

#### 2.1. Agricultural advisory and extension systems as service ecosystems

A service ecosystem perspective positions advisory work as a systemic capability for innovation, involving interactions in networks between farmers, advisors, researchers and other actors (Phillipson et al., 2016; Pigford et al., 2018; Lioutas et al., 2019). Where advisory services are no longer organized centrally by a government agency, a diversity of individual and collective actors, public, private and not-for-profit organizational forms, methods and institutional structures make up an advisory and extension system (Prager et al., 2017). In this system, the value of advisory and extension services is produced through the interaction of this wider web of actors operating 'beyond the provider-recipient dyad' (Lioutas et al., 2019 p142) and actors take relative positions in the system (Lioutas et al., 2019). In applying this conceptualization, we differentiated three groups of farmers based on use of fee-for-service advisors (use/non-use) and their relative importance as an advisory source (main source/non-main source).

#### 2.2. Social and attitudinal dimensions of farmers' decision making

The theory of planned behavior (TPB) is a common framework in decision-making studies (Ajzen, 1991; Fishbein & Ajzen, 2010), particularly in work with an applied focus on the design of interventions to support behavior change (Conner and Armitage, 1998). The theory posits specific behaviors (e.g. paying for advice) as reasoned action

arising from a person's beliefs, attitudes and degree of control over decisions, including the effect of social norms. The TPB expects that a given behavior is determined by the strength of a person's intention to perform that behavior. The intention is a function of three social-psychological constructs:

- 1. Attitude toward the behavior, i.e. the degree to which the behavior is negatively or positively evaluated.
- 2. Subjective norms, i.e. the perception of the social pressure to perform or not perform the behavior.
- 3. Perceived behavioral control, i.e. the self-perception of one's capability to successfully perform the behavior and the autonomy to perform the behavior.

#### (Fishbein and Ajzen, 2010).

The TPB infers that the intention to act is stronger when attitude and subjective norms are more favorable and when perceived behavioral control is greater (Davis et al., 2002). In farming and other studies, indirect measures are often added to the framework. For instance, underlying beliefs (behavioral beliefs) are expected to influence attitudes, normative beliefs are expected to influence subjective norms and control beliefs are expected to influence perceived control (Sok et al., 2016). In addition, background factors such as demographic variables (e.g. age, education) (Martinovska et al., 2016) and access to resources (e.g. land) (Daxini et al., 2018) have been included.

Results from TPB analyses have been applied in a range of agricultural contexts to develop and recommend different approaches to policy implementation and interventions. For instance, in cattle vaccination behaviors (Sok et al., 2016), farm nutrient management and environmental programs (Daxini et al., 2018; Wauters et al., 2010), grazing management practices (Borges et al., 2016; Hyland et al., 2018), farmers' intention to apply for rural development support (Martinovska et al., 2016), farmers' adoption of crops for energy production

#### Table 1

Categories of sources of information, advice and support from which Australian farmers were asked: a) which they used and b) which was their main source.

- Government (i.e. Commonwealth<sup>a</sup>, State agriculture / primary industry / environment departments / local government or water catchment bodies)
- Research and development corporations (e.g. Sugar Research Australia, Dairy Australia, Meat and Livestock Australia, Horticulture Innovation Australia, Australian Pork Limited, Grains Research and Development Corporation, Cotton Research and Development Corporation)
- Product re-sellers / farm input suppliers (e.g. fertilizer, seed, feed, chemical merchants (local or national distributors or agencies or multinational companies)
- **Independent (fee-for-service) advisors** (e.g. farm management consultants, agronomists, specialist advisors, such as veterinary surgeons, crop specialists, breeding companies, etc)
- Farmer-owned information, advice and support organizations (e.g. local productivity services, farming systems groups, farmer membership organizations)
   Processing companies farmers supply (dairy, meat, cotton, grains, processing companies)
- Other (please specify)

<sup>a</sup> 'Commonwealth' covers national government agencies providing information, advice or support to farmers such as the Department of Agriculture and Water Resources (DAWR) or research organizations such as CSIRO.

(Sherrington et al., 2008) and the process of adoption of organic farming (Issa and Hamm, 2017). In acceptance of conservation practices, social pressures, especially from family, were found to be important in farmers' decision making (Beedell and Rehman, 2000).

A key strength of TPB is the emphasis it places on different types of control over decision making, including individual and social factors. We used the TPB as a relevant conceptualization to inform the development of an hypothesized causal model (Fig. 1), which we then used to identify factors associated with use of fee-for-service advisors.

#### 3. The advisory and extension system in Australia

The Australian farming sector consists predominantly of family farms (Dufty et al., 2019), with diversity in farm sizes and operations across diverse agro-ecological zones ranging from tropical to temperate (National Farmers Federation, 2017). The sector is supported by a knowledge system that is arranged on an industry or commodity basis (e. g. beef and sheep, horticulture, grains) involving a diversity of private sector, public and other organizations (Hunt et al., 2012; Nettle et al., 2017; Paschen et al., 2017; Department of Agriculture, 2019). The involvement of the private sector in extension is influenced by the different approaches of agricultural industries.

Australia is an interesting and important case for exploration of farmers' use of fee-for-service advisors in farm management. Under privatization, there has been an implicit assumption that the private feefor-service advisory sector would replace the role of the State in advisory and extension services, particularly in fee-for-service advice that supports farmer decision-making (Mullen et al., 2000). There is now no single national or state-based organization of publicly funded farm management advisory and extension services, or a single large private advisory service (Paschen et al., 2017). There are no specified public policies relating to advisory and extension services such as in the EU (Prager, et al., 2016). Most Australian farmers belong to an industry/commodity research and development body that collects a fixed percentage fee or levy for research, development and extension (Hunt et al., 2014; Paschen et al., 2017). Each industry then administers different engagement models for advisory and extension services. Federal or state governments, as well as some agricultural industry research and development organizations, may contract fee-for-service advisors to deliver information and advisory services. Others may deliver their own advisory services. Farmer-owned and managed groups or processing companies (e.g. meat and milk processors) may employ advisors or contract fee-for-service advisors to provide free advice to their members/suppliers. The types of organizations involved in the advisory and extension system are outlined in Table 1.

Concerns have been raised about agricultural productivity and the state of the research, development and extension system in Australia (Hunt et al., 2014; Paschen et al., 2017; Department of Agriculture, 2019) yet there has been limited recent research that has examined the current configuration of the advisory system in Australia or examined farmers' use of advisory sources.

#### 4. Methods

#### 4.1. Overview of study design

We conducted a cross-sectional study of Australian farmers between July and September 2016 as part of a larger study of the advisory and extension system in Australia (2015–18) (Paschen et al., 2017).

## 4.2. Definition of use of fee-for service advisors

Use of fee-for service advisors was described using an ordinal data variable with three categories, where independent (fee-for-service) advisors were: i) used, and the farmer's main source of information, advice and support, ii) used, but not the farmer's main source, or iii) not used. To assess use, we developed a typology of sources of advice and extension services ('source types'; Table 1) based on studies of advisory and extension systems in Europe (Paschen et al., 2017) and known sources in the Australian context. Each farmer was asked which of these sources they used, and which was their main source (i.e. having the greatest impact on their farming and business operations). Farmers could only nominate one main source option.

#### 4.3. Development of a hypothesized causal model

To develop the questionnaire and conduct the analysis, we applied the concepts of the theory of planned behavior (TPB) (Ajzen, 1991) to identify exposure variables associated with the use of independent (fee-for-service) advisors. We developed a directed acyclic graph (Shrier and Platt, 2008; Greenland et al., 1999) depicting the hypothesized causal pathways between exposure variables based on these TPB constructs, and between exposure variables and the dependent variable (i.e. use of independent [fee-for-service] advisors) (Fig. 1). Exposure variables are those hypothesized to affect the distribution of the dependent variable either directly and/or indirectly (i.e. mediated via other variables). This graph was used to inform the choice of covariates in multivariable statistical models to examine the strengths of associations between each putative determinant and use of independent (fee-for-service) advisors. Although the dependent variable was 'use of independent (fee-for-service) advisors' rather than 'paying for advice', we included 'intention to pay for advice' and 'plan to pay for advice' in the graph as, most commonly in Australia, farmers using independent (fee-for-service) advisors directly pay for such services.

#### 4.4. Questionnaire development

Results from farmer and advisor focus group discussions were used to develop the questions pertinent to the TPB constructs for the study. These focus groups involved 143 participants and were conducted in regional areas across four states of Australia in 2016 (for detail of the focus group process, refer to Nettle et al. 2018a. In these group discussions, farmers were asked to describe their current use of advisory and extension services; who they used for information and advice; attitudes towards information/advice and the importance of this in their farming; how they accessed services; reasons for willingness to pay for advice and on-farm changes they had made because of advice received. A range of farm enterprises were represented in the forums.

We found farmers described different sources of information, advice and support and a favored or main source of advice. Themes from the Construct and description

information, advice or

independent (fee-for-

Intention (intend to pay for

advice in the next 12

Attitude (the farmer's

positive or negative

evaluation of paying for

Behavioral beliefs (beliefs

about the likely

outcomes of the

behavior and the evaluations of these

outcomes) (Ajzen,

Subjective norms (the

to perform that behavior)

should do)

others)

(injunctive norm - the

perceptions of what

(descriptive norm - the

perceived behavior of

referents think he or she

social pressures one feels

2006).

months)

advice)

Behavior (currently use

support from an

service) advisor

#### Table 2

Description of the exposure variables and measurement scales for use of inde pendent (fee-for-service) advisors in relation to constructs of TPB in the directed acyclic graph.

Do you currently seek out

advice, or support from

service) advisors – such as farm management consultants, agronomists, special advisors (e.g. veterinary surgeons, crop specialists, breeding,

Of those sources that you are using, which would you say is the MAIN source, or the source of information, advice or support that has had the greatest impact on your farming and business operations?

I intend to pay for advice

productivity in the next

I plan to pay for advice to improve my farm productivity in the next

to improve my farm

Paying for advice to

productivity would be beneficial for me.

I would receive value for money by paying for advice to improve my farm productivity<sup>c</sup>.

Paying for advice to

productivity would be profitable<sup>c</sup>.

Paying for advice to

productivity will provide more control in farm decisions<sup>c</sup>.

My paying for advice to improve my farm productivity will identify new opportunities for my farm business<sup>c</sup>

(injunctive) Generally

speaking, I want to do what other farmers think

(descriptive) Most of the

farmers whose opinions I

value pay for advice to

(Injunctive) I feel under

advice to improve my productivity<sup>c</sup>.

(injunctive) Generally

speaking, I want to do

makers on the property

the property think that I

should pay for advice to

what other decision

think I should do. Other decision makers on

social pressure to pay for

I should do

improve farm productivity each year.

improve my farm

improve my farm

improve my farm

12 months.

12 months

independent (fee-for-

or use information

Question

etc)?

	Table 2 (continued)		
t scales for use of inde-	Construct and description	Question	Scale
	or should not pay for advice) (affecting	improve my productivity in the next 12 months.	
Scale Main source group (Use fee-for-service advisor as main source) Non-main source group (Use fee-for- service advisor but not as their main source)	subjective norms) Perceived behavioral control (the perceived own capability to perform that behavior)	Other farmers do not think that I should pay for advice to improve my productivity in the next 12 months <sup>c</sup> . Completely disagree (1) Completely agree (7) <sup>b</sup>	It is mostly up to me whether or not I pay for advice to improve my farm productivity in the next 12 months. If I wanted to, I could pay for advice to improve my farm
	I am confident that I could		productivity in the next 12 months <sup>c</sup> .
<b>Non-use group</b> (Do not use)	easily access paid advice to improve my farm productivity in the next 12 months <sup>c</sup> .		
Completely disagree (1)	Control beliefs (beliefs about the presence of factors that may facilitate or impede performance of the behavior and the perceived power of these factors)	I expect that financial constraints will place high demands on me in the forthcoming year. With financial constraints placing high demands on me this year, paying for advice to improve my farm productivity in the	Completely disagree (1) Completely agree (7) <sup>b</sup>
Completely agree $(7)^{b}$	Hypothesized	next 12 months will be very difficult Age of respondent	18–29; 30-39; 40–49;
Completely disagree (1)	determinants of the behavioral beliefs affecting attitudes to paying for advice	Farm gross income: Over the past five years, please	50–59; 60–69; 70 or older <sup>d</sup> AUD <sup>e</sup> (\$0-25,000; 26- 50000; 51-100,000;
Completely agree $(7)^c$		estimate the average annual total gross income from your farm operations?	102-200,000; 201- 300,000; 301-400,000; 401-500,000; 501,000-1 million; 1-5 million; 5- 10 million; more than 10
Completely disagree (1)		Business stage: Which of the following best	million) <sup>a</sup> Starting out (less than four years on this farm);
Completely agree (7) $^{ m b}$		are at in farming?	growth; in the process of planned handing on to next generation; winding down operations (no succession); other
		Focus on profit: It is important in farming to focus on profit.	Completely disagree (1) Completely agree (7) <sup>b</sup>
Completely disagree (1)		Education: Have you, or a member of your business, completed formal education relating to agricultural science, farm management or business	Y/N
Completely agree (7)"		Sudies? Self-reported skills and knowledge: I currently have the skills and knowledge required to manage the property/ farm effectively.	Completely disagree (1) Completely agree (7) <sup>b</sup>

 $^{\rm a}\,$  Respondents were offered 'don't know' or could refuse (coded 'refused').

<sup>b</sup> Forthese questions, respondents could choose one from nine categories; these sevencategories and two further categories: 'don't know' and 'not applicable'.

<sup>c</sup> These questions were asked in the on-line questionnaire, and for the first 9 CATI respondents only. CATI respondents were asked fewer questions to reduce the time of the interview.

<sup>d</sup> Respondents could refuse (coded 'refused')

 $^{\rm e}\,$  AUD is equivalent to 0.64 Euro as at 15/2/2020.

Normative beliefs (extent
to which other people
who are important to the
farmer think they should

Completely disagree (1) Completely agree (7)<sup>b</sup>

5

focus group discussions relating to farmers' use of fee-for-service advisors were grouped into the TPB construct categories. The key themes and their coding to the TPB constructs are summarized in the Appendix (Table A1). Questions for each construct were then developed following the phrasing of questions for TPB studies provided by Ajzen (2006). The questionnaire was piloted with 10 farmers prior to release. The exposure variables associated with the TPB constructs (Section 4.3), the questions asked, and their scales are provided in Table 2. Possible responses were proposed to respondents in random order.

#### 4.5. Respondent enrolment

Following questionnaire development, a national cross-sectional study of Australian farmers (n = 1003) was conducted from July to September 2016. A stratified sampling scheme based on the main farm enterprise type was used. Farmers were encouraged to respond using the on-line questionnaire (i.e. respondents were not randomly selected). Participation in the study was promoted via the various communication modes of recognized farmer and industry organizations, including newsletters, websites, emails and social media (e.g. Twitter). After 503 on-line responses had been obtained, 500 telephone interviews were conducted with randomly selected respondents within each stratum. Numbers were selected to ensure that the final proportions of respondents from each enterprise were at least half the proportion of all Australian farmers in that enterprise. After the first nine telephone interviews, some of the questions assessing the respondent's degree of agreement with various statements were no longer asked due to time constraints. The respondent sample broadly reflected the distributions of Australian farmers by enterprise, state, age, gender and education (ABS, 2017). The prevalence estimates for all farmers pooled had a margin of error of approximately 3% (i.e. for point estimates near 50%, 95% confidence intervals were the point estimate  $\pm$  approximately 3%).

#### 4.6. Statistical analyses

Statistical analyses used Stata (version 15, StataCorp, College Station, Texas, USA). Associations between the 24 potential determinants (exposure or independent variables) and use of independent (fee-forservice) advisors were assessed using multivariable generalized ordered logistic regression models.

An iterative process identified the partial proportional odds model that best fitted the data. The proportional odds assumption was assessed for each category of each exposure variable in the model relative to the reference level for that exposure variable at 0.05 significance level. Where the p-value for this test was >0.05 for a particular level of a particular exposure variable, the proportional odds assumption was considered to be met for that level. (See Appendix for an explanation of the proportional hazards assumption).

We assessed whether the exposure variable was associated with both a) any use of independent (fee-for-service) advisors and b) use of independent (fee-for-service) advisors as the main source. Overall p-values for each exposure variable were calculated using likelihood ratio tests.

The enterprise categories were cotton production, cropping (grains) or mixed cropping and grazing, dairy cattle, horticulture (fruit), horticulture (vegetables), pork, sheep and/or beef, and sugar cane. Farmers whose enterprises were poultry, rice growing or 'other' were excluded from these statistical analyses as there were insufficient numbers within each and they were not similar to other enterprise categories so pooling them with other categories was not considered appropriate. The enterprise was fitted in all models to remove any confounding effects. The effect of each exposure variable on use of independent (fee-for-service) advisors was assessed by fitting a separate regression model with the appropriate covariates. Covariates were chosen for each exposure variable based on the directed acyclic graph drawn a priori (i.e. Fig. 1 and Section 4.3).

The minimal sufficient adjustment set for the total effect of an

Table 3

Australian farmers' use of independent (fee-for-service) advisors, by enterprise (n = 1003).

Respondent's	No.	Use of independent (fee-for-service) advisors					
enterprise		Not used	Used but not main source	Main source			
Cotton production	50	4% (2)	38% (19)	58% (29)			
Cropping (grains) <sup>a</sup>	171	26% (44)	24% (41)	50% (86)			
Mixed - cropping and beef <sup>a</sup>	76	25% (19)	30% (23)	45% (34)			
Dairy cattle	81	22% (18)	42% (34)	36% (29)			
Horticulture (fruit)	107	29% (31)	51% (55)	20% (21)			
Horticulture (vegetables)	23	48% (11)	30% (7)	22% (5)			
Pork	46	24% (11)	35% (16)	41% (19)			
Poultry <sup>b</sup>	14	64% (9)	14% (2)	21% (3)			
Rice growing <sup>b</sup>	12	33% (4)	50% (6)	17% (2)			
Sheep for meat <sup>c</sup>	85	49% (42)	29% (25)	21% (18)			
Sheep for wool <sup>c</sup>	57	39% (22)	39% (22)	23% (13)			
Beef cattle <sup>c</sup>	181	52% (94)	30% (54)	18% (33)			
Sugar cane growing	88	44% (39)	45% (40)	10% (9)			
Other <sup>b</sup>	12	58% (7)	8% (1)	33% (4)			
Pooled	1003	35%	34% (345)	30% (305)			
		(353)					

<sup>a</sup> Pooled into a single category for analyses of potential determinants of use of fee-for-service advisors.

<sup>b</sup> Excludedfrom analyses of potential determinants of use of fee-for-service advisors due o sparse number

<sup>c</sup> Pooledinto a single category for analyses of potential determinants of use offee-for-service advisors

exposure variable on use of independent (fee-for-service) advisors was the set of covariates that, based on the directed acyclic graph, removed confounding but did not include intervening variables. The minimal sufficient adjustment sets for the total effects of each exposure variable were identified using specific software (Dagitty, version 2.3; Textor et al., 2011). For some exposure variables, two distinct minimal sufficient adjustment sets were identified. For these, total effects were estimated twice, once with each distinct minimal sufficient adjustment set. For statistical analyses, to avoid unstable models due to sparse combinations of exposure variables and the dependent variable, we pooled Likert scale results into three categories: 1–3 (referred to as 'disagreement'), 4 or 5, and 6 or 7 (referred to as 'strong agreement').

Mean numbers of advisory source types used (Table 2) were compared between the three groups (i.e. main source group; non-main source group; non-use group) with linear regression using Stata's -regress- command. Distributions of responses on the Likert scale were compared between these three groups with the Kruskal-Wallis test, and pair-wise comparisons were performed using the Mann-Whitney test.

#### 5. Results

#### 5.1. Respondents

Of the 1003 study respondents, 83% (829) were male and 17% (174) female. Most were from the States of Queensland (26% or 261), New South Wales (32% or 317) and Victoria (23% or 228). Nine per cent (90) were from South Australia, 8% (79) from Western Australia, 3% (27) from Tasmania and one from Australian Capital Territory.

Thirty-five per cent (353) did not use fee-for-service advisors, 34% (345) used such advisors but they were not their main source. For 30% (305), fee-for-service advisors were the main source. Use of fee-for-service advisors varied markedly by enterprise (Table 3).

#### 5.2. Attitudes to paying for advice

With respect to farmer attitudes to paying for advice and excluding those selecting 'don't know' or 'not applicable', 38% (368/982) saw

#### Table 4

Amount spent by farmers on fee-for-service farm management advice by main source and non-main source groups.

In the past year, how much in total did you pay for independent farm management advice	Used bu main so	it not ource	Main source		
Less than \$5000	77%	264	44%	133	
\$5001-\$10,000	11%	38	22%	68	
\$10,001-\$20,000	6%	20	15%	46	
\$20,001-\$50,000	5%	16	11%	35	
\$50,001-\$100,000	1%	5	4%	13	
\$100,001 or more	1%	2	3%	10	
Pooled	100%	345	100%	305	

benefit from paying for advice (i.e. strongly agreed [selected 6 or 7 on the Likert scale for that question]) and 37% (177/483) felt that paying for advice would be profitable. When asked whether paying for advice would be beneficial, 38% (368/962) selected 6 or 7, 30% (287/962) selected 4 or 5, and 32% (307/962) did not believe it would be beneficial (selecting 1, 2 or 3). Affordability was an issue for only 31% (382/ 968) of farmers, who said paying for advice would be difficult in the next 12 months.

# 5.3. Numbers of 'source types' used and attitudes to the relevance and value of advice received

With respect to farm size and advisory sources, the number of sources (including fee-for-service advisers where they were used) varied markedly between farms (mean 4.36; SD 1.54; range 0–7). The mean number of sources for small farms (those with <AUD50,000 average annual gross farm income) was 3.75 (SD 1.69), only a little less than the mean numbers of sources for higher farm income categories (i.e. 4.27 sources (SD 1.54) for farms with AUD50,000–500,000 average annual gross farm income).

The mean number of source types (*excluding* fee-for-service advisors; Table 1) differed significantly between the non-use, non-main source and main source groups (overall p < 0.001; all pair-wise p-values  $\leq 0.001$ ). Mean (and SD) values were, respectively, 3.1 (SD 1.5), 4.2 (1.1) and 3.7 (1.3). That is, farmers who used fee-for-service advisors but not as their main source had overall more source types.

Distributions of scores for agreement (6 or 7) with 'the information, advice or support (from my main source) was relevant and useful to my farm/property' differed significantly (overall p < 0.001) by group, with higher scores for the 'main-source group' (82% or 248/303) compared to the non-main source group 68% (245/345) and the 'non-use group' (63% or 205/327) (pair-wise p-values both <0.001).

Distributions of scores for agreement (6 or 7) with 'I feel I received value for money from the information, advice or support I received (from my main source)' differed significantly (overall p < 0.001) by group, with higher scores for the 'main-source group' 73% (220/302) compared to the non-main source group (60% or 203/336) and the 'non-use group' (56% or 175/310) (pair-wise p-values both  $\leq 0.014$ ). Of the respondents where independent advisors were their main source who gave scores of 6 or 7 for relevance and usefulness, only 82% (202/247) gave scores of 6 or 7 for value for money.

# 5.4. Numbers of advisors used and amounts of money spent annually on independent farm management advice

Of the 650 study respondents who used fee-for-service advisors (i.e. 65% of the 1003 respondents) in the past year, 40% (258) used one advisor, 33% (217) used two advisors, 24% (156) used three to five advisors, and 3% (19) used between five and 10 advisors. Table 4 shows the amount spent by farmers on fee-for-service advice in each of the 'main source' and 'non-main source' groups. It shows 55% of the main source group were paying more than AUD5000 per year for advice compared with only 24% of the non-main source group.

#### 5.5. Factors associated with use of fee-for-service advisors

After losses to follow-up due to unanswered questions and questions that the respondent considered non-applicable to them for exposure variables of interest and/or fitted covariates, responses from between 852 and 959 farmers were analyzed (88–99% of the  $965^1$  respondents eligible for statistical analyses). Of the  $512^2$  respondents asked their degree of agreement with various statements, 504 were eligible for analyses. For these latter exposure variables, and for exposure variables where these latter variables were required as covariates for multivariable analyses, between 385 and 491 farmers were analyzed (76–97% of these 504 respondents).

Descriptive statistics and adjusted odds ratios for the exposure variables are shown in the appendix (Tables A2–A4). These tables provide results of analyses for both: a) the use of fee-for-service advisors as mainsource and non-main source combined rather than non-use, and b) use of fee-for-service advisors as main-source rather than non-main source or non-use combined. For example, relative to where the farm was winding down operations with no succession, for farms that were expanding/ growing, the proportional hazards assumption was considered to be met and so both odds ratio estimates were the same – 2.1 (Table A2). Thus, farmers whose farms were expanding/growing were both a) more likely to use fee-for-service advisors as their main-source and non-main source combined, and b) more likely to use fee-for-service advisors as their main-source group.

Where the proportional hazards assumption was considered not met, it was important to report separate odds ratios for each of a) 'main source' or 'non-main source' combined rather than non-use and b) 'main source' rather than 'non-main source' or 'non-use' combined (e.g. Table A4: Agreement with the statement 'I feel under social pressure to pay for advice to improve my productivity'). For exposure variables with two different minimal sufficient adjustment sets, estimated total effects of these exposure variables are shown using each minimal sufficient adjustment set.

Of the 24 exposure variables included in the directed acyclic graph, 17 were significantly associated with use of fee-for-service advisors. Farmers were both a) more likely to use fee-for-service advisors as either main-source and non-main source combined rather than non-use and b) more likely to use fee-for-service advisors as their main-source rather than non-main source or non-use combined if:

- 1. Their farm was expanding/growing or they were in the process of planned handing on to the next generation relative to if they were winding down operations with no succession (Stage in farming) (Table A2).
- 2. They had an undergraduate qualification rather than no formal education (Formal education) (Table A2).
- 3. Their farm's average annual total gross income was higher relative to those with lower gross incomes (Farm gross income) (Table A2).
- 4. They considered that paying for advice would be profitable (Normative behavioral belief) (Table A2).
- 5. They considered that paying would provide more control in farm decisions (Normative behavioral belief) (Table A2).
- 6. They considered that paying would identify new opportunities for their farm business (but for only one of the two minimal

 $<sup>^1</sup>$  After exclusion of farmers whose enterprises were poultry (n = 14), rice growing (n = 12) or 'other' (n = 12), 965 of the 1003 respondents were eligible for statistical analyses.

<sup>&</sup>lt;sup>2</sup> 503 on-line responses and the first nine telephone interviews. After the first nine telephone interviews, some of the questions assessing the respondent's degrees of agreement with various statements were no longer asked due to time constraints.

sufficient adjustment sets used). (Normative behavioral belief) (Table A2).

- 7. They disagreed that other farmers did not think that they should pay for advice (Normative belief) (Table A3).
- 8. They considered that other decision makers on the property thought they should pay (Normative belief) (Table A3).
- 9. They disagreed that paying for advice would be very difficult due to high demands created by financial constraints (Control belief) (Table A3).
- 10. They considered that they would receive value for money by paying for advice (Attitude) (Table A3)
- 11. They considered paying would be beneficial for them (Attitude) (Table A3).
- Generally speaking, they wanted to do what the other decision makers on the property thought they should do (Subjective norm) (Table A4)
- 13. Most farmers whose opinions they valued paid for advice (Subjective norm) (Table A4).
- 14. They could pay for advice if they wanted to (Perceived behavioral control) (Table A4).
- 15. They could easily access paid advice (Perceived behavioral control) (Table A4).
- 16. They intended to pay for advice (Intention) (Table A4).
- 17. They planned to pay for advice (Intention) (Table A4).

The proportional hazards assumption was considered not met for three of these variables. For variable 14 above, odds ratios differed a little between: a) use of fee-for-service advisors as either main-source and non-main source combined rather than non-use, and b) use of feefor-service advisors as their main-source rather than non-main source or non-use combined (Table A4) for one minimal adjustment set. For variables 16 and 17 above, the estimated odds ratios for using fee-forservice advisors as their main source (rather than non-main source or non-use combined) was much larger than the estimated odds ratios for all use of fee-for-service advisors (i.e. main and non-main source combined) rather than non-use (Table A4).

#### 6. Discussion

In this study, we set out to contribute to knowledge of the determinants of use of fee-for-service advisors in the context of privatization in the agricultural advisory and extension system. We found farmers in the non-main source group had more source types than both main source and non-user farmers. The non-main source group therefore displays higher levels of external knowledge-seeking behavior, commonly referred to as absorptive capacity, which is important for innovation (Zahra and George, 2002). While it has previously been found that farmers differ in the way they configure their advisory networks (Cofre'-Bravo et al., 2019) and diverse advisory sources can be a strength of pluralistic advisory and extension systems (Garforth et al., 2003), this finding identifies, at the national scale, a group of farmers actively accessing the diversity of sources for their farm management. This finding can assist in targeting innovation support from government or industry via the advisory system. For instance, enabling use of fee-for-service advisors by subsidizing fee-for-service advice may not be effective with farmers already accessing diverse sources of advice or famers who do not believe the use of advisers is necessary. This finding is also relevant for understanding different impacts from privatization of the advisory sector in the Australian context. In studies of privatization in the EU the privatization and commercialization of advisory services (i.e. via advice connected to farm input sales) has indicated the potential for over-reliance of some farms on commercial sources of advice (Labarthe and Laurent, 2013; Sutherland et al., 2013; Prager et al., 2016) or the potential reduction in farmer autonomy in their decision making through over-reliance for farm decisions on fee-for-service advisors (Ingram, 2008; Prager et al., 2016). The number and range of advisory

sources used by the main and non-main source groups in our study, including small farms, does not indicate a reliance on one main source group. The lower use of advisory sources by the non-user group would benefit from further investigation.

Unsurprisingly, farmers nominating a fee-for-service advisor as their main source were more likely to agree that the information, advice or support from their main source was relevant and useful compared to the non-main source and non-user farmers. While they were also more likely to agree that they received value for money from the information, advice or support they received from their main source, fewer were certain of the value. This implies that farmers place different types of benefit and value on their advisory sources. This was also highlighted in the focus group discussions (Table A1) in which farmers reported that benefit and value were difficult to measure and encompassed not only better farm returns but access to networks, independence of advice, being up to date or saving time. This finding elaborates the description provided by Lioutas et al. (2019) of different forms of value co-creation amongst farmers and their advisory services. This finding has implications for the advisory sector. While value for money from the advisory system is clearly a key issue for farmers, advisors could focus on the different forms of value they can create with farmers and not assume that farmers will see value from receiving advice nor that paying for advice is the only way to recognize the value famers' place on information, advice or support.

This finding is relevant to the policy interest in enabling farmers' use of independent fee-for-service advisors through incentives to cover some of the cost of advice via vouchers (EU SCAR, 2015). In the Australian context, farmers pay directly for advice and/or they may access fee-for-service advisors via their involvement in industry or government programs in which advisors' involvement is subsidized or provided without direct payment from farmers. While disentangling the influence of free from paid advice was beyond the scope of this study, the finding indicates that enabling use of independent advisors extends beyond the cost to farmers.

The large number and range of determinants of farmers' use of feefor-service advisors reflects the complexity of farmers' decision making in this area. Similar to studies of willingness to pay for advice, we found respondents use of fee-for-service advisors was associated with higher farm gross income (Hite et al., 2002; Alexopoulos et al., 2009; Budak and Budak, 2010; Bonke et al., 2018;) and formal education (Kidd et al., 2000; Gidarakou et al., 2008; Budak and Budak, 2010). In addition, we found the odds of using a fee-for-service advisor among expanding businesses are markedly higher than for those winding down. The association between paying for advice and growing businesses has been noted in a study of young farmers in Greece (Alexopoulos et al., 2009). While it may be expected that expanding a farming enterprise would be associated with increasing demand or need for advice, other business stages are arguably as important from a public policy or structural adjustment perspective. For instance, starting-out farmers, who may lack knowledge or be time poor, and farmers winding down, who may have limited interest in maintaining an intensive land management focus, could well benefit from tailored advice, yet in this study they were less likely to use a fee-for-service advisor. This finding suggests the importance of the temporal dimension in advice-seeking behavior whereby farmers seek out advice when circumstances warrant rather than routinely using an advisor. This temporal use may also be influenced by previous experience. In a study of participation in rural development support programs, prior experience was found to positively affect intention to participate in new programs (Martinovska et al., 2016). However, temporal dimensions in the use of fee-for-service advisors and the role of experience are rarely considered in the study of advisory systems. Further study of the conditions under which farmers stop, start or change their use of fee-for-service advisors is warranted.

We found a range of social and attitudinal factors associated with use of fee-for-service advisors. Firstly, normative behavioral beliefs (i.e. beliefs that paying for advice will be profitable, will provide control in farming and will help identify new opportunities for the farm business) and attitudes (paying for advice will be beneficial) were associated with use of fee-for-service advisors. Importantly, these beliefs relate to dealing with uncertainty (i.e. control) and the future (i.e. new opportunities). While previous studies of farmers' willingness to pay for advice has been associated with improvements in a farm's profitability or in lowering production costs (Budak and Budak, 2010; Farinde and Atteh, 2009; Klerkx and Leeuwis, 2008; Bonke et al., 2018), our findings suggest that farmers' use of fee-for-service advisors is determined by beliefs that these advisors support a broader purpose and offer a broader range of benefits than improvements in farm profitability alone. Secondly, the associations between different control beliefs, perceived behavioral control and use of fee-for-service advisors varied. The perceived behavioral control over the decision (i.e. 'If I wanted to, I could pay for advice to improve my farm productivity in the next 12 months') was associated with use of fee-for-service advisors. We found no evidence for an association between the use of fee-for-service advisors and agreement with 'I expect that financial constraints will place high demands on me in the forthcoming year' and yet we found that those agreeing that 'With financial constraints placing high demands on me this year, paying for advice to improve my farm productivity in the next 12 months will be very difficult' were less likely to use fee-for-service advisors. This apparent discordance in effects of these two beliefs may reflect an underlying belief about the priority for using fee-for-service advisors, that is, financial constraints per se are not a strong determinant unless using fee-for-service advisors is not important. If so, these results suggest that the perceived priority or importance of seeking fee-for-service advice needs to be considered alongside beliefs of affordability or financial capacity. This is pertinent, given the studies that suggest farmers may want to pay for advice but are not able to afford it, such as small farms (Labarthe and Laurent, 2013), and reinforces the importance of motivational or goal-oriented factors as determinants of behavior, as noted by Ajzen and Kruglanski, (2019). Thus, while we found farmers' use of fee-for-service advisors was associated with higher farm gross income, our findings also suggest that it is the priority or importance farmers place on seeking fee-for-service advice and not only beliefs about the affordability of advice or the financial capacity to pay for advice which is affecting use of fee-for-service advisors. We acknowledge that the lower importance placed on accessing fee for service advice by smaller farms may however be in part associated with the prevalence of alternative forms of advice.

We found normative beliefs (i.e. disagree that 'other farmers do not think I should pay' and 'others on the property say I should pay') and subjective norms ('generally speaking I do what others on the property think I should do' and 'generally speaking I do what other farmers whose opinions I value think' and 'most farmers whose opinions I value pay for advice') were associated with use of fee-for-service advisors. While social pressure and the influence of family and peers are recognized as important factors in farmers' decision making, behavior change and adoption of practices (e.g. Beedell and Rehman, 2000; Sok et al., 2016; Hyland et al., 2018; Daxini et al., 2018; Martinovska et al., 2016), the social environment has not previously been studied when examining willingness to pay for or use fee-for-service advisors. This finding is an important consideration for policies associated with extension service privatization where there may not be a culture of use of fee-for-service advisors or where services that used to be free are now charged for. With privatization, attention needs to be directed to how to develop favorable beliefs and norms toward fee-for-service advice and this will need to consider the range of decision makers on farms, including family members and sub-groups of farmers who may not have prior experience of use of advisory services. The strong associations for these exposure variables suggest that there may be value in supporting farmers to give fee-for-service advice a try.

The perceived behavioral control factor 'I could easily access advice' was strongly associated with use of fee-for-service advisors. While other studies have found farmers with less access to other extension services

are more likely to pay for advice (e.g. Gidarakou et al., 2008) in the Australian context, where large farms and remote locations mean there may be very few farm businesses in a geographic area to sustain an advisory service (thereby limiting the number and availability of advisors), the issue of access to services is important. In our study, a relatively high proportion of farmers (29% or 136/477 respondents) *disagreed* that they were confident they could easily access fee-for-service advice. Issues with access to advice falls under a criteria of market failure and can be used to justify the maintenance of some public provision of extension and advisory services (Mullen et al., 2000). The study findings further reinforce the importance of social and values-based factors alongside economic factors in the use of advisory services (Spash et al., 2009:961).

The relative strengths of association of the various factors found in the study can also be applied by industry or government in strategies for the advisory and extension system. For instance, having other decision makers on the property who support use of fee-for-service advisors has a much stronger association with use than the farm business stages of expanding/growth or handing on to the next generation (i.e. Table A.3 and Table A.2 show that odds ratio estimates of both these business stages is 9.0, relative to farmers who are winding down [2.1]). Assuming these are causal relationships and that our odds ratio estimates reflect the true values, this indicates that the proportional increase in odds of using fee-for-service advisors is considerably greater for a farmer where other decision makers on the property are supportive than for a farmer moving into a different farm business stage. As the percentages of respondents in the reference groups for these factors that were using feefor-service advisors were similar (i.e. 48–50%; Table A.1), the increase in absolute percentage of the target group of farmers who pay for advice would also be considerably greater if other decision makers on the property become supportive of use compared with the percentage of farmers who move into the expanding/growth or handing to the next generation business stage. This finding can be used, for instance, to justify the effort and expenditure on interventions to increase social endorsement in paying for advice because of the established link between use of advisors and farmer adoption of improved management practices (e.g. Ingram, 2008; Kinsella, 2018; Daxini, et al., 2018).

While the current study has identified key factors associated with use of fee-for-service advisors among Australian farmers, the study is not without limitations. The study applied concepts from the theory of planned behavior, including using this theory as the basis for our directed acyclic graph. If the interrelationships differ from those postulated in our directed acyclic graph, minimal sufficient adjustment sets may differ and hence estimated total effects may have differed from those we have reported. Directed acyclic graphs are usually defined on a less-explicit basis but this reduces transparency and can prevent readers from understanding the basis of the graph. In this regard, the use of TPB to frame our analysis represents an advance in the use of directed acyclic graphs, however we acknowledge there may be a more appropriate directed acyclic graph and theoretical framework could be developed. To extend and develop the theoretical application of this study, comparing results from the application of different graphs is suggested. Further, one of the questions used to group farmer respondents and assess the behavior of paying for advice was a binary question asking farmers to identify a single main source of information, advice and support. We acknowledge that farmers may view some advisory sources equally and could have multiple 'main' sources. In TPB studies, it is also more common to include at least three items for assessing intention, attitude and control beliefs (e.g. Ajzen, 1991), whereas due to the questionnaire length and potential respondent burden, only two items were used for four constructs (normative beliefs, control beliefs, attitudes and intentions). One of the recognized weaknesses in the TPB is the focus on attitudinal dimension of planned behavior whereas famers' use of advisors may be habitual/routine or not thought about consciously.

Finally, whereas previous studies have identified the capability,

competence and quality of advisors and their organization and services as factors in farmers interaction with advisory services (Oerlemans and Assouline, 2004; Charatsari and Lioutas, 2019) we did not explicitly examine this. Rather, we used farmer perceptions of relevance, use and benefits as implicit assessments of advisor quality in their intent to pay for advice. Further work examining the interaction between perceptions of advisory quality across different advisory types and organizations is warranted. Finally, each farmer chooses whether to use each of numerous specialist advisors for advice on separate aspects of their business. For example, the same farmer may have quite different patterns for sourcing information, advice and support for agronomy, animal health and farm business management. In the current study, we did not distinguish between use of advice on these different aspects of the business, and it is possible that determinants of use vary between these aspects.

#### 7. Conclusions

This study aimed to identify factors associated with use of fee-for service advisors, where each study farmer was classified based on their use of these advisors as either 'main source', 'non-main source' or 'non-user', whether they paid directly for advice or not. The study has provided fresh conceptualization of the determinants of farmers' use of fee-for- service advisors, identifying associations between hypothesized determinants of use developed from the theory of planned behavior and inclusive of other advisory sources (i.e. the pluralistic advisory ecosystem). The study has shown that fee-for-service advisors are wellestablished in the advisory and extension system in Australia after gradual withdrawal of direct government investment in agricultural extension over the past 40 years. However, there remains a relatively large proportion of farmers who do not use fee-for-service advisors.

The findings have potential relevance for policy, advisory practice and future research. With privatization policies, the findings can be applied to increase use of fee-for-service advisors, such as through efforts to increase the social acceptance of paying for advice in sub-groups of farmers with lower exposure to and use of advisory services. This could include providing farmers with the opportunity to experience advisory services, or advisors could offer 'fee on success', as in some other professions. Subsidized services could also be considered for nonuser farms in those business stages where the farmer is most likely to see increased need for advice and the importance of better decisions aligns with public policies (for e.g. structural adjustment/farm entry and succession). Helping advisors to better articulate the value of their services in terms that farmers view as important could also help gain support from family and farmer peers. Policies to engage fee-for-service advisors in implementation of industry or government agendas would need to link the value of fee-for-service advice to reducing uncertainty or providing new opportunities and innovation in farming. This presents an avenue through which greater alignment between farm interests, the advisor role and industry or public policies could be established. This is an important contribution in the current policy environment in which the focus appears to be to develop mechanisms for professionalizing and certifying advisory services to enable farmers' use of advisors (EU SCAR, 2019). Our findings indicate that these mechanisms on their own would not necessarily lead to greater use of fee-for-service advice, because use is also based on a number of social and attitudinal factors in addition to perception of quality or the cost of advice.

The service ecosystem perspective applied in the study provided a

relevant conceptualization in examining farmers' use of fee-for-service advice in the context of other sources. The conceptual framework and methodology represent a departure from common advisory system assessments which focus on the coverage of client groups by fee-for-service advisors and with limited attention to farmers' advisory networks and their attitudes to advisory services. Given privatization policies often assume broad acceptance and demand for fee-for-service advice, the methodology used in this study could be applied to better understand the social and attitudinal dimensions of use of fee-for-service advisors in farmers' advisory networks prior to policy implementation, and changes in use over time, as well as applied to the evaluation of pluralistic advisory and extension systems at a national or regional level.

Areas identified for future research include the effect of perceived quality of the advisory services available to the farmer and their perceptions of sources available to them, but not used. Another area is the effects of past use of advice or a particular advisor on current use, along with further investigation of the motivations for advice seeking, such as the range of advantages to farm management. While we identified differences in the proportions of farmers paying for advice between different industries (e.g. cotton, beef, dairy), the key determinants of these differences were not explored, and further research is warranted to understand causes of these different patterns of use of advice by industry. In our study, the cross-sectional study design introduces the possibility of potential determinants being caused by rather than or in addition to, being causes of using fee-for-service advisors. Thus, we recommend longitudinal research to better understand determinants of use of fee-for-service advisors.

#### CRediT authorship contribution statement

**R. Nettle:** Conceptualization, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing original draft, Writing - review & editing. **J.M. Morton:** Conceptualization, Data curation, Formal analysis, Software, Validation, Visualization, Writing - review & editing. **N. McDonald:** Data curation, Formal analysis, Investigation. **M. Suryana:** Investigation. **D. Birch:** Investigation. **K. Nyengo:** Investigation. **M. Mbuli:** Investigation. **M. Ayre:** Investigation, review and editing. **B. King:** Investigation, Writing - review & editing. **J.-A. Paschen:** Investigation, Writing - review & editing. **N. Reichelt:** Investigation, Writing - review & editing.

#### **Declaration of Competing Interest**

None.

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#### Appendix

See Appendix Tables A1-A4.

Themes from focus group discussions coded to TPB constructs for the purpose of questionnaire development.

Focus group theme	TPB Construct
Use of advisors as main source/all sources Farmers used services provided by fee-for-service advisors (e.g. 'consultants', 'agronomists', 'vets', 'animal nutritionists', 'sheep consultants' 'HR consultants'). Other sources noted included: 'agricultural machinery advisors', 'financial services', 'genetics and breeding groups', 'public-service extension', 'my processor', 'the research and development corporation', 'farm input retailers', 'farm benchmarking services', 'Landcare', 'discussion groups', and 'rural financial counsellors'.	Behavior (currently use information, advice or support from an independent (fee-for- service) advisor
Return on investment from advice	Attitude (the farmer's positive or negative evaluation of paying for advice)
Farmers described the return on investment from paying for advice as 'difficult to measure'. Farmers said they asked themselves questions before paying for advice, such as: 'Is that person going to be of value to my business?' 'Is their knowledge going to be useful for my business?'.	<ul> <li>Beneficial</li> <li>Value for money</li> </ul>
Farmers described 'value' from advisors who were well connected to industry, research and other networks and their trustworthiness including: the independence of advice; the reputation of the advisor for having good relationships and a track-record of results and confidence that advisors are 'up to date'. Farmers described having limited time to attend events or sift through relevant	
information, which was a benefit of using an advisor.	
Relevance and usefulness of advice	Behavioral beliefs (beliefs about the likely outcomes and the evaluations of these outcomes)
Farmers described the usefulness and relevance of advice as being related to the tailoring of advice that gave them options and improved the performance of their farm, tailored to their location and farm situation and coordinated with other advice. This was related to a consultant's ability to look at whole farm issues and be 'customer focused' and 'advisors knowing and understanding your business', 'an advisor that listens'; someone who 'fits your style/circumstances', 'challenges their business', 'bring new ideas to the table' and a 'moven track record of helping farmers make better returns'	<ul> <li>Profitable</li> <li>Provide control</li> <li>New opportunities</li> </ul>
Cultural issues impacting who pays for advice	Subjective norms and normative beliefs (the social pressures to perform that behavior
Farmers expressed beliefs that there were 'cultural issues' with regards to paying for private advice amongst their peers and that most farmers (other than themselves) wouldn't pay for advice.	and the extent to which other people who are important to the farmer think they should or should not pay for advice) Key norms:
Farmers described 'testing' the choice of advisor/advice they received against other opinions (of other farmers, other advisors or family members).	<ul> <li>Other farmers pay</li> <li>Other farmers/family members think I should pay</li> </ul>
Access to advisory services Farmers described some situations where gaining access to a quality advisor in their area could be an issue and this was why they belonged to an industry association or were part of a producer group that allowed access and interaction 'with agronomists' at meetings or over the phone.	Perceived behavioral control and control beliefs (the perceived own capability to perform that behavior and beliefs about the presence of factors that may facilitate or impede the behavior) Key control beliefs: - Access to advice
Farmers noted that it was difficult to develop close relationships with advisors.	<ul> <li>It is up to me/I can pay for advice if I want to</li> <li>Financial pressure limits paying for advice</li> </ul>
When advice was needed and the kind of advice needed Farmers described situations where choosing consultants/advisors was not straightforward. This was associated with needing to find an advisor for the 'stage of the business' and having someone who would 'ask the right questions' and be independent.	<ul> <li>Hypothesized determinants of the behavioral beliefs affecting attitudes to paying for advice</li> <li>Farm business stage</li> <li>Demographic features of farmer</li> <li>Importance of business performance</li> </ul>

Estimated total effects of exposure variables that were proposed determinants of behavioral beliefs on use of independent (fee-for-service) advisors by Australian farmers.<sup>a</sup>

Proposed determinant	No.	Use of independent (fee-for-service) advisors			Adjusted odds ratio	95% CI	P <sup>b</sup>
		Not used	Used but not main source	Main source			
Respondent's farm business stage							0.006
Starting out (less than four years on this farm)	63	33% (21)	48% (30)	19% (12)	1.2	0.6-2.3	0.582
Established	384	37% (142)	36% (137)	27% (105)	1.6	1.0 - 2.6	0.032
Expanding/growth	256	28% (72)	34% (86)	38% (98)	2.1 <sup>c</sup>	1.3 - 3.4	0.003
In the process of planned handing on to the next generation	157	27% (43)	36% (56)	37% (58)	2.1	1.3 - 3.5	0.002
Winding down operations (no succession)	95	52% (49)	26% (25)	22% (21)	Reference category		
Pooled	955	34% (327)	35% (334)	31% (294)			
Agreement with the statement 'It is important in farming to focus on	profit'	1001 (000)	2.44 (222)				0.143
1 (completely disagree) to 3	67	43% (29)	34% (23)	22% (15)	Reference category	0 7 1 0	0.000
4  or  5	276	38% (105)	37% (101)	25% (70)	1.1	0.7-1.9	0.669
6 or / (completely agree)	600	31% (188)	35% (208) 25% (222)	34% (204)	1.4	0.9-2.3	0.169
POOLED Formal education of respondent or a member of their husiness	943	34% (322)	35% (332)	31% (289)			0.020
None	412	41% (168)	34% (140)	25% (104)	Reference category		0.030
A vocational (e.g. TAFE) certificate or diploma)	220	33% (72)	34% (75)	33% (73)	1.2	0.9-1.7	0.226
An undergraduate gualification (e.g. from a college/university)	212	24% (51)	36% (77)	40% (84)	1.6	1.2-2.3	0.003
A postgraduate qualification	106	31% (33)	40% (42)	29% (31)	1.2	0.8 - 1.8	0.386
Pooled	950	34% (324)	35% (334)	31% (292)			
Respondent's age (years)							0.597
18 – 29	24	21% (5)	38% (9)	42% (10)	Reference category		
30 – 39	102	24% (24)	39% (40)	37% (38)	0.9	0.4 - 2.1	0.830
40 – 49	203	33% (68)	37% (76)	29% (59)	0.7	0.3 - 1.5	0.350
50 – 59	296	34% (102)	32% (96)	33% (98)	0.7	0.3 - 1.6	0.405
60 – 69	245	37% (90)	36% (87)	28% (68)	0.7	0.3 - 1.5	0.348
70 or older	89	45% (40)	30% (27)	25% (22)	0.6	0.2 - 1.4	0.223
Pooled	959	34% (329)	35% (335)	31% (295)			
Agreement with the statement 'I currently have the skills and knowled	dge requi	ired to manage	the property/farm effectively",	0.000	D.C.		0.725
1 (completely disagree) to 3	34	26% (9)	47% (16)	26% (9)	Reference category	05.00	0.000
4 or 5	152	26% (39)	50% (76)	24% (37)	1.0	0.5-2.0	0.993
Booled	460	30% (83) 38% (121)	43% (120)	20% (73)	0.9	0.4-1./	0.008
Pooled	402	20% (131)	40% (212)	20% (119)			0.060
1 (completely disagree) to 3	36	25% (9)	47% (17)	28% (10)	Reference category		0.900
4 or 5	160	26% (42)	49% (79)	24% (39)	1 0	05-20	0.905
6 or 7 (completely agree)	291	30% (88)	44% (127)	26% (76)	0.9	0.5-1.9	0.814
Pooled	487	29% (139)	46% (223)	26% (125)	019	010 119	01011
Response to 'Over the past five years, please estimate the average and	nual tota	l gross income f	rom your farm operations? <sup>,d</sup>				< 0.001
\$0 to \$100,000	222	49% (108)	36% (81)	15% (33)	Reference category		
\$101,000 to \$500,000	292	39% (113)	37% (109)	24% (70)	1.5	1.0 - 2.1	0.027
\$501,000 to \$1 m	108	24% (26)	37% (40)	39% (42)	2.3	1.5-3.7	< 0.001
More than \$1 m	236	16% (38)	34% (80)	50% (118)	3.1	2.1-4.7	< 0.001
Pooled	858	33% (285)	36% (310)	31% (263)			
							< 0.001
\$0 to \$100,000	132	41% (54)	43% (57)	16% (21)	Reference category		
\$101,000 to \$500,000	162	33% (54)	52% (85)	14% (23)	1.1	0.7 - 1.8	0.575
\$501,000 to \$1 m	54	13% (7)	48% (26)	39% (21)	3.1	1.7-6.0	< 0.001
More than \$1 m	114	14% (16)	39% (44)	47% (54)	3.3	1.9-5.9	< 0.001
Pooled	462	28% (131)	46% (212)	26% (119)			0.001
Agreement with the statement 'Paying for advice to improve my farm	product	ivity would be p	rofitable <sup>rd</sup>	00/ (10)	Defense		<0.001
1 (completely disagree) to 3	128	55% (70)	30% (40) E404 (91)	9% (12) 10% (20)	Reference category	1746	<0.001
4005	149	20% (39)	54% (81) 45% (72)	19% (29) 47% (75)	2.8	1./-4.0	< 0.001
Dooled	10U 427	0% (13) 28% (122)	45% (72) 46% (199)	4/% (/5) 27% (116)	9.2	5.4-15.0	<0.001
1 OOICU	137	2070 (122)	TU 70 (177)	2/ 70 (110)			< 0.001
1 (completely disagree) to 3	124	56% (69)	36% (45)	8% (10)	Reference category		~0.001
4 or 5	154	25% (39)	56% (86)	19% (29)	2.3	12-43	0.014
6 or 7 (completely agree)	167	7% (12)	45% (75)	48% (80)	5.9	2.8-12.6	< 0.001
Pooled	445	27% (120)	46% (206)	27% (119)			
Agreement with the statement 'Paying for advice to improve my farm	product	ivity will provid	e more control in farm decision	s'			< 0.001
1 (completely disagree) to 3	167	50% (83)	39% (65)	11% (19)	Reference category		
4 or 5	146	19% (28)	53% (77)	28% (41)	3.3	2.1-5.3	< 0.001
6 or 7 (completely agree)	116	6% (7)	46% (53)	48% (56)	8.1	4.8-13.8	< 0.001
Pooled	429	28% (118)	45% (195)	27% (116)			
							0.055
1 (completely disagree) to 3	168	48% (80)	42% (70)	11% (18)	Reference category		
4 or 5	155	21% (32)	52% (81)	27% (42)	1.4	0.8 - 2.5	0.229
6 or 7 (completely agree)	122	7% (8)	45% (55)	48% (59)	2.3	1.2-4.4	0.018
Pooled	445	27% (120)	46% (206)	27% (119)			
Agreement with the statement 'My paying for advice to improve my f	arm prod	ductivity will ide	entify new opportunities for my	farm business' <sup>d</sup>			<0.001
1 (completely disagree) to 3	137	47% (65)	39% (53)	14% (19)	Reference category		0.007
4 or 5	169	25% (42)	51% (86)	24% (41)	2.2	1.4-3.4	0.001
o or / (completely agree)	126	7% (9)	50% (63)	43% (54)	5.3	3.1-8.8	< 0.001
						(continued on	next page)

#### Table A2 (continued)

Proposed determinant	No.	Use of independent (fee-for-service) advisors			Adjusted odds ratio	95% CI	$P^{b}$
		Not used	Used but not main source	Main source			
Pooled	432	27% (116)	47% (202)	26% (114)			
							0.673
1 (completely disagree) to 3	138	49% (67)	39% (54)	12% (17)	Reference category		
4 or 5	172	26% (44)	49% (85)	25% (43)	1.2	0.7 - 2.2	0.488
6 or 7 (completely agree)	135	7% (9)	50% (67)	44% (59)	1.3	0.7-2.6	0.382
Pooled	445	27% (120)	46% (206)	27% (119)			

<sup>a</sup> Numbersof respondents shown are after excluding those not asked the question that measured the proposed determinant or any of the minimal adjustment set variables, and those selecting 'don't know' or 'not applicable' or not responding for the question that measured the proposed determinant or any of the minimaladjustment set variables.

<sup>b</sup> Boldedp-values are overall likelihood ratio test p-values for the respective exposurevariables; unbolded p-values are for the specified category relative to thereference category.

<sup>c</sup> Exampleinterpretation: The odds ratio for a response being either 'main source' (ofadvice) or 'used but not main source' rather than 'not used' were assumed to bethe same as the odds ratio for a response being 'main source (of advice)' rather than either 'used' but not main source, or 'not used'. For both, theodds were estimated as being 2.1 times higher if the respondent's farm wasexpanding/growing relative to for respondents that were winding down operationswith no succession. Thus, respondents were more likely to use fee-for-serviceadvisors and for these advisors to be their main source if their farm wasexpanding/growing relative to respondents that were winding down operationswith no succession.

<sup>d</sup> Exposurevariables with two sets of results had two different minimal sufficientadjustment sets; estimated total effects of these exposure variables are shownusing each minimal sufficient adjustment set.

#### Detailed statistical methods and explanations

Statistical analyses used Stata (version 15, StataCorp, College Station, Texas, USA). Associations between the 24 potential determinants (exposure or independent variables) and use of independent [fee-forservice] advisors were assessed using multivariable generalized ordered logistic regression models. Ordered logistic regression models were used rather than other types of regression models because the dependent variable, paying for advice, was ordinal data, having three categories (paid for advice in the last 12 months, intend to pay in the next 12 months, and plan to pay in the next 12 months). Binary logistic regression models are appropriate only for outcome variables with two categories, and as paying for advice was not continuous data, linear regression was inappropriate. The logit link was more appropriate than the log-log and complementary log-log links as cumulative probabilities increased gradually over the ordinal range of paying for advice rather than responses being 'main source' (if this had been the case, the log-log link may have been more appropriate) or most responses being 'not used' (if this had been the case, the complementary log-log link may have been more appropriate).

An iterative process was used that identified the partial proportional odds model that best fitted the data. The proportional odds assumption was assessed for each category of each exposure variable in the model relative to the reference level for that exposure variable at 0.05 significance level. Where the p-value for this test was > 0.05 for a particular level of a particular exposure variable, the proportional odds assumption was considered to be met for that level. Under the proportional odds assumption, the odds ratio for a response being either 'main source (of advice)' or 'used but not main source' rather than 'not used' was assumed to be the same as the odds ratio for a response being 'main source (of advice)' rather than either 'used but not main source' or 'not used'. Where the p-value for this test was  $\leq$  0.05, the proportional odds assumption was violated and, instead, odds ratios were fitted for that level for either 'main source' or 'used but not main source' rather than 'not used', and separately for 'main source' rather than either 'used but not main source' or 'not used'. Each level of each exposure variable was assessed separately. Thus, for an exposure variable with two or more levels to be assessed relative to the reference level, the proportional odds assumption could be assumed to be met for some but not other levels of that variable. Similarly, the proportional odds assumption could be assumed to be met for some exposure variables but not others in the same multivariable model. Overall p-values for each exposure variable were calculated using likelihood ratio tests.

Enterprise was fitted in all models to remove any confounding due to

enterprise. Enterprise categories were cotton production, cropping (grains) or mixed cropping and grazing, dairy cattle, horticulture (fruit), horticulture (vegetables), pork, sheep and/or beef, and sugar cane growing. Farmers whose enterprises were poultry, rice growing or 'other' were excluded from the study as there were insufficient numbers within each and pooling them with other enterprise categories was not appropriate. The number of respondents was not sufficient to provide precise estimates of interactions between exposure variable and enterprise or to allow precise effect estimates separately for each enterprise category.

The effect of each exposure variable on paying for advice was assessed by fitting a separate regression model with the appropriate covariates. Covariates were chosen for each exposure variable based on the directed acyclic graph drawn a priori (see Fig. 1 and Section 4.3).

With directed acyclic graphs, a pathway from an exposure variable to the outcome variable without passing through another exposure variable is considered a direct effect, and a pathway from an exposure variable passing through another ('intervening') exposure variable to the outcome variable is an indirect effect. The total effect of an exposure variable is the sum of a direct pathway and all indirect pathways (Dohoo et al., 2009). Our interest was in estimating the total effect of each exposure variable on paying for advice (the outcome variable). Directed acyclic graphs inform the choice of covariates for regression models when estimating the effect of an exposure variable. Confounders can be identified, including variables that, if included in multivariable regression models, would become confounders through conditional association (Greenland et al., 1999; Shrier and Platt, 2008). If the total effect of an exposure variable is of interest, it is essential that effects of indirect pathways are not removed by fitted intervening variables as covariates.

The minimal sufficient adjustment set for the total effect of an exposure variable on paying for advice was the set of covariates that, based on the directed acyclic graph, removed confounding but did not include intervening variables. The minimal sufficient adjustment sets for the total effects of each exposure variable were identified using specific software (Dagitty, version 2.3; Textor et al., 2011). For some exposure variables, two distinct minimal sufficient adjustment sets were identified. For these, total effects were estimated twice, once with each distinct minimal sufficient adjustment set. For statistical analyses, to avoid unstable models due to sparse combinations of exposure variables and the dependent variable, for exposure variables measured on the Likert scale, we pooled results into three categories: 1–3 (referred to as 'disagreement'), 4 or 5, and 6 or 7 (referred to as 'strong agreement').

Mean numbers of advisory source types used (Table 2) were compared between the three payment groups with linear regression

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Estimated total effects of exposure variables that were proposed normative beliefs on use of independent (fee-for-service) advisors by Australian farmers<sup>a</sup>.

т.	No.	Use of independent (fee-for-service) advisors			Adjusted odds	95% CI	P <sup>b</sup>
		Not used	Used but not main source	Main source	ratio		
Agreement with the statement 'Other farmers do not think that I should pay for advice to improve my productivity in the next 12 months'	_						0.002
1 (completely disagree) to 3	225	19% (43)	48% (107)	33% (75)	Reference catego	ry	
4 or 5	96	31% (30)	49% (47)	20% (19)	0.6	0.4- 0.9	0.026
6 or 7 (completely agree)	64	42% (27)	45% (29)	13% (8)	0.4	0.2- 0.7	0.001
Pooled	385	26% (100)	48% (183)	26% (102)			
Agreement with the statement 'Other decision makers on the property think that I should	pay for	advice to im	prove my productivity	in the next 12 n	ionths'		< 0.001
1 (completely disagree) to 3	470	50% (235)	34% (161)	16% (74)	Reference catego	ry	
4 or 5	192	22% (42)	40% (77)	38% (73)	3.1	2.2- 4.3	< 0.001
6 or 7 (completely agree)	190	6% (11)	33% (62)	62% (117)	9.0	6.2- 13.0	< 0.001
Pooled	852	34% (288)	35% (300)	31% (264)			
Agreement with the statement 'I expect that financial constraints will place high demands	s on me	in the forthco	oming year'				0.596
1 (completely disagree) to 3	301	37% (111)	33% (98)	31% (92)	Reference catego	ry	
4 or 5	235	34% (79)	34% (79)	33% (77)	1.2	0.9- 1.6	0.317
6 or 7 (completely agree)	400	33% (131)	38% (151)	30% (118)	1.1	0.8- 1.4	0.733
Pooled	936	34% (321)	35% (328)	31% (287)			
Agreement with the statement 'With financial constraints placing high demands on me this	; year, po	aying for adv	ice to improve my far	m productivity in	the next 12 months v	vill be very	< 0.001
difficult'							
1 (completely disagree) to 3	434	29%	30% (131)	41%	Reference catego	ry	
		(127)	0001 (000)	(176)			
4 or 5	208	31% (64)	39% (82)	30% (62)	0.8	0.6-	0.133
6 or 7 (completely agree)	289	45%	37% (107)	18% (53)	0.4	0.3-	<0.001
Dooled	021	(129)	3406 (320)	2106		0.6	
loita	551	(320)	5470 (520)	(291)			
Agreement with the statement 'I would receive value for money by paying for advice to it	nprove n	nv farm proc	luctivity'	(2)1)			< 0.001
1 (completely disagree) to 3	147	54%	36% (53)	10% (14)	Reference catego	ry	
4 or 5	166	(80) 23%	54% (90)	23% (38)	2.0	1.1-	0.027
6 or 7 (completely agree)	151	(38) 6% (9)	45% (68)	49% (74)	4.3	3.7 2.1-	< 0.001
Pooled	464	27%	45% (211)	27%		8.8	
		(127)		(126)			
Agreement with the statement 'Paying for advice to improve my farm productivity would	be benej	ficial for me'	,				< 0.001
1 (completely disagree) to 3	283	67%	26% (73)	7% (21)	Reference catego	ry	
		(189)		0.000 (0.00)			
4 or 5	270	32%	44% (118)	24% (66)	2.8	1.9-	< 0.001
6 or 7 (completely agree)	355	(80)	34% (122)	56%	85	4.0 53-	< 0.001
o or / (completely derec)	555	(35)	51/0 (122)	(198)	0.0	13.9	~0.001
Pooled	908	34%	34% (313)	31%			
		(310)		(285)			

<sup>a</sup> Numbers of respondents shown are after excluding those not asked the question that measured the proposed determinant or any of the minimal adjustment set variables, and those selecting 'don't know' or 'not applicable' or not responding for the question that measured the proposed determinant or any of the minimal adjustment set variables. <sup>b</sup> Bolded p-values are overall likelihood ratio test p-values for the respective exposure variables; unbolded p-values are for the specified category relative to the

reference category.

Estimated total effects of exposure variables that were subjective norms on use of independent (fee-for-service) advisors by Australian farmers<sup>a</sup>.

	N	The off index			A diverse d a data martia	050/ 01	<b>p</b> b
	NO.	Use of indep	endent (fee-for-service) advis	ors	Adjusted odds ratio	95% CI	P-
		Not used	Used but not main source	Main source			
Agreement with the statement 'Generally speaking, I want to do wh	at the o	ther decision ma	kers on the property think I sho	uld do'			0.001
1 (completely disagree) to 3	421	39% (163)	36% (151)	25% (107)	Reference category		
4 or 5	293	29% (85)	37% (109)	34% (99)	1.5	1.1 - 2.0	0.006
6 or 7 (completely agree)	155	27% (42)	30% (47)	43% (66)	1.9	1.3 - 2.7	0.001
Pooled	869	33% (290)	35% (307)	31% (272)			
Agreement with the statement 'Generally speaking, I want to do wh	at other	farmers think I	should'		-		0.885
1 (completely disagree) to 3	420	29% (120)	45% (188)	27% (112)	Reference category	0 = 1 4	0 750
4 or 5	54	28% (15)	50% (27)	22% (12)	0.9	0.5-1.6	0.759
Booled	17	29% (5)	53% (9) 46% (224)	18% (3)	0.8	0.3-2.0	0.081
Agreement with the statement 'Most of the farmers whose opinions	I value i	2370 (140)	improve farm productivity eac	2070 (127) h vear'			<0.001
1 (completely disagree) to 3	366	54% (197)	33% (122)	13% (47)	Reference category		20.001
4 or 5	240	27% (65)	41% (98)	32% (77)	2.9	2.1 - 4.0	< 0.001
6 or 7 (completely agree)	241	10% (24)	32% (78)	58% (139)	8.3	5.8-11.9	< 0.001
Pooled	847	34% (286)	35% (298)	31% (263)			
Agreement with the statement 'I feel under social pressure to pay for	or advice	to improve my	productivity <sup>, c</sup>				0.401
1 (completely disagree) to 3	412	26% (109)	46% (191)	27% (112)	Reference category		
4 or 5	43	40% (17)	44% (19)	16% (7)	0.7	0.4 - 1.2	0.203
6 or 7 (completely agree)	18	39% (7)	33% (6)	28% (5)	0.8	0.3-2.0	0.608
Pooled	473	28% (133)	46% (216)	26% (124)			
							0.121
1 (completely disagree) to 3	834	34% (284)	35% (289)	31% (261)	Reference category	0	0 = 0 :
4 or 5	72	32% (23)	39% (28)	29% (21)	0.9	0.5-1.4	0.504
6 or 7 (completely agree)	33	52% (17)	21% (7)	27% (9)	See below		
Pooled	939	35% (324)	35% (324)	31% (291)			
6 or 7 (completely agree)					0.5	0010	0.000
Main source or used but not main source rather than not used					0.5	0.2-1.0	0.063
Agreement with the statement if is mostly up to me whether or not	Inneto	r advica to imp	ous my farm productivity in the	novet 19 months?	1.2	0.5-2.7	0.085
Agreement with the statement it is mostly up to the whether of not 1 (completely disagree) to 3	1 pay jo 114	43% (49)	26% (30)	31% (35)	Reference category		0.269
4 or 5	147	29% (43)	39% (58)	31% (46)	1 4	0.9-2.3	0.134
6 or 7 (completely agree)	686	34% (235)	35% (239)	31% (212)	1.3	0.9-1.9	0.163
Pooled	947	35% (327)	35% (327)	31% (293)			
Agreement with the statement 'If I wanted to. I could pay for advic	e to imp	rove mv farm pi	oductivity in the next 12 month	us <sup>c</sup>			< 0.001
1 (completely disagree) to 3	99	49% (49)	44% (44)	6% (6)	Reference category		
4 or 5	119	29% (35)	52% (62)	18% (22)	2.4	1.4-4.0	0.001
6 or 7 (completely agree)	255	19% (49)	43% (110)	38% (96)	4.1	2.6-6.7	< 0.001
Pooled	473	28% (133)	46% (216)	26% (124)			
							< 0.001
1 (completely disagree) to 3	98	49% (48)	45% (44)	6% (6)	Reference category		
4 or 5	118	31% (36)	52% (61)	18% (21)	2.4	1.4-4.1	0.002
6 or 7 (completely agree)	255	19% (49)	43% (109)	38% (97)	See below		
Pooled	471	28% (133)	45% (214)	26% (124)			
6 or 7 (completely agree)					0.7	00 ( 0	0.001
Main source or used but not main source rather than not used					3.7	2.2-6.2	< 0.001
Main source rather than used but not main source or not used	core nai	d advice to imp	ous my form productivity in the	novet 10 months?	6.5	3.5-12.2	< 0.001
Agreement with the statement 1 am conjugent that I could easily ac	126	1 UUVICE IO IIIIPI 10% (66)	41% (56)	10% (14)	Peference cotegory		<0.001
4 or 5	112	23% (26)	56% (63)	21% (23)	2 7	17_44	<0.001
6 or 7 (completely agree)	229	16% (37)	43% (99)	41% (93)	4.6	29-71	< 0.001
Pooled	477	27% (129)	46% (218)	27% (130)	1.0	2.9 7.1	0.001
Agreement with the statement 'I intend to pay for advice to improve	e my far	m productivity i	n the next 12 months'				<0.001
1 (completely disagree) to 3	389	67% (261)	25% (97)	8% (31)	Reference category		
4 or 5	203	22% (45)	51% (104)	27% (54)	See below		
6 or 7 (completely agree)	348	6% (21)	35% (121)	59% (206)			
Pooled	940	35% (327)	34% (322)	31% (291)			
4 or 5 <sup>d</sup>							
Main source or used but not main source rather than not used					7.0	4.7-10.4	< 0.001
Main source rather than used but not main source or not used					29.6	18.0-48.8	< 0.001
6 or 7 (completely agree) <sup>4</sup>							
Main source or used but not main source rather than not used					3.8	2.4-6.3	< 0.001
Main source rather than used but not main source or not used					16.2	10.4-25.1	< 0.001
Agreement with the statement 'I plan to pay for advice to improve i	ny farm	productivity in	the next 12 months'		-		<0.001
1 (completely disagree) to 3	206	55% (113)	3/% (/b) 6204 (62)	8% (17) 10% (10)	Keierence category		
4 01 0 6 or 7 (completely agree)	175	18% (18)	03% (03) 44% (77)	19% (19)	see below		
Dooled	1/5	270 (4) 2806 (12E)	7470 (77) 4506 (216)	3470 (94) 2706 (120)			
4 or 5 <sup>d</sup>	401	2070 (133)	чJ70 (Δ10)	2170 (130)			
To o Main source or used but not main source rather than not used					63	35-115	<0.001
Main source or used but not main source or not used					46.4	16.4_131.6	< 0.001
6 or 7 (completely agree) <sup>d</sup>					10.1	10.1-131.0	~0.001
Main source or used but not main source rather than not used					2.7	1.3–5.6	0.006
Main source rather than used but not main source or not used					11.0	6.0-20.0	< 0.001

<sup>a</sup> Numbers of respondents shown are after excluding hose not asked the question that measured the proposed determinant or any of the minimal adjustment set variables, and those selecting 'don't know' or 'not applicable' or not responding for the question that measured the proposed determinant or any of the minimal adjustment set variables.

<sup>b</sup> Bolded p-values are overall likelihood ratio test p-values for the respective exposurevariables; unbolded p-values are for the specified category relative to thereference category.

<sup>c</sup> Exposure variables with two sets of results hadtwo different minimal sufficient adjustment sets; estimated total effects of these exposure variables are shown using each minimal sufficient adjustment set.

<sup>d</sup> For 6 or 7 (completely agree) relative to 1 (completely disagree) to 3, theproportional odds assumption was considered not met and so odds ratios wereestimated for either main source or used but not main source rather than notused, and separately for main source rather than either used but not mainsource or not used.

using Stata's -regress- command. Distributions of responses on the Likert scale were compared between these three groups with the Kruskal-Wallis test, and pair-wise comparisons were performed using the Mann-Whitney test.

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