Ministry for Primary Industries
Manatū Ahu Matua

Understanding producers' perspectives on primary industry advisory services in New Zealand: a literature review

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Executive Summary

New Zealand's Ministry for Primary Industries has contracted Manaaki Whenua – Landcare Research to undertake research to gain a better understanding of how producers (farmers, growers and foresters) are using the primary industries advisory services (PIAS) offered to them, and how PIAS could be improved to transition the sector to more sustainable and productive land use.

As part of this project the Ministry requested a review of research published over the last 10 years on producers' views of PIAS, in particular what worked and what did not work, including a focus on whether advice has resulted in changes in behaviour or what might encourage changes in behaviour.

A review has been conducted to collect peer-reviewed international and national research on PIAS and behaviour change. To capture insights not easily accessible through the peer-reviewed literature, we supplemented our work with a scoping workshop, which asked primary industry advisors to share their experiences of engagement with producers, and any research they have undertaken in New Zealand to assess the effectiveness of their advisory services from producers' perspectives.

Our literature review and workshop produced the following findings.

- Relationships and trust are the foundations of PIAS provision.
- New Zealand's PIAS system is optimised for providing advice on production, productivity and efficiency, but less so for the integration of production, regulation and environmental management.
- Producers perceive advice to be relevant if it is production, productivity and efficiency focused.
- Producers perceive advice to be legitimate if they have an established or long-term relationship with an advisor.
- Producers need to be provided with compelling evidence to be confident there is a financial return or benefits to be gained by the practice or system changes they are being encouraged to make.
- Producers perceive advice to be credible if they respect the experience and expertise of the advisor. However, this expertise is recognised by producers as bounded (e.g. veterinarians are highly trusted for their advice on animal welfare, but not genetics).
- Product-based advisors (e.g. fertiliser company representatives) have a high level of access to producers, which influences the relevance and legitimacy of their advice.
- Producers value the advice of peers, but there are sensitivities around this.
- Conventional productivity-based advisory services are insufficient and potentially counter-productive for Māori landowners.
- There are significant gaps in knowledge about the advisory services needs of Māori producers and current capacity within the PIAS system to address these needs.
- Families, spouses in particular, are key decision-makers and should be included in advisory activities.
- There is evidence that advisory services are resulting in producers gaining new knowledge, awareness and motivation. However, these changes do not easily or straightforwardly translate into on-the-ground action.
- Over the past 10 years there is only limited evidence to attribute producer behaviour change directly to advisory services.
- The extent to which advice is perceived by producers to be credible, salient and legitimate is helpful for understanding how producers might engage with different sources and topics of advice.

While there is limited evidence of behaviour change directly attributable to advisory services, there is evidence that advisory services are building awareness, encouraging new motivations, and building knowledge. What might be needed, from producers' perspectives, to translate awareness, motivations and knowledge into on-the-ground action will be examined further in the next stages of our research.

It is important to recognise that not all topics of advice are equal, and that advice provision can result from either:

- endogenous pressures on the internal farm or production system ('pull advisory services')
- exogenous pressures on the farm system, such as imperatives to invest in public goods like biodiversity ('push advisory services').

In other words, different advisory provision approaches are likely to be required depending on whether the advice being provided is perceived by a producer as welcome, no-choice or optional. Again, we will be exploring these ideas in the next stages of our research.

Introduction

The Ministry for Primary Industries (MPI) is planning to invest $5 million over 4 years to enhance the Primary Industries Advisory Services (PIAS) system, with an additional $127 million provided to support the primary sector to transition to more productive and sustainable land use. Building the capability and capacity of the PIAS system is a work stream within the Productive and Sustainable Land Use programme.

MPI is seeking to support the PIAS system to more effectively meet producer and future sector needs in relation to sustainable and productive land use. It has contracted Manaaki Whenua – Landcare Research (MWLR) to undertake research to gain a better understanding of what does and doesn't work within the current PIAS system from the perspective of producers. MPI wants this information in order to identify the barriers to and opportunities for developing a more effective PIAS system in the future.

As part of this research, MPI has requested a review of research published over the last 10 years on producers' views and use of PIAS, including both international and New Zealand research. MPI requested a review to help identify what does and doesn't work from the perspective of producers, including a focus on whether advice has resulted in changes of behaviour or might encourage changes in behaviour.

Insights from this literature review have been used to design the next step of our research, the *Producer Perspectives on Primary Industries Advisory Services Survey*. The literature review and the findings from the survey will inform the third stage of our research, which will use qualitative research methods to gain deeper insights from producers.

Background

Since the 1980s a number of institutional reforms have reconstructed the foundations of New Zealand's PIAS system. Until this time agricultural extension services in New Zealand were publicly funded and administered by the New Zealand Government through the Farm Advisory Division of the Ministry of Agriculture and Fisheries (McEntee 2010). Neo-liberal reforms of the 1980s ceased government funding for advisory services. In 1992 Crown Research Institutes were established to undertake research for the benefit of New Zealand, and they were required to 'promote and facilitate the application of the results of research and technology developments' (Crown Research Institutes Act 2018). Also in the 1990s, responsibility for resource management was delegated to regional councils under the Resource Management Act 1991 (Botha & Coutts 2006; McEntee 2010). These changes have meant that primary industry advice provision now occurs through the private sector, levy-funded organisations, and an increasing number of actors, organisations and institutions seeking to bring about change within the agricultural sector (McEntee 2010; see also Murphy et al. 2012).

Terminology

The advice and information that producers receive and choose to accept, adapt, file for future reference or ignore are the product of an advisory services system that has multiple components (e.g. research, education and extension) (EU SCAR 2012). Importantly, agricultural producers are at the heart of this system.

Advisory services can be understood as the many ways in which research, extension and education are linked to and interact with agricultural producers. In New Zealand, we define advisory services as advice or information provided by and/or available from:

- fee-for-service rural consultants
- accountants, bank managers and insurance providers
- veterinarians
- product-based consultants (e.g. seed and fertiliser company advisors)
- government organisation advisors (e.g. regional councils, MPI, Forestry NZ),
- Māori land advisory organisations
- researchers
- industry and levy body organisations

The advice and information covered by the term 'advisory services' includes (but is not limited to) producer-initiated studies, assessments and reports provided by fee-for-service rural consultants; farm environment plans; fact sheets; best practice guidelines; websites, publications and newsletters; workshops, field days, and conferences; one-on-one discussions with advisors; on-line forums; and industry reports.

Methodology

Advice providers workshop

We began our research by gathering the perspectives of advice providers on what they believe works and doesn't work in terms of behaviour change, based on their engagement with primary producers. Our rationale was that hearing from advice providers at the outset would help us understand the variety of advisory services that producers are encountering and receiving, the methods used by organisations providing advisory services, and the challenges they face in providing advice and information to producers. The scoping workshop also helped us access assessments of producers' views on advisory services that were unlikely to be accessible through the peer-reviewed literature.

We invited representatives of a range of advice provider organisations to attend a workshop on Thursday, 30 January 2020, at the Lincoln Events Centre, Lincoln. A diverse range of advisors attended the workshop, including representatives from local government, industry organisations, banking, veterinarians, horticulturalists, irrigators, and farm foresters (see Appendix 1 for a list of organisations, and Appendix 2 for the workshop agenda). We took the workshop participants through a variety of practical exercises, and data were collected through notetaking of discussions by the research team and participants writing answers to questions on large sticky notes and A1 sheets.

The workshop also provided an opportunity to ask participants if they had assessed the effectiveness of their advisory services with producers, and, if so, whether they were willing to share this information. This request elicited a number of reports, presentations and follow-up telephone conversations, which we summarise in the results and explain in more detail in Appendix 3.

Peer-reviewed literature review

Our peer-reviewed literature review was guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) systematic review guidelines (Liberati et al. 2009). After an initial scoping search of peer-reviewed literature, the article screening criteria were modified and agreed upon between MPI and MWLR. We have specifically excluded literature from developing countries in which the producers are mostly subsistence farmers (e.g. sub-Saharan Africa, southern Asia). In these contexts, advice given to farmers, as well as their perspectives on that advice, will be radically different from the New Zealand context. Accordingly, data have been sourced from developed countries (e.g. USA, Europe, Australia), or from countries with export-led primary industries similar to New Zealand's (e.g. Chile, Ecuador); in other words, countries where we anticipate advisors will be providing similar services to those on offer in New Zealand. The full article screening criteria are detailed in Table 1.

TABLE 1: ARTICLE SCREEN CRITERIA

Included	Excluded
Local and international peer-reviewed journal articles	Not peer-reviewed journal articles
Written in English	Not written in English
Published between 2010 and 2020	Published before 2010
Contains information regarding land-based food and fibre producers' views on advisory services	Contains information regarding aquatic and/or marine food and fibre producers' views on advisory services
Data come from a developed country (e.g. UK, USA, European Union, Australia) or export-led primary producer (e.g. Chile, Argentina)	Data come from a developing country in which most producers are subsistence farmers (e.g. sub-Saharan Africa, southern Asia)

To gather the relevant peer-reviewed papers, we accessed the ISI Web of Science database. Our search strategy (see Table 2) was developed after the initial scoping search was complete. Rather than creating one large search chain that gathered tens of thousands of results, we split the search into a series of different search chains based on different categories of producers, advisory services, and the 'object of analysis', resulting in 3,370 citations. These articles were then screened using the criteria set out in Table 1, ultimately resulting in 52 citations being included in the final codebook.

TABLE 2: SEARCH STRATEGY

Category 1 – Primary producers	Category 2 – Advisory services	Category 3 – Object of analysis
"farmer*", "horticult*", "viticult*", "orchard*", "forest*", "grow*", "arable", "agricult*", "prim* production"	"advi*", "consult*", "knowledge transfer", "extension"	"attitude*", "perception*", "behaviour*"

A codebook (see Table 3) was created, which contains annotations for each variable considered in the analysis.

TABLE 3: CODEBOOK FORMAT

BIBLIOMETRIC INFORMATION		
1	Title	
2	Year published	
3	Authors	Last name, first initial
4	First author's institutional affiliation	A) Academic B) Government or Crown Research Institute C) Consultancy D) NGO (global, regional, national) E) Other
5	Keywords	
6	Provenance	A) New Zealand B) Other nation C) Multi-national
REPORT OR PAPER INFORMATION		
7	Type of land use / sector	E.g. dairy, forestry, arable, viticulture.
8	Producer view on PIAS	
9	What worked / what didn't work?	
10	Evidence of behaviour change?	
11	Attribution of behaviour change to advisory services	
12	Any additional notes	Connections across domains, limitations, significance, etc.

Results

As discussed, we conducted the advice providers scoping workshop and obtained assessments from advice providers on producer perspectives of their advisory services. We also undertook a systematic peer-reviewed literature review. We now present the results from these two strands of work, starting with the advice providers workshop.

Advice providers workshop

From the data collected through our workshop exercises and the reports provided to us by advice providers, we have identified the following themes (see Appendix 3 for more detailed commentary).

New Zealand's PIAS system is optimised for production, productivity and efficiency

Having asked providers what advisory services their organisations provide, it was clear that New Zealand's PIAS system is optimised for production, productivity and efficiency. For many of the advisors at the workshop and their colleagues this was the basis of their training, which has been and remains highly valued by producers.

Advisors need to demonstrate the value of advice to producers

The focus on production, productivity and efficiency was not only about the training of advisors: it was also because advisors believe they need to demonstrate the value of their services to producers. If producers cannot see clear evidence of potential increased yield or profit resulting from the advisory services, they might be reluctant to engage these advisors. We also heard that while top-performing producers see the value of advice, lower-performing producers often do not. Reports from the deer industry (CINTA AgriResearch 2018) and the Red Meat Profit Partnership (RMPP) support these views (Bewsell & Brenton-Rule 2019; UMR Research 2014, 2015, 2016).

Pathways are needed for new recruits to gain experience and build networks

The legacy of extension services provided by the Ministry for Agriculture and Fisheries (MAF), which ended in the 1980s (see 'Background'), means that the current system of private advisors within the PIAS is, in part, still benefiting from the state-run extension services of the past. Importantly, many of these advisors are nearing retirement. The past MAF extension system trained advisors and allowed them to develop a range of different skills. MAF advisors received apprenticeships where they could build up their experience and networks while receiving mentoring from more experienced staff. According to workshop participants, this contrasts starkly with the current system of private firms, where it is time consuming and expensive to train young would-be advisors, especially if they are unable to generate revenue for several years into their training. Reports from the forestry industry support this view and highlight how experience is often valued over education, which raises questions about how new recruits are to gain experience, especially in areas not related to increasing production, productivity and/or efficiency.

We also heard that advisors are overworked, pulled in different directions and unable to devote enough time to critical issues. This has important implications for the advice that producers receive and the relationships advisors are able to build with them. For example, if PIAS advisor is not a viable career path, there is likely to be a high turnover of advisors, which can diminish producer trust.

Relationship building is key to advisory services but is hard to sustain

Advisors believe that building trust and credibility through long-term personal relationships is key to providing advice, but there were concerns the current PIAS system does not support the development of these long-term relationships. Uncertainty around future environmental regulations was raised as having the potential to erode relationships, as well as inconsistent messaging from industries about what regulations might mean in theory and practice, along with quick turnover of staff. The advisors at the workshop argued that the PIAS system needs to focus on building relationships with producers as much as it does on providing advice and information.

Activities that facilitate producer interaction are successful

When asked what works with the current PIAS system, advisors said that working with small groups of people is effective, especially when questions can be raised and answered among a small number of producers. Peer-to-peer learning was also identified as something that is very important for producers, but it was pointed out that peers are not formally recognised as part of the PIAS. The success of producer-interactive activities and evidence they are being utilised within the PIAS comes from reports provided by the deer industry, forest industry, organic wine industry, and the RMPP.

However, there are some caveats to these conclusions from RMPP research. The size of producer groups should not be too large, as bigger groups make participants more reluctant to speak up and share information. Also, while field days are valued and useful, they often involve too many people, which makes asking specific questions difficult and diminishes their value for producers. If a producer is serious about change, the preference is to be sitting down and discussing issues and ideas with someone one-on-one.

Farm visits are important because they allow farmers in a group to put what they are hearing into context, but some farmers can be reluctant to allow people onto their farm, as visitors might be critical of what they see. Hence, peer-to-peer activities need to be developed with sensitivity and in conjunction with producers.

The importance of family

Research conducted by the RMPP identified that an underlying motivation for why top-performing farmers operate the way they do relates to family, legacy, and way of life (Bewsell & Brenton-Rule 2019; UMR Research 2014, 2015, 2016). Furthermore, RMPP's reports, as do those provided by the deer industry (CINTA AgriResearch 2018), highlight the importance of spouses in farm businesses and the multiple roles they play, and recommend that they should also be the recipients of advisory services (if they are not already and are willing to participate).

In relation to this aspect, we contacted the Agri-Women's Development Trust. This trust delivers programmes to empower women in agriculture through training and building skills in how to change mind sets and behaviour, build confidence, overcome resistance, and have influence in their homes, their communities and across the agricultural sector. We also spoke with the Rural Support Trust, which helps primary producers who are struggling with the many issues facing families and communities in the primary sector. They receive phone calls from worried spouses and refer them or producers to advisors, who try to help families to develop new ways of working or to address issues they are facing. While not ordinarily seen as PIAS advisors, these organisations are playing a vital but somewhat unrecognised advisory role in training and supporting producers and families in grappling with change across the agricultural sector.

Independent advice is valued but often not accessible

The RMPP research found that farmers struggle to 'source solid independent expert advice' and often have few alternatives but to rely on sales representatives for technical advice (UMR Research 2016, p. 31):

> *On the one hand, company representatives could be a great source of information especially when there was a long established and trusted relationship. However, a nagging concern remained for many farmers who also understood that the company representative operated under a business model that required them to sell product. (UMR Research 2016, p. 31)*

Māori land issues require unique skills

A Ministry for Agriculture and Forestry report published in 2011 highlighted that much Māori land is under-utilised and under-performing for a range of challenging reasons (e.g. many small blocks, different ownership structures, and underperforming land productivity). These circumstances mean that the advisory needs of Māori will be considerably different from those of non-Māori. In particular, conventional production-based knowledge, skills and training will be insufficient, and potentially counter-productive, for providing advisory services to Māori landowners.

Getting advice on system change can be surprisingly difficult

Case studies that chart the shift from conventional to organic farming provide important insights into the challenges of accessing advice for system change. Reider (2007) found from her producer research participants that it was initially extremely difficult for them to obtain useful and credible information about organic farming. She also highlighted (p. 61) the need for 'stepping stone' systems to help producers take manageable steps in their transition.

A close relationship with researchers was identified as vital in making a large shift, because there are many technical issues to overcome when changing whole systems, or even parts of a system (e.g. pest control for organic pip fruit crops). Reider (2007) raised concerns about input substitution, which can occur if producers remain reliant on conventional production-focused networks rather than finding ways to undertake holistic system change, which requires the creation of new knowledge, skills and networks.

Concerns about moving goalposts makes advice provision challenging

Advisors at our workshop were unsure how to respond to new environmental regulations, especially if they felt the regulations were not going to work. This led to a dilemma: how do we provide advice on something both we and the producers do not feel will reach its desired objectives? There was also a perception among advisors that the environmental goalposts are constantly shifting, making it incredibly difficult to provide credible advice to producers with a confident level of certainty.

Advisors also expressed concern that mixed messages from government, as well as between local and central government, fuel uncertainty. Discussion with a rural consultant after the workshop raised the point that compliance with regulations is far easier and more cost effective for corporate producers compared to family farms, which could have detrimental implications for the success of family farm businesses and the structure of the agricultural sector in New Zealand.

Lack of strategic direction of the PIAS system

Advisors voiced concerns that there is a lack of strategic direction in the PIAS system that makes it somewhat *ad hoc* in terms of where it is headed, areas of specialisation, and how the various components (e.g. research, education and extension) link up. It was argued that without a clear strategy on what is needed and required and where the system should be headed, it will optimise in directions that might not be what is needed; for example, a system focused on production, productivity and efficiency and a lack of knowledge, skills, experience and evidence on how to align productive *and* sustainable land use.

Awareness does not necessarily translate to action

Reports we received show that advertising campaigns and key messages through newsletters, publications, websites, social media, etc. are raising awareness and conveying new knowledge, but are not necessarily leading to practice change. Barriers identified in the kiwifruit industry, for example, include producer concerns of workability, practicality and effectiveness, and the cost of recommended practices. In contrast, the deer industry reports some success in instigating practice change from advisory services (CINTA AgriResearch 2018).

Overall, we found from the workshop and reports provided to us that:

- advice providers are utilising a range of communication channels and engagement strategies to connect with producers
- in some cases advice providers are evaluating the effectiveness of their engagement strategies and advisory services to identify what does and doesn't work from the perspective of producers
- producers are engaging with a wide range of advisory services and consider them useful to varying degrees (e.g. see the deer industry report, CINTA AgriResearch 2018).

Notably, the scoping work identified three broad topics of advice currently provided to New Zealand producers:

- production, productivity and efficiency
- regulation
- environmental management.

As noted, production, productivity and efficiency were the dominant topics of advice provision across providers. According to advisors, producers are willing to pay for this advice if they can be confident it can lead to increases in production, productivity and efficiency, and thus can be demonstrated to be a worthwhile investment. This being the case, advisors are concerned they risk irrelevance and not meeting the needs of producers if their advice is not focused on production-focused topics.

As well as obvious economic viability imperatives, this perception helps explain why New Zealand's PIAS system has been optimised for production, productivity and efficiency. It also explains the production-focused training and careers of many of the advisors that have contributed to the financial success of New Zealand's agricultural sector.

This economic success has come at considerable environmental and cultural cost, however, resulting in resource management regulations changing. Hence, advice has been needed to help producers obtain and retain access to natural resources and navigate complex regulations. While these services are likely to be an investment demonstrable to producers through time saving and the need for specialised expertise, the workshop raised questions about the depth and extent of capability in this area, with similar concerns for environmental management. In terms of the latter, it can be difficult to link the benefits of public goods such as biodiversity to increased production, productivity and efficiency to substantiate the needed cost/benefit calculations that producers understandably require (Eanes et al. 2017; Vanclay 2004).

Overall, the workshop highlighted the importance of building trust and relationships between advisors and producers, and how factors beyond these relationships can have a significant impact on the advice that is given and how it is received.

We now turn to the systematic review of the international and national peer-reviewed literature.

Peer-reviewed literature review

Guided by the PRISMA method of systematic literature review, we collected a total of 52 articles. Figure 1 provides a visualisation of this review process.

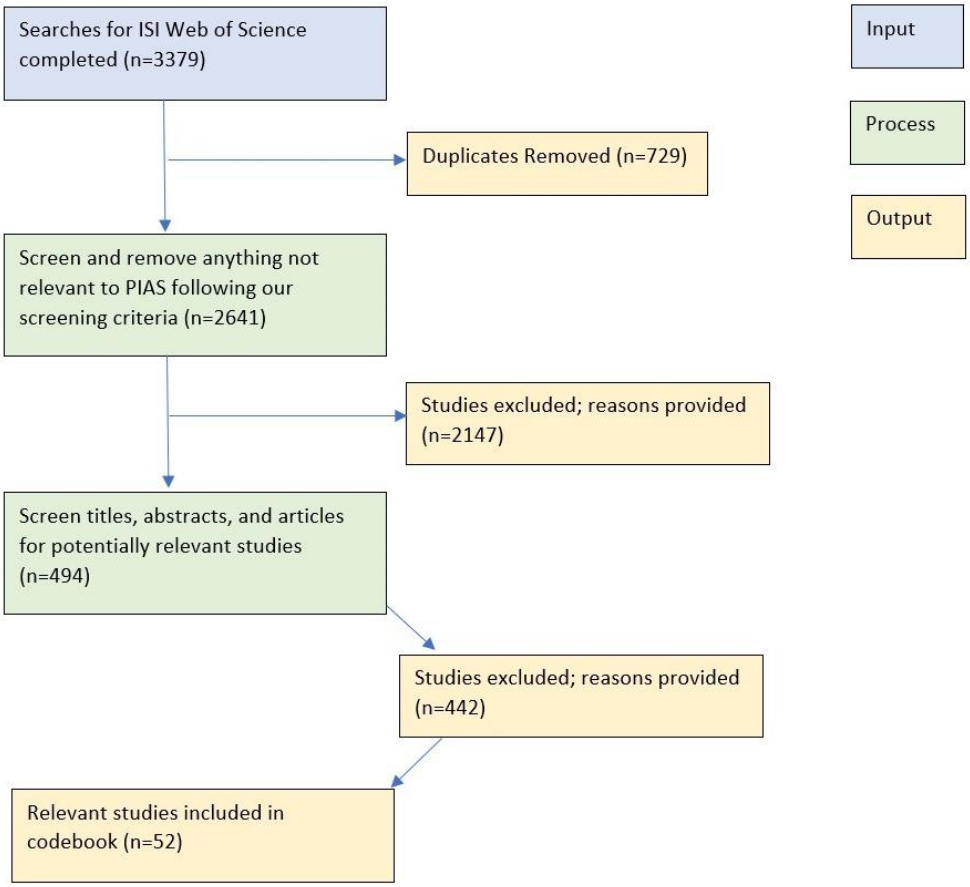

FIGURE 1: VISUALISATION OF THE LITERATURE REVIEW PROCESS

Figure 2 presents the 52 papers by year of publication. The only significant trend is a recent upsurge in papers published in 2019. Perhaps this indicates that the topic of producer attitudes towards advice is now receiving more scholarly attention. It will be interesting if this trend continues in 2020 and beyond.

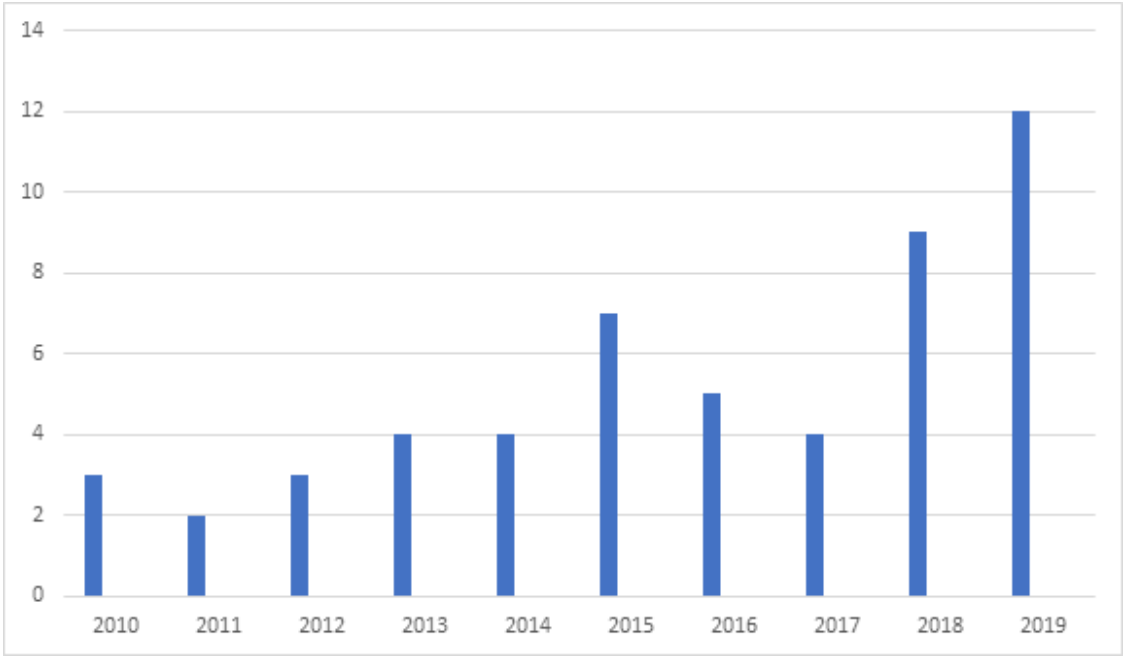

FIGURE 2: PAPERS PUBLISHED PER YEAR

Figure 3 presents the papers by land use/sector. Note that in 21 papers the research was not associated with a particular land use or sector (N/A category). Often such research would be geographically based rather than sector-based; e.g. research that surveys all the local farmers in a geographical location on their attitudes, perceptions, or potential behaviour change as a result of advisory services.

The majority of papers in which farmers were managing cow herds (e.g. dairying, sheep and beef) focused on farmers' use of advice on herd health. The relationship between the dairy farmer and veterinarians was an important component of this research. The other types of land use were evenly spread in terms of papers. The arable farming literature was sourced either from the USA (four papers) or Australia (one paper).

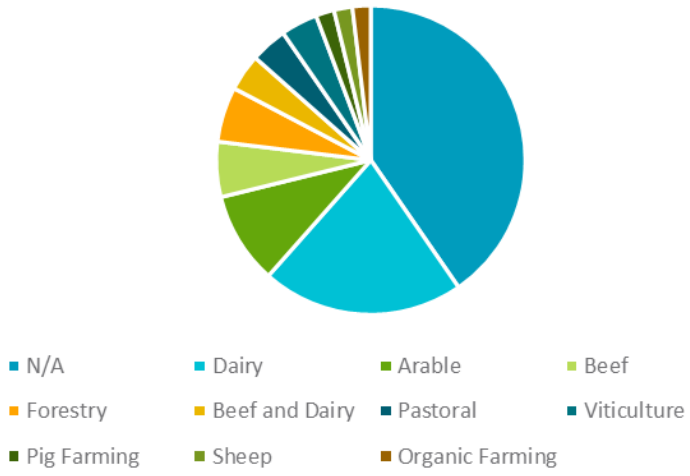

FIGURE 3: PAPERS BY LAND USE / SECTOR

Figure 4 presents the provenance of the 52 selected papers. The UK, the USA, and Australia accounted for just over 50% of all references. The rest were evenly spread, with a focus on European countries, and including one paper from Central America (Ecuador) and one from South America (Chile). The one paper without provenance was a highly relevant literature review on what influences farmer behaviour to improve water quality (Blackstock et al. 2010) (N/A category).

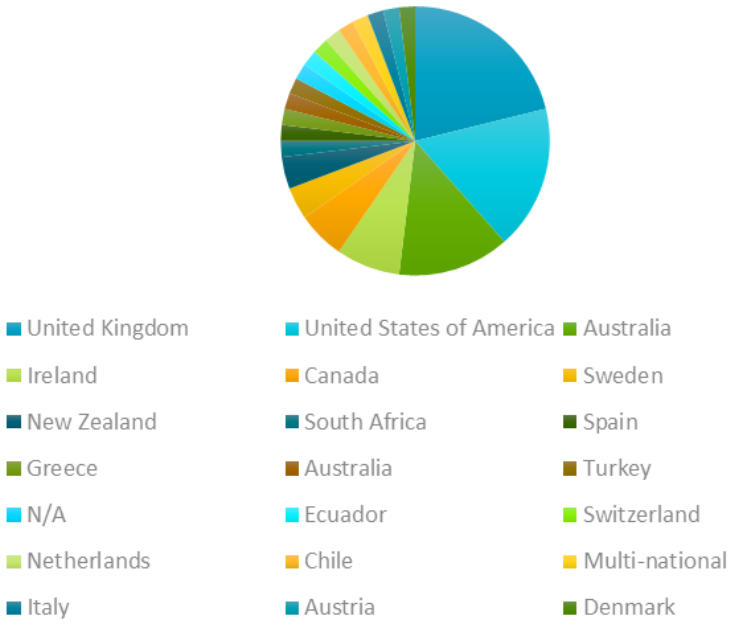

FIGURE 4: PROVENANCE OF RESEARCH

The 52 collected papers highlight a variety of perspectives that producers hold regarding the advice and information they receive. We have organised these producer perspectives in terms of what does and doesn't work into the credibility, salience and legitimacy framework of Cash et al. (2006). We then discuss what the collection of papers tells us about evidence of behaviour change or what might motivate behaviour change.

Credibility, salience and legitimacy

Relationships, trust, and how these are gained and lost is a dominant theme across this collection of literature. It is important to understand what contributes to and diminishes trust in advisors and advisory services. To do so we have used the credibility, salience and legitimacy framework of Cash et al. (2006). In seeking to find ways to better link research and action, Cash et al. (2003, p. 8086; see also Cash et al. 2006) identify multiple knowledge attributes, and note that 'scientific information is likely to be effective in influencing the evolution of social responses to public issues to the extent that the information is perceived by relevant stakeholders to be not only credible, but also salient and legitimate'.

Credibility is about the adequacy of technical evidence and arguments: were defensible methods, concepts and models used and properly employed? Salience is about relevance: does the knowledge answer the right questions, and is it in a form and provided at a time that is useful? Legitimacy is about process: were the right people involved? (See Cash et al. 2003, and also Cash et al. 2006.) This framework is useful for thinking about relationships and the dimensions of trust in advisory services.

Credibility of advice

We found that producers find advice credible if they respect the expertise and experience of advisors (e.g. Blackstock et al. 2010; Sutherland et al. 2013). For example, the advice of veterinarians was found to be highly credible to producers in different surveys (e.g. Jelinski et al. 2015; Ritter et al. 2019). Vets are required to have a high level of education, knowledge and skill in order to practise. Also, their expertise and experience are highly visible to producers whenever they call on vets to help. However, there are limits to this credibility. In one paper (Pothmann et al. 2014), the authors concluded that farmers accept veterinarians as a good source of advice on dairy herd health issues, but lack credibility when offering advice on fertility, feeding, and sire selection, topics that require expertise and experience in breeding and genetics.

Salience of advice

Producers perceive advice to be salient if it is productivity and/or efficiency-focused. For example, papers argued that producers deem advice relevant to their operations if, by following and implementing this advice, they would receive positive financial returns or other benefits (Alarcon et al. 2014; Aydogdu 2017). This conclusion supports the finding from our workshop that advisors felt they needed to be able to demonstrate the value of advisory services and practice change in terms of improvements in production, yield, efficiency or productivity. This imperative for advisors to demonstrate the value of their advice in production-related terms appears to be creating barriers for advisors in also demonstrating the value of advice related public goods such as ecosystem services.

Given that all producers and agricultural production systems are different, advice that works well for one producer might not work well for another, and advice providers need to recognise this. Indeed, Mills et al. (2019) suggest that advisors need to adapt and target measures to specific producers, particularly with regard to different combinations of producer willingness, ability and engagement.

It was also found that when joining agri-environmental schemes, perceptions of too much paperwork and prescriptive limits under a scheme that restricted what producers could do with their land reduced their likelihood of joining a scheme (Schroeder et al. 2015). Hence, understanding what is relevant and important for producers before programmes are put in place is important for avoiding issues such as these and encouraging participation rather than discouraging it.

How advice is framed and conveyed is a factor in its relevance to producers and is also critical to encouraging behaviour change. In some cases, advisors have found more success in achieving behaviour change through communicating messages of moral responsibility and social identity rather than environmental and economic costs (Hogan & Berry 2011).

Legitimacy of advice

Producers perceive advice to be legitimate if they have established an existing relationship with an advisor. Advisors such as fertiliser company representatives, nutritionists, crop consultants, seed suppliers, university extension services, and veterinarians were identified as trustworthy sources because they had established relationships with producers and their systems over time (Russell and Bewley 2013; Houser et al. 2019; Kuehne et al. 2019; Stuart et al. 2018. These long-term relationships build social capital between the advisors and the producers (Fisher 2013).

Notably, it was recognised by Houser et al. (2019) that crop consultants, fertiliser company representatives and seed suppliers have a high level of access to producers because they are involved in productivity and/or efficiency-focused advisory services, whereas those involved in, for example, environmental management advisory services did not have the same level of access or ability to build relationships with producers. On this basis, legitimacy can be linked to access.

A trend in the literature was that producers have positive perceptions of advisory groups that comprise producers themselves. Examples included:

- grower groups (Anil et al. 2015)
- grower-to-grower networks (Crawford et al. 2015)
- farmer-informed crop models (Lacy 2011)
- use of Twitter as a mode of farmer-to-farmer communication (Mills et al. 2019).

In some papers it was concluded that advisors were perceived as being more legitimate by producers if they work in the private sector rather than the public sector (Andreopoulou et al. 2014; Brennan et

al. 2016; Alvarez-Coque et al. 2018). In two papers, private sector advice was perceived as more legitimate due to distrust in government services (Andreopoulou et al. 2014; Brennan et al. 2016).

Looking beyond credibility, salience and legitimacy, the collection of papers indicated that financial incentives encouraged producers who had not previously used extension services to engage with them (Läpple and Hennessy 2015). However, this advice was designed to improve production. More evidence is needed before it can be claimed that financial incentives also encourage producers to adopt advice designed to protect public goods, such as local biodiversity, which producers are likely to argue provides no private benefit to them.

A New Zealand study highlights the importance of thinking about topics of advice as well as sources of advice. Hilkens et al. (2018) single out financial management as an advisory service that requires special attention and modes of interaction because it is a sensitive and taboo topic among the producers they studied. These authors found that being a good financial manager was 'not central to farmers' identity' compared to managing production (Hilkens et al. 2018, p. 83). Hence, encouraging producers to seek advice and providing advice to them is likely to require special skills, and would at the very least require one-on-one interactions. Hence, while group-based activities will be unlikely to grapple with an individual's circumstances and needs, they could highlight the importance of financial management, help recast the production identity to include financial management, and provide some generic skills and tools.

Is there evidence of behaviour change?

Two articles in the collection show clear evidence of behaviour change due to advice. Rasamoelina et al.'s (2016) paper on extension education in the adoption of sustainable forest management practices showed how participation in educational programmes relates to higher levels of adoption for all forest management practices. The paper 'clearly associated the adoption of a variety of sustainable forest management practices to participation in forestry extension programmes' and concluded 'there are significant relationships between adoption and participation in educational programs' (Rasamoelina et al. 2016, p. 415).

In Upton et al. 2019, a survey was conducted on how extension services affect the management decisions of new forest owners in Ireland. The survey was conducted before and after a forest thinning demonstration, and the follow-up survey confirmed that the majority of participants went on to install inspection paths in their forest following the demonstration, a key practice that facilitates future thinning. A significant number had also thinned their forest or were planning to thin in the immediate future. Notably, this was a hands-on mode of advice provision that clearly had an impact.

Beyond these two papers we found limited evidence of producer behaviour change directly attributable to advisory services in the collected papers over the past 10 years. This could be attributed to methodological difficulties in attributing behaviour change to advice. For example, Hill et al. (2017) used two different methods to assess knowledge transfer among farmers in Wales, and they discovered that the different methods presented different results when assessing on-the-ground adoption. It was found that farmers were likely to self-report that their practices had changed due to advice, but methods of analysis that go beyond farmer self-reporting illustrated that practices had not changed much at all. It can also be difficult to causally link advice to behaviour change given the variety of other variables that affect decision-making by producers.

Although there was limited direct evidence of behaviour change, there was evidence that producers gain awareness, new knowledge or motivations from receiving advice. For example, Gabel et al. (2018) found evidence that those who received advice on biodiversity were more receptive to protecting biodiversity. In Marquez-Garcia et al. (2018) the researchers measured knowledge change as a result of advice, and similarly Mills et al. (2019) found evidence of learning but not necessarily behaviour change from advice.

Discussion

Our advice providers workshop highlighted how New Zealand's PIAS system is optimised for production, productivity and efficiency. This foundation of the PIAS system has contributed to the considerable success of New Zealand's agricultural sector over many decades and its major contribution to New Zealand's economy, society and way of life. However, as we now know, and

increasingly accept, the bounty from intensive agriculture has come at considerable environmental and cultural costs. It is now recognised that change is needed, but the question is how?

Building a better PIAS system is key to responding to this very big question, in particular, understanding how producers use the PIAS system, what works and what doesn't work from their perspective, what advisory service provision is likely to lead to behaviour change, and what is needed into the future. Producers are undoubtedly integral to finding ways to recast New Zealand's agricultural sector towards not only productive land use but also sustainable land use that together can deliver outcomes across all pillars of sustainability (i.e. social, economic, cultural and environmental). It appears that New Zealand's PIAS system is not yet fully geared up for this much wider and more complicated remit. Understanding producers' perspectives on PIAS and finding out what they need in the future is crucial, and is the goal of this research.

From our literature review and workshop we have identified the following findings.

- Relationships and trust are the foundations of PIAS provision.
- New Zealand's PIAS system is optimised for providing advice on production, productivity and efficiency, but less so for in the integration of production, regulation and environmental management.
- Producers perceive advice to be relevant if it is production, productivity and efficiency focused.
- Producers perceive advice to be legitimate if they have an established or long-term relationship with an advisor.
- Producers need to be provided with compelling evidence to be confident there is a financial return or benefits to be gained by the practice or system changes they are being encouraged to make.
- Producers perceive advice to be credible if they respect the experience and expertise of the advisor. However, this expertise is recognised by producers as bounded (e.g. veterinarians are highly trusted for their advice on animal welfare, but not genetics).
- Product-based advisors (e.g. fertiliser company representatives) have a high level of access to producers, which influences the relevance and legitimacy of their advice.
- Producers value the advice of peers, but there are sensitivities around this.
- Conventional production-based advisory services are insufficient and potentially counter-productive for Māori landowners.
- There are significant gaps in knowledge about the advisory services needs of Māori producers and current capacity within the PIAS system to address these needs. Families, spouses in particular, are key decision-makers and should be included in advisory activities.
- There is evidence that advisory services are resulting in producers gaining new knowledge, awareness and motivation. However, these changes do not easily or straightforwardly translate into on-the-ground action.
- Over the past 10 years there is only limited evidence to attribute producer behaviour change directly to advisory services.
- The extent to which advice is perceived by producers to be credible, salient and legitimate is helpful for understanding how producers might engage with different sources and topics of advice.

The above findings are preliminary and we will be examining them further through the next stages of this research project. Specifically, the two strands of work have helped in the development and design of a survey aimed at primary producers, which will be the next phase of our project. Inspired by the themes of the literature review and the workshop, the survey will ask producers:

- what topics they have sought advisory services on,
- from whom they have sought advice (e.g. fee-for-service rural consultants; accountants, bank managers and insurance providers; vets; product-based consultants, government organisation advisors, Māori land advisory organisations, researchers, family and other producers)
- how satisfied they are with the quality of advice
- whether they pay for advice
- who they trust in terms of advice providers
- how important experience is in an advice provider
- how important established relationships are with advice providers
- what advice they believe they need to operate into the future.

We will also be exploring these and other issues through the third qualitative phase of the research.

The success of advisory services, both in New Zealand and internationally, has been shown to be predominantly in terms of raising the awareness of individual producers and building their motivations

and knowledge base. These are indispensable activities, but this finding raises important questions about what might account for the lack of evidence of behaviour change from advisory services in the literature we reviewed. Is there a lack of behaviour change or a lack of evidence?

Arguably it is a matter of both. As discussed, the lack of evidence of behaviour change could be attributed to methodological difficulties in attributing behaviour change to advice and who makes the call on what is and is not behaviour change, which can be conceived quite differently for policymakers compared to producers: the first step of transformation is likely to be experiential and thus invisible, and everyone's first step will be different (Duncan et al. 2018). It can also be difficult to causally link advice to behaviour change given the variety of other variables that affect decision-making by producers (Knook et al. 2020).

A lack of behaviour change can also be attributed to the topics of advice. For example, an issue that dominates the advisory services literature is producer involvement (or not) in, and attitudes towards, agri-environmental schemes in Europe, the United Kingdom and the USA (e.g. Doudna et al. 2015; Gabel et al. 2018; Mills et al. 2019 Schroeder et al. 2015). These schemes seek to resolve the tension between 'private goods' and 'public goods' (Eanes et al. 2017) and reward producers for society's expectation that they should provide both. Instigating behaviour change and providing advisory services can be difficult when what is being asked and encouraged is perceived to be a burden, a cost, a lack of reward or someone else's problem. Under these circumstances, it is not surprising that a considerable amount of effort has gone into seeking to understand the attitudes and motivations of producers in the quest to change the behaviour of producers on this challenging issue.

This tension highlights the importance of differentiating the topics of advice. For example, is advice being provided on production, on response to regulation, or on improving environmental management? We also need to recognise that producers experience endogenous pressures on the internal farm system, which encourage them to pull advisory services in when needed ('pull advisory services'), while also experiencing exogenous pressures on their farm system, in which external actors encourage them to seek out advisory services ('push advisory services'). Of course, whether the advice from either direction translates to behaviour change depends on a range of factors (e.g. compelling evidence, appropriate timing, trust in the advisor and the advice). The reality is that advice on these topics is not equal.

In New Zealand, exogenous pressures on producers have been growing. These pressures relate to food safety, staff management, financial management, biosecurity, climate change, environmental regulations, and ecological performance. Hence, for some time, advice providers have been offering advisory services to producers not only to help with production, productivity and efficiency, but also to address these exogenous pressures, usually through communication strategies and surveys to understand attitudes and motivations on the basis that better targeted messages are more likely to get through. This is evident in the reports provided to us through the advice providers workshop.

However, as stated above, all topics are not equal. Arguably, advice related to production, productivity or efficiency can be classed as welcome advice. Advice to address changing regulations to gain or sustain access to natural resources for production, in particular, could be classed as no-choice advice. Advice to invest time and resources in, for example, biodiversity or biosecurity could be classed as optional advice (Table 4). Notably, changes in environmental and biosecurity policy regulations, for example, are shifting optional advice into the no-choice zone.

TABLE 4: CATEGORIES OF ADVICE AND ADVICE PROVISION

What sort of advice, goods and advisory service?	Relates to what topic?	What facilitates advice provision?
Welcome advice Private goods A pull advisory service	Production, productivity and/or efficiency	• Long-term relationship • Expertise and experience of advisors • Access to producers (e.g. through product supply) enables relationship development and knowledge of a producer's agricultural system • A body of research from which to draw strong evidence of return on investment and/or benefits

No-choice advice Making public goods private goods A pull advisory service	Regulations, consents	• Expertise and experience • Understanding a producer's agricultural system, business circumstances and context
Optional advice Public goods A push advisory service	Ecosystem services, biosecurity	**Current approaches to advice provision** • Communication strategies to raise awareness • Measuring attitudes and motivations • Methods often distant from producer • Costs highly visible but not benefits

Expectations for PIAS to encourage the production of public goods (e.g. ecosystem services and biosecurity) raise important questions about how optional advice is to be provided and what the prospects are for advisory services instigating behaviour change for sustainable as well as productive land use given that the current approaches are dominated by communication strategies and measuring attitudes and motivations.

Southerton et al. (2011) maintain that initiatives focused on individuals will be limited in their effectiveness if they do not take a multiple-contexts approach (i.e. seek to intervene in individual, social and material practices). The individual context refers to initiatives that focus on influencing the attitudes and preferences of individual consumers. Going beyond the individual, the social context refers to social norms, cultural conventions, habits and shared understandings of practices. The material context refers to objects, technologies and infrastructures. The social and material contexts both enable and constrain what individuals do, why they do what they do, and how they do it. Therefore, Southerton et al. (2011) argue, these contexts are important to consider in seeking to foster changes in behaviour. These, too, are issues we will explore in the next stages of our research.

Conclusions

This literature review presents an overview of the last 10 years of research internationally and nationally on primary industries advisory services and behaviour change. We have supplemented the systematic peer-reviewed literature review with insights from primary industry advice providers in New Zealand and their assessments of producers' perspectives on PIAS.

New Zealand's current PIAS system is well suited to providing advice to producers that delivers private benefits, such as increased productivity, efficiency and profit. These productivity and/or efficiency-focused advisory services are being used widely by producers, with many producers paying for these services. However, this is no longer sufficient.

The review has highlighted a range of criteria that producers use to choose providers of advisory services (e.g. compelling evidence, long-term relationships, expertise and experience), but we have seen that the most popular topic is production. As imperatives for sustainable as well as productive land use are increasingly recognised, it will be important to understand what criteria producers might use for PIAS across a broader range of other topics, and who they will be looking to for the help they need. The next stages in our research will examine these issues.

We now turn to recommendations we have drawn from our literature review for MPI to consider as we proceed with the next stages of our research.

Recommendations

1 View the PIAS system in terms of relationships rather than technology or knowledge transfer.
2 Examine the implications for producers of New Zealand's PIAS system being optimised for advice on production, productivity and efficiency (e.g. a lack of capacity for the integration of production, regulation and environmental management).
3 Consider what bodies of evidence exist, beyond production, productivity and efficiency, for providing compelling evidence to producers so that they can be confident there is a financial return or benefits to be gained by practice or system changes they are being encouraged to make. The evidence base influences the credibility and relevance of advice.

4 Identify opportunities to illustrate to producers the multiple benefits of productive *and* sustainable land use and what that looks like in different settings so that performance in terms of productivity, environmental management and well-being are seen as mutually reinforcing attributes of a primary sector business rather than mutually exclusive.
5 Provide pathways and support for new or retraining PIAS advisors to gain the experience, expertise and networks required to build credibility and legitimacy with producers.
6 Given that producers value the advice of peers, find ways to capitalise on this but recognise the identified sensitivities to this approach.
7 Develop new ways of supporting Māori landowners, in recognition of the fact that conventional productivity and/or efficiency-based advisory services are insufficient and potentially counter-productive for Māori producers.
8 Address the significant gaps in knowledge in regard to how Māori producers use advisory services, what their unique needs are in terms of advisory services, how these differ from non-Māori producers and the implications of these differences for current advice provision capacity and pathways to build Māori advisor capability.
9 Given that families, in particular spouses, are key decision-makers, seek to include them in advisory activities.
10 Shape New Zealand's PIAS system with the knowledge that a 'one-size-fits-all' approach to advice will not be as effective as advice tailored to a specific context and farm system.
11 Recognise there is tension for producers between private and public goods, and they are often receiving messages from different actors and organisations to achieve both. Developing incentives and schemes that encourage producers to create both private and public goods on their land could be beneficial, although doing so would require much further investigation.

Given that knowledge, awareness and motivation do not easily or straightforwardly translate into action on the ground, we will explore with producers in the next stages of our research how actions across the individual, social and material contexts (Southerton et al. 2011) can make a difference. In recognising the 'push'/'pull' dynamics of advice and that not all advice is equal from a producer's perspective (e.g. welcome, no-choice and optional), we will also examine what this means for how producers engage with different sources and topics of advice, which we expect will provide further insights into how credibility, salience and legitimacy need to be balanced from producers' perspectives.

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Appendix 1 –List of participating organisations in workshop

Amuri Irrigation / Environmental Managers Group

Bragato Research Institute

Dairy Development Consulting

Dairy NZ

Deer NZ

Environment Canterbury

Farmers Mutual Group

Federated Farmers

Fonterra

Forest Growers Research / Forest Owners Association

Foundation for Arable Research

Geosocial Technologies

Irrigo Centre Limited / Environmental Managers Group

Kiwi Vine Health

NZ Farm Forestry Association

Red Meat Profit Partnership

Water Strategies

Appendix 2 – Workshop agenda

Primary Industries Advisory Services System Advice Providers

Thursday, 30 January 2020 (10 am – 4 pm)

Baylis Room, Lincoln Events Centre, 15 Meijer Drive, Lincoln

9.30–10.00 am	• Tea and coffee available
10.00 am **Workshop start**	• Introduction to research project and workshop • Participant introductions • Q&A • Social ethics consent
10.30 am **Kick-off question**	How does the call for *a transformation to more sustainable production systems* change what's required of the primary industries advisory services system?
11.00 am	*Morning tea (15 mins)*
11.15 am – 12.30 pm **What works?**	• What sorts of advice do you or your organisation provide to producers (i.e. farmers, growers, foresters)? • What are you trying to achieve with your advice and how do you know you've done it? • What have you found works well and why?
12.30 pm	*Lunch (30 mins)*
1.00 pm – 2.30 pm **What doesn't work so well**	• What doesn't work in providing advice to producers and why? • What assumptions do you and/or others make about producers and the contexts they are operating within when advice is designed and given?
2.30 – 2.45 pm	*Afternoon Tea (15 mins)*
2.45 – 3.30 pm **What could be done better?**	What's needed from the PIAS system to help producers transition to more sustainable and productive systems?
3.30 – 4.00 pm	Wrap up • Discussion of insights arising from the day and lingering questions • Evaluation

Appendix 3 – Commentary on advice provider reports

Rural consultants

Rural consultants provided a number of responses when we asked them what worked and what did not in terms of the advice they give. One rural consultancy said that working in partnership with producers works well for them. This same consultancy also indicated that farmers often lack business and financial expertise.

Another consultancy reported they were not involved in traditional productivity and/or efficiency-focused agricultural extension but usually worked as part of a larger team assembled by farm businesses. They provided resource management and regulatory advice, which was a specialised area and required practitioners to keep up to date in the constantly changing policy environment. An ethic of collaboration between advice providers working for one client was raised as crucial, but it was conceded that this was not always put into practice as some firms wanted to protect their own interests.

It was felt that top-performing producers see the value of advisory services but lower-performing producers often do not. Hence, demonstrating the value of advisory services for a significant portion of the sector was a challenge. It was also mentioned that managing compliance with regulations is far easier and more cost effective at the corporate scale compared to that of the individual farm, highlighting that in some cases there are financial constraints that limit producers' ability to seek advice.

This representative saw advisors as connectors, but maintained they need help linking up with research and researchers. For example, it is not clear how advisors might contact researchers, who they should contact, or how they might interact. Nor was it clear what expertise might be available to answer questions advice providers might have, but these questions were important in the context of complex environmental policy and regulation changes. It was also raised that there is a lack of connection between advisors, who see what is occurring on-the-ground, and policy makers.

Another consultancy indicated it had conducted a survey to see whether clients were aware of several campaigns it had instigated. The results showed that awareness of the campaigns was high. However, when asked if clients had made recommended changes in response, the survey showed that the campaigns had not had a significant impact on taking action.

Kiwifruit industry

Kiwifruit Vine Health (KVH) also responded to our email. It has conducted surveys of growers in 2017 and 2018. The 2018 survey focused on the effectiveness of their communication to growers (e.g. website, bulletins, emails, meetings). The survey results show growers are generally happy with the communications they received and that they visit the KVH website primarily for advice, news, and weather tools.

KVH's 2017 survey asked questions about biosecurity practices. The results show that there are challenges for the industry regarding the implementation of biosecurity practices; for example, the time it takes to keep equipment clean and concerns about the effectiveness of recommendations. The survey highlighted that growers and staff can be reluctant to undertake particular practices if they perceive them to be impractical, are a waste of time, cost money, or are seen as ineffective. Survey participants wanted a consistent message about what is needed, what is important, and what are essential best practices.

We were also provided with a 2016 study (Dyck 2016, p. 24), which found that growers were overwhelmed by an 'oversaturation of information'. Growers were receiving communications from Zespri, Horticulture NZ, NZ Kiwifruit Growers Inc, Kiwifruit Vine Health and post-harvest companies, as well as organisations trying to sell them products and service. This meant information was getting binned or deleted. As was found in the KVH 2017 survey, growers were concerned about the workability of some recommended practices. If these practices were perceived to be excessive, ineffective or cost money, it was clear they would not be kept up.

It was concluded that explaining the 'why' was very important. Furthermore, risks needed to be explained in easy-to-understand terms and in ways growers can easily relate to (e.g. the impacts of productivity and value on trade, with images to visually illustrate the impacts). Communication of key

messages, ways to facilitate implementation, as well as support beyond implementation to ensure that practices are maintained were recommended by this study.

Deer industry

We were also provided with a 2018 New Zealand deer industry report (which compared results with its 2011 survey) (CINTA AgriResearch 2018). This report assessed the effectiveness of the industry's communication channels. Deer industry publications were by far the most popular way that farmers keep their farming knowledge and skills up to date, with acknowledgment of their importance increasing from 66% in 2011 to 91% in 2017. Information sharing with 'like-minded farmers' was also a favoured source of knowledge for many farmers (although more likely with South Island than North Island farmers).

Professional advice and trial results were found to be strong influences on practice change. It was also found that deer finishers, who adopt more innovative practices, were likely to be younger farmers (i.e. 50 and under) with larger herds and higher incomes (CINTA AgriResearch 2018, p. 13).

Overall, the survey found that increasing productivity and profit were the main motivations for making significant changes to deer farming practices or adopting new technologies. Importantly, the viability and workability of changes needed to be demonstrated. Financial constraints were the main barrier to not making significant changes as well as lack of evidence or assurance of the benefits of a change.

Veterinary recommendations and assurances were found to have the highest level of influence when making a change on-farm or adopting a new technology. Field day trial results, listening to and observing what other members do, listening to and observing neighbours and producers you know, as well as industry leader recommendations and testimonials were all found to be influential. Notably, farm consultant recommendation/assurance was recorded as quite low, but it is unclear if this was a paid-for-service consultant, a product-based rural consultant, or a government-based consultant.

The report differentiates two categories of deer farmers. First, there are those who want to 'develop and grow'. These tend to be young farmers (50 years and younger) who have larger herds, higher incomes and plans to expand their operation in the next 5 years. The report explains that these farmers have more at stake in terms of time and money invested, and so they are looking to be competitive while increasing productivity and profitability.

The other group are those that are 'happy with the status quo'. These farmers tend to be older, with smaller herds, lower incomes and plans to downsize. They are less likely to look to employ new practices or technologies. For farmers in this category that do want to make changes, they, too, need evidence of success in a practice or technology so they can be confident changes will work. They also seek experienced professional advice. According to the survey, 'these deer farmers cannot afford to waste time, effort and resources in strategies that prove to be ineffective or inefficient in the long term' (CINTA AgriResearch 2018, p. 56).

Forestry

Information from the Farm Forestry Association was provided. It indicated that farmer forestry discussion groups, which were established decades previously, still demonstrate value and utility today. It was considered that advisory services of 1970s and 1980s were very useful in developing farm forestry, and the question was posed, 'Could these services be recreated?' In other words, can current graduates give credible and properly informed advice on the wise integration of trees onto farmland? It was suggested that the answer is no, given that interest and experience are keys to success rather than tertiary education.

We were also provided with information from Forest Growers Research Ltd. As with other sectors, information is provided to foresters through field days, websites, social media, technical reports repository, newsletters and email updates and videos. It was noted that while there are many channels for communication, attention spans are getting shorter and digital overload is a danger. Conferences, poster sessions, field trips and operational demonstrations continue to occur, as well as processes created to better link industry input with research priorities. Research and industry recognise achievements within the industry with awards.

The conclusions were that:

- there are many channels through which to communicate research to stakeholders
- key messages need to be repeated frequently

- industry likes hearing from peers on research uptake and innovations
- more onsite field demonstrations are needed
- video clips/YouTube are useful for conveying information
- having an active presence on social media is important.

The challenges of communicating research to stakeholders are important to acknowledge. This is because there are an estimated 14,000 forest owners, with the largest having over 250,000 hectares and the smallest less than 5 hectares. The forests are geographically dispersed across New Zealand. It was explained that interests vary depending on the nature of the owner, forest size, forest age and modes of management. This means the appetite for change and risk vary, as does the capacity of forest owners to utilise research. Management structures for forestry programmes play a key role in communicating research and include steering groups, technical committees and cluster groups.

Sheep and beef sector: Red Meat Profit Partnership

The Red Meat Profit Partnership (RMPP) was established in 2013. Funded by government and industry, it was created to help the pastoral red meat livestock sector increase productivity and profitability, and to work with farmers and sector businesses to 'develop, test and put new ideas, technology solutions and new ways of working into action behind farm gates and between farms and red meat processors' (Bewsell and Brenton-Rule 2019). A considerable amount of social and evaluative research has been commissioned by the RMPP in the creation of its national extension and action network, and a number of these reports can be accessed here: https://www.rmpp.co.nz/page/our-research/ We cannot summarise this expansive body of research but will draw attention to some key ideas that link with research in other primary industries.

It was found that there are multiple drivers that contribute to the success of top performers. An underlying motivation for why these farmers operate the way they do relates to family and the farming way of life, which is valued so highly. This key conclusion has implications for how advisory services in the sheep and beef sector are conceived and delivered:

> *[I]f the industry is to credibly engage with farmers to try new practices and improve their on-farm practices, it is critical this engagement is couched in a much broader set of values. These values include the centrality of family, legacy and the 'way of life' that is unique to sheep and beef farming. (Elliott & Wakelin 2016, p. 28)*

Elliott & Wakelin maintain that the difference between top- and low- performing farmers is their ability to execute, which means support is needed 'behind the farm gate' (p. 28).

Several reports highlight the significant role of spouses in farm businesses, who were found to contribute in multiple ways, such as on-farm work, managing accounts and stock-related activity (Bewsell & Brenton-Rule 2019; UMR Research 2014, 2015). These findings highlight the limitations of the stereotypical farmer, who is a single person and usually male. Of course, as alluded to above, many farms are operated by families and can rely on family contributions, which could be labour or off-farm income. These conclusions highlight the importance of understanding the social, economic and cultural contexts of farms and farm systems, and that decisions about practice or system change are unlikely to rest with one person. These conclusions are relevant for thinking about the audience of advisory services and who should be involved in advisory service activities.

The RMPP top performers study also found that these producers recognised the limitations of their own expertise and the expertise they needed to bring in. For example, it was found that animal farmers were willing to invest in cropping advice because it could have significant rewards if done well for productive animal farming (UMR Research 2014, p. 12). However, this study also heard from producers about wrong advice; for example, farmers being given advice to change to sheep milking, which turned out to be bad advice (UMR Research 2014, p. 62).

While findings are similar to other sectors mentioned above, in terms of what modes of engagement are useful, some important nuances have been identified through RMPP interviews. For example, having discussions with other farmers was found to be useful because it allows more detail and information to be gleaned, but concerns were raised by producers that all farms are different, and even though they might look similar based on their broad characteristics, geography, soil and financial situation can make a significant difference and need to be understood before applying one-size fits all solutions.

The size of producer groups is also important. They should not be too large, as bigger groups make participants more reluctant to speak up and share information. Furthermore, while field days are valued and useful, and better than one-way presentations, they often involve too many people, which makes asking specific questions difficult. The preference is to be sitting down and discussing issues and ideas with someone. While farm visits are important, as they allow farmers in a group to put what they are hearing into context and can see what is going, some farmers can be reluctant to allow people onto their farm as visitors might be critical of what they see.

The RMPP research also found that farmers struggle to 'source solid independent expert advice' and often have few alternatives but to rely on sales representatives for technical advice (UMR Research 2016, p. 31).

> *On the one hand, company representatives could be a great source of information especially when there was a long established and trusted relationship. However, a nagging concern remained for many farmers who also understood that the company representative operated under a business model that required them to sell product. (UMR Research 2016, p. 31)*

The RMPP pilot gave farmers access to independent advice, which was a key reason for some farmers to get involved. Interviews revealed that while farmers knew the basics, they struggled with the details of trying new things and so were reluctant to do so if they felt they did not have backup, in case something went wrong or they did not know how to respond. When margins are tight, change becomes too risky if access to expertise and help is perceived as being out of reach. Hence, these findings raise important questions about support and backup for those experimenting with, transitioning to, and implementing new practices and systems.

Seeking to link farmers and meat processors through the extension project raised an interesting issue. Farmers were keen to obtain information on the quality of their produce from processors to link back to their farm and practices (and potentially practice changes). However, producers found that processors were not able to provide that level of detailed information. This aspect of the programme highlights the utility of co-development to at least find out the different needs and capabilities of producers and processors, and that there are gaps that could be filled with measuring, monitoring and digital infrastructure. Although it does not appear to fall into any of the extension categories set out in section 3, the desire for feedback and creating some kind of infrastructure to link producer and processor would appear to be an advisory service opportunity that could lead to behaviour change or confidence that changes are working.

A conversation with a representative from the RMPP revealed that extension activities have been production and efficiency focused, but that some groups are now starting to think about the environmental management initiatives that are needed to respond to the changing environmental policy context.

Organic wine industry

We were also provided with a research report that examined how organic production developed in three sectors (dairy, mixed cropping and apples) to draw lessons for the organic wine industry (Reider 2007). The report explains that many people interested in organic production are linked into conventional agricultural production methods and networks that have little incentive to focus on a marginal approach to farming. Hence, initially it was extremely hard for people interested in organics to obtain useful and credible information on the topic and related research (e.g. soil biology).

Notably, large corporations have been instrumental in helping to build organic production in New Zealand as an export industry (e.g. Heinz Wattie's export of organic frozen vegetables, New Zealand Kiwifruit Marketing Board's export of organic kiwifruit and Fonterra's export of organic milk). The point was made that just because there was increasing international demand for organics, this did not mean organics would automatically grow in New Zealand – growth would require networks, coordination, a vision, support and people willing to experiment and drive organic production forward and convince producers to convert.

The report concludes that although each agricultural production system, region and farm is different, a common thread across the case studies was that human networks are crucial for allowing market opportunities and information to flow. Catalysts in different case studies were identified: leading

producers in the dairy and apples studies, corporate representatives for cropping in Canterbury, and researchers and discussion group facilitators for apples. These were identified as people who were closely involved in production and were trusted by producers.

The report also talks about the importance of the 'presence and public visibility of stepping stone' systems'. These are seen as necessary to help producers take manageable steps in their transition (Reider 2007, p. 61). A close relationship with researchers was also seen as important in making a large shift, as there are many technical issues to overcome when changing systems or part thereof (e.g. pest control for organic pip fruit crops).

It was explained that farmers like to learn from peers who have gone before them, and they are the most trusted. Trust arises from knowing that peers have had to grapple with the day-to-day issues – this is crucial. Hence, farmer-to-farmer networks have been key to the development of organics in New Zealand. Organised discussion groups, visiting other people's properties and informal advice networks stimulated by discussion groups have also been important, although it was recognised that relying on leading farmers can be a drain on their time.

It was also maintained that these initiatives are most effective when they are organised by other people, as producers are busy people. Hence, it was noted that groups that have lasted the longest are those that have had paid facilitators. Another key point is that these facilitators have been most effective when they have had depth of knowledge and commitment to organics. It was also mentioned that researchers need to have knowledge and commitment to organics to be trusted. A concern is that those who are not committed to organics could impose inappropriate measures of success of conventional agriculture onto organic production, which is not helpful and is likely to diminish trust with producers.

The report also highlights that new industries need new networks to avoid 'input substitution':

> *… outside funding is critical to supply the flow of non-commercial information in organic farming. Otherwise, organic farmers can wind up in an 'input substitution' mode: because they get all their information from product providers, they end up substituting conventional chemical inputs with organic ones, rather than redesigning their whole farm system to better suit organic production. … A farming approach that relies only on chemical fixes can be expensive, and may ignore plenty of other important techniques and practices. As past studies have pointed out (Pretty 1998; Warner 2007), true agro-ecological farming requires more than just 'technology transfer' of specific products; it requires an ongoing, dynamic learning process that involves producers. If information transfer is left up to fertiliser and spray companies (including organic companies), then organic farmers in New Zealand will likely remain in input substitution mode. (Reider 2008, p. 65)*

This concern raises important questions about whether product-based advisors and levy-based advice providers that are tightly wedded to conventional modes of production, inputs and outputs can help producers change practices and systems. For example, the research found that 'some industry representatives argue that because organic production only accounts for a small percentage of their levy incomes, only a small percentage of their funding should go into supporting organic production' (Reider 2008, pp. 65–66).

Māori extension services

We were also provided with information on primary industry advice that is tailored specifically for Māori, which is important given their unique circumstances. Prior to the signing of the Treaty of Waitangi in 1840 all land was Māori land (Reid et al. 2019, p.3). In June 2018, 5.7% of New Zealand was Māori land, with almost all of this land being owned freehold in 27,000 land block titles (Reid et al. 2019, p. 3).

The land that Māori own and occupy might have a different status from other land types, a status conferred through Te Ture Whenua Māori Act 1993 (the Māori Land Act). This Act decrees that all land in New Zealand shall have a status, either being:

- Māori customary land – land held by Māori which was never transferred into freehold land or ceded to the Crown
- Māori freehold land – land that has remained in Māori control and ownership as determined by the Māori Land Court
- land owned by Māori – land owned communally by five or more people, where the majority are of Māori descent
- general land – land that is not Māori land or Crown land
- Crown land – state-owned land
- Crown land reserved for Māori – state-owned land that has been set aside for the use or benefit of Māori (Reid et al. 2019. p. 2).

A Ministry for Agriculture and Forestry report published in 2011 highlighted that only 20% of Māori land was operating productively (Reid et al. 2019, p. 7). The report categorised Māori land enterprises and found that 80% of their land was non-arable, with up to half of this land being under-utilised and the other half under-performing in relation to industry standards. Given different ownership structures and underperforming land productivity, the advisory and extension needs of Māori will differ from those of non-Māori. For these reasons, several Māori-specific advice and extension services have been trialled in New Zealand.

One example is MPI's Pathway to Increased Productivity (MAPIP) programme, which focuses on Māori land and how to increase both productivity and the sustainability of existing land use. Māori landowner collectives apply for funding through the programme if they can demonstrate a clear governance structure, transparent decision-making processes, and the permission of all relevant landowners. By 2017/18 16 projects had been supported through MAPIP (Reid et al. 2019, p. 25).

Another example started by MPI is the Māori Agribusiness Extension Programme (MABx). This programme offers agricultural extension support for Māori specifically aimed at clusters: collectives of Māori land and agribusiness operations in a geographical region (MPI 2020). One example of a cluster is the Whangaparoa Māori Lands Trust, a grouping of 20 Māori land organisations that are working with MABx to explore the potential of their land together. MABx are also partnering with DairyNZ to deliver extension programmes to Māori dairy farms in an eastern Bay of Plenty cluster.

One more example led by MPI is Extension 350, an initiative that also includes the Northland Regional Council, DairyNZ, and Beef + Lamb New Zealand. Extension 350 is a farmer-led extension programme in Northland that aims to improve productivity, sustainability, and profit. The focus is on sheep and beef farmers as well as dairying operations. Advice is provided by farm consultants, as well as representatives from the industry organisations. Participating farmers are expected to mentor other farmers and interact with their local community in order to spread the benefits (Reid et al. 2019, pp. 25–26).

The Federation of Māori Authorities (FOMA) established a project with FarmCare NZ to help Māori landowners create improvement plans for their property, working to implement the plans with farm staff, and then reviewing and adjusting the plans if necessary (Reid et al. 2019, p. 41). FarmCare NZ were a critical actor because they helped train staff to implement new technologies and strategies rather than just passively giving advice. The project concluded that tailoring plans to the specific needs and aspirations of different land blocks and learning from clusters of different land blocks in the same region to share and learn experiences were critical to the success of the programme.

One further example is an extension programme offered by the Agri-Women's Development Trust (AWDT) for women involved in sheep and beef farming. The programme, known as Wahine Maia Wahine Whenua, offers courses on farm management across the country. These courses are designed to help the participating women better understand how their whānau, trust, or incorporated farm is run. Seventy women graduated in 2019, and although all women work on Māori land, not all identify as Māori, and ethnicity data were not captured (Reid et al. 2019, p. 28).

Although not specifically advice, there are also many training programmes and educational courses that are specific to Māori. Of particular relevance for Māori, there are a number of courses that help navigate the governance and management of multi-generational land blocks, such as Toi Oho Mai Institute of Technology's Certificate in Māori Governance (Reid et al. 2019, p. 14). There are also courses that provide advice to staff who work on farms or in production, such as caring for livestock, repairs and maintenance. For example, the Eastern Institute of Technology offers a certificate in agriculture, and similar training is available throughout the country (see Reid et al. 2019, p. 19).

Advisory services as support

We also spoke with the Agri-Women's Development Trust. As mentioned above, this organisation delivers programmes and initiatives to empower women in agriculture through training and building their skills in how to change mindsets and behaviour, build confidence, overcome resistance and have influence in their homes, in their communities and across the agricultural sector. Importantly, graduates of the Trust's programmes are going on to set up their own networks.

We also spoke with the Rural Support Trust (RST), which has 14 branches or trusts across the country. The trusts have service agreements with MPI to provide rural mental wellness services and support for producers in adverse events. We were told that RST works in the crisis space and helps primary producers that are struggling with the many issues facing families and communities in the primary sector. They receive phone calls from worried spouses and refer them or producers to advisors, who try to help families develop new ways of working or to address issues they are facing.

Overall, a number of advice providers are utilising a range of communication channels and engagement strategies and, in some cases, evaluating their effectiveness to identify what does and does not work from the perspective of producers. Producers are clearly engaging with a wide range of advisory services.

Our scoping work shows that there are three broad topics of advice currently provided to New Zealand producers, focused on:

- Production, productivity and efficiency
- regulation
- environmental management.

Production is the dominant topic of advice, with fee-for-service and industry advisors offering advice on increasing yield, productivity and efficiency. Producers are usually willing to pay for this advice because they understand that it could lead to increases in profitability, and thus it can be demonstrated to be a worthwhile investment. Advice to help producers navigate increasingly complex regulations can also be demonstrated through saving time and paying for specialised expertise.

These same arguments are more difficult to make for advice on environmental management, as it is often not clear to producers whose advice to seek, and whether following that advice will result in private benefits. It is a similar situation for system change. As shown with those trying to shift to organics, there was limited scientific information to help decision-making, limited knowledge about what it might look like, limited access to skills development, and a lack of evidence of demonstrable benefits.