Improving Access to Carbon Farming Markets

Improving Access to Carbon Farming Markets:

Stakeholder Needs Analysis

NSW GOVERNMENT | Department of Primary Industries

Improving Access to Carbon Farming Markets: Stakeholder Needs Analysis

for the project

'A Decision Support Tool to Enhance Carbon Farming Opportunities'

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1. Introduction

1.1 The introduction of carbon farming to the rangelands in NSW

The mitigation of carbon via the Emissions Reduction Fund (ERF) is one of three ways the Federal Government is addressing action on climate change. The ERF currently has 36 approved methodologies for the production of carbon credits, in the marketplace known as Australian Carbon Credit Units (ACCUs). Many of these methodologies were originally created under the Carbon Farming Initiative (CFI), which operated under Australia's previous carbon pricing scheme from 2011 to 2014. 11 of these methodologies are particularly related to protecting or 'growing' carbon in vegetation and can be voluntarily adopted by private landholders and public land managers.

In the rangelands of NSW (see Figure 1), carbon farming agreements were first entered into by landholders from 2011 (via the Carbon Farming Initiative, CFI) and from 2015 (via the Emissions Reduction Fund). These carbon farming projects are based largely on two methodologies, Avoided Deforestation (AD) and Human Induced Regeneration (HIR). AD projects specifically refer to keeping existing vegetation while HIR refers to active encouragement of vegetation recruitment and growth.

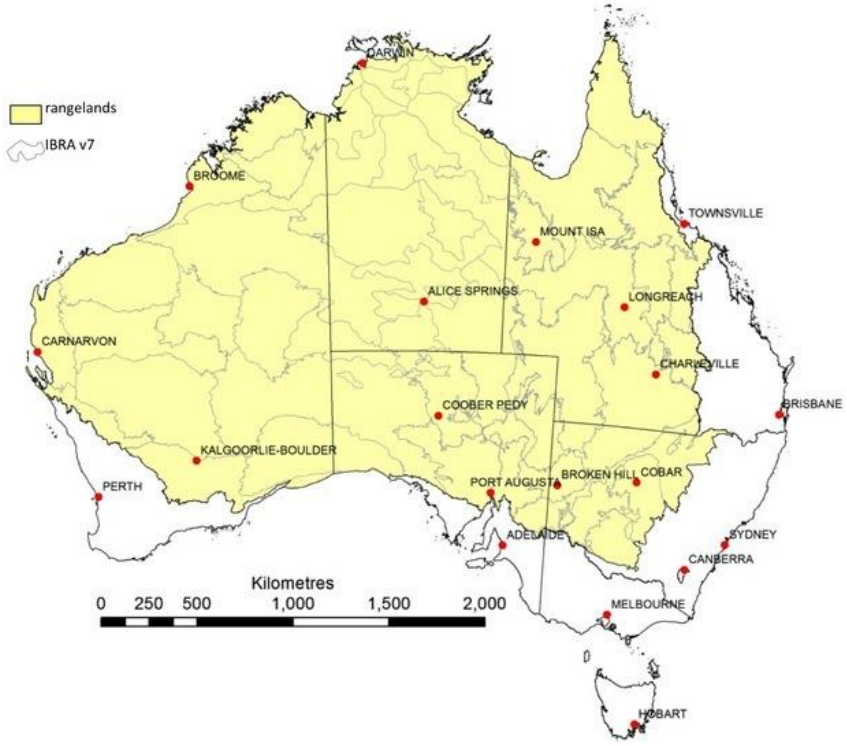

Figure 1: Location of the rangelands in Australia. Source: Bastin & Chewings (2014)

Projects using either the AD or HIR methodologies involve contract periods of either 100 years or 25 years, the former more commonly associated with AD projects and the latter commonly associated with HIR projects. These projects are predominantly located in the rangelands of NSW and Queensland due to the volume of existing vegetation and the potential volume of regeneration (Butler

et al., 2014) (see Figure 2). Furthermore, this is a region where woody weeds or Invasive Native Scrub (INS) are a common incursion into pastures and grasslands. Their removal has long been best practice for improving biodiversity in the rangelands, and so Property Vegetation Plans (PVPs) commonly permit the legal removal of INS. AD refers to retaining this vegetation that would otherwise be cleared, hence additionality is achieved when this carbon store is maintained. In contrast, HIR requires the active regeneration of woody native vegetation in order to 'grow' the carbon store.

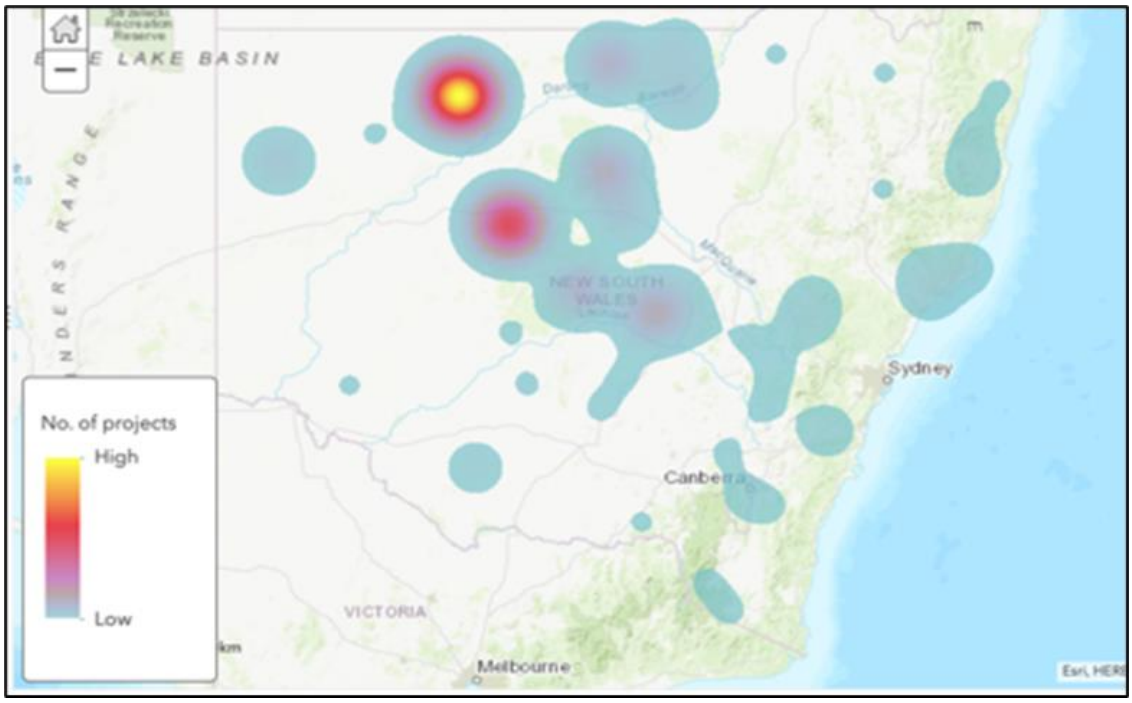

Figure 2: Concentration of ERF project sites in NW NSW. Source: http://www.cleanenergyregulator.gov.au/maps/Pages/erf-projects/index.html 22 March 2019 (Baumber et al., 2019)

A further consideration that has made the rangelands attractive for carbon farming is land size. While potential sequestration per unit of land is relatively low, the extent of the rangelands has led some to suggest that even modest changes to these environments could change the global carbon cycle (Pitten et al., 2012). Aggregators are carbon market brokers who negotiate, monitor and trade carbon on behalf of landholders (although landholders can also be aggregators). Aggregators also 'aggregate' projects together into bundles to increase attractiveness of win/win packages to bargain with. Large farm sizes and aggregation into bundles means that aggregators have access to large tracts of woody vegetation with fewer landholders involved, thereby reducing complications and transaction costs. In comparison with regions further east, the rangelands offered the 'low-hanging fruit' and so has been the main target for the establishment of projects.

As farmer interest and buy-in into projects underpins the success of the ERF scheme, there is a need to understand how carbon farming is perceived by the farming sub-culture in the rangelands (George et al., 2012; Dumbrell et al., 2016; Torabi et al., 2016a; Kragt et al., 2017; Jassim, 2018). With 199 vegetation projects in NSW registered as of November 2019, and only 3 projects awarded contracts during the 2019 July ERF auction (CER, 2019), there is much scope for increased adoption. Understanding the motivations and barriers that enable or disable decision-making for successful adoption of carbon farming is of high importance. Furthermore, understanding perceived co-benefits

and dis-benefits, as well as levels of awareness and information-seeking behaviours, is integral to improving the scheme and encouraging uptake for win/win results. Without considering community perceptions and local resistance, policies reliant on voluntary uptake may result in limited impact and on-ground conflict (Jassim, 2018).

The aims and objectives of this stakeholder analysis based in the NSW rangelands were to:

1. Identify motivations and constraints to adoption of carbon farming
2. Identify co-benefits and dis-benefits of carbon farming
3. Understand information sources and needs

1.2 Reported benefits of carbon farming

Benefits and co-benefits of carbon farming have been reported in a number of studies. The main benefit of carbon farming is reportedly the economic benefit and financial flexibility offered through this land-use type (Crossman et al., 2011; Evans et al., 2015; Salas Castelo, 2017; Jassim, 2018, Cowie et al., 2019). Cowie et al. (2019) surveyed 68 stakeholders in the NSW rangelands and found that diversification of farm income and enterprise was the main benefit resulting from carbon farming. Jackson et al. (2017) found that carbon farming payments were aiding local communities with natural resource management and community development, particularly Indigenous communities in rural and remote Australia. Jassim (2018) interviewed 15 stakeholders in South-West Queensland and found that the perceived financial outcomes and benefits afforded to individual enterprises outweighed the perceived benefit of carbon mitigation. Salas Castelo (2017) surveyed 214 landholders in Central and Northern Queensland and found that economic benefits and environmental health were equally rated as motivators for carbon farming. However, Fleming et al. (2019) argued that other co-benefits of carbon farming have been overshadowed by the heavy focus on the financial benefits it delivers. They argue that framing carbon farming in this way limits the perceived potential of carbon farming as a boon for productivity, conservation and rangeland renewal.

Reported ecological benefits of carbon farming include increased biodiversity, increased habitat provision, reduced soil loss, improved soil health, structure and water holding capacity, management of erosion and salinity and improved water quality (van Oosterzee et al., 2012; Lin et al., 2013; Evans et al., 2015; Sinnett et al., 2016; Tang et al., 2016; Torabi et al., 2016a; Torabi et al., 2016b; Kragt et al., 2017; Salas Castelo, 2017; Cowie et al., 2019; Fleming et al., 2019). Dumbrell et al.'s (2016) survey of 43 landholders in the northern wheatbelt of Western Australia, found that improving soil quality was the main co-benefit motivating adoption of carbon farming and ranked higher than 'being given the opportunity to generate carbon credits'. Similarly, Torabi et al. (2016b) found that program attractiveness and value of co-benefits for biodiversity conservation were more influential motivators for adoption over financial incentives. Habitat restoration and promoting biodiversity conservation were found to be the key motivators for adoption in other studies as well (Schirmer & Bull, 2014; Evans et al., 2015; Dumbrell et al., 2016; Sinnett et al., 2016; Salas Castelo, 2017). Co-benefits directly associated with productivity increases include perceptions of increased yield, reduced use of inputs, pollination, and the provision of shelter belts and wind breaks (Lin et al., 2013; Kragt et al., 2017; Fleming et al., 2019; Summers et al., 2019).

Social benefits of carbon farming, beyond increased income, include improved mental health and community resilience (Cowie et al., 2019), innovative community initiatives and networks, and new markets for carbon-farm products (Fleming et al., 2019). Torabi et al. (2016a) conducted 17 interviews with landholders in Victoria and found that existing trust and communication networks amongst peers can increase uptake of carbon farming projects. 14 of their 17 respondents explained that they had

pursued carbon farming due to recommendations through their social networks. Furthermore, they found that trust in the person introducing the scheme had a deep impact on local perception, and differed between, for example, a known and trusted early adopter or a corporate partner representing an aggregator. Others have reported that farmers are also motivated by a moral will to 'do their part' for climate change (Kragt et al., 2017). Regenerating vegetation could also have a positive impact on landscape aesthetics which also has wider community benefits beyond the individual farm (Kragt et al., 2016).

Cowie et al. (2019) concluded that carbon farming is one of a few key tools being used by landholders to increase their socio-ecological resilience in the rangelands of NSW.

1.3 Issues around carbon farming

There are a number of environmental, social, cultural and economic issues that have been associated with vegetation-related carbon farming projects across Australia.

Vegetation projects in the rangelands are especially reliant on the retainment or active encouragement of woody weeds or Invasive Native Scrub (INS). INS invades farming land, especially where poor farming practices in the past – for example widespread clearing and over-stocking – have severely altered the landscape (Cowie et al., 2019). INS supresses pasture growth, reduces ground cover, has ramifications for livestock husbandry and can be uneconomic to manage (Harrington et al., 1984 cited in Cowie et al., 2019). Retaining woody weeds for carbon farming has the potential to create a range of disbenefits such as increased fuel loads for fire, altered hydrology and decreased biodiversity (Lin et al., 2013; Butler et al., 2014).

Due to the perceived negative impacts of INS, a major focus of natural resource management (NRM) in the rangelands for the last sixty years has been the removal of INS (Hodginson & Harrington, 1985). This focus on removing INS and viewing INS as an undesirable feature in the landscape is a social norm in the rangelands farming community. Jassim (2018) found that active management of INS via removal was ingrained in community perceptions of responsible land management, and that carbon farming methods were actively challenging this community norm.

While Jassim (2018) found that perceptions linking INS to an unhealthy landscape was a barrier to adoption, Cowie et al. (2019) proposed that income generated via carbon farming can result in better management of INS, and previous studies have suggested that positive impacts of INS and relative advantages associated with retaining INS (including income from carbon farming) may be changing local perceptions of INS (Eldridge & Soliveres, 2015; Berry et al., 2018). Evans (2018) supports a renewed focus on HIR as a methodology which can overcome perceptions that link INS to carbon farming. They argued that HIR has better potential for increasing biodiversity and contributing to improved landscape-scale function as it is less about 'locking up monocultures' and, if valued appropriately with co-benefits, can focus more on regenerating desirable native species. As Kragt et al. (2016: 130) state "using native species for carbon farming does not necessarily equate to creation of biodiverse habitat". For co-benefits such as biodiversity conservation to be achieved, they must be explicitly considered in the design and management of carbon farming projects.

Uncertainty and risk are key concepts that framed most barriers to carbon farming uptake in previous studies. Political uncertainty, policy and policy design, characteristics and contexts were found to be major impediments (Mitchell et al., 2012; Evans et al., 2015; Page & Bellotti, 2015; Dumbrell, 2016; Kragt et al., 2017; Salas Castelo, 2017; Evans, 2018; Jassim, 2018; Jellinek et al., 2019). For example, for locking in a project for the 100 year commitment period, overwhelming paperwork and high

transaction costs, especially for the auditing process, were all reported to be barriers for landholders (Baumber et al., 2011; van Oosterzee et al., 2014; Torabi et al., 2016b; Kragt et al., 2017; Salas Castelo, 2017; Evans, 2018). Kragt et al.'s (2017:119) survey of 125 landholders in the Western Australia wheatbelt, found that almost three quarters of their respondents reported 'uncertainty about the possible carbon farming practices and their impacts on the farm business' as the major barrier to adoption. Uncertainty with carbon markets and carbon pricing specifically, were also cited as barriers (Evans et al., 2015; Kragt et al., 2017; Salas Castelo, 2017). Management uncertainty and increasing risk of fire and pest invasion were also concerns mentioned by landholders (Torabi et al., 2016a).

Linked to this uncertainty, a lack of clear and transparent information and communication of policy are also noted to be key factors impeding adoption (Page & Bellotti, 2015; Kragt et al., 2017; Salas Castelo, 2017; Jassim, 2018). The complexity of carbon farming policy and a dearth of locally available government advice compounded this issue. Jassim's (2018) study furthermore found that the lack of an on-the-ground 'honest broker' led to increased feelings of community mistrust. Community values, beliefs and mistrust were key aspects shaping negative perceptions of carbon farming in Jassim's (2018) study. They found that lack of clear communication led to word-of-mouth communication which was problematic when feelings of envy or scepticism were intertwined into these knowledge transfers, generating resentment, mistrust and non-acceptance (Jassim, 2018). Likewise, Kragt et al. (2017) found local perceptions of carbon farmers as poor land managers who were now being rewarded for not effectively managing their INS. This conflict was expressed as government rewarding some while overlooking voluntary sustainable practice change and adaptations made outside of the ERF that reduce carbon emissions (Kragt et al., 2017). Similarly, Cowie et al. (2019) found that the perceptions of difference between the haves and have nots was prevalent on the ground, with cut off dates for PVPs embedded in policy generating this community division.

In terms of carbon farming's compatibility with existing production, concerns around 'locking up the land', perceptions of competition between carbon farming and grazing land, the trade-offs associated with retiring agricultural land, perceptions of 'losing control over management' decisions and flexibility were also barriers identified in the literature (Polglase et al., 2011; Polglase et al., 2013; Schirmer & Bull, 2014; Cowie et al. 2019; Jellinek et al., 2019). Perceived incompatibility with existing farm practice, not having technology or skills needed, and potential issues with reselling the property were also raised as barriers by Kragt et al., (2017). Kragt et al., (2012) and Kragt et al., (2016) also point to potential overall economic losses, even if carbon credits are sold, due to loss of income from farming.

The perceived link between carbon farming and absenteeism has also been highlighted in a number of studies. Jassim (2018) and Cowie et al. (2019) found that the lack of active management seemingly required for some projects was leading to local perceptions around rural decline and fears for the future of the rangelands. With the rangelands already suffering long-term trends in decline of population and services (Western LLS, 2017), this perception feeds into a sentiment that shapes carbon farming as just one more stress on socio-cultural fragmentation.

1.4 Defining stakeholders

To conduct a stakeholder analysis, there needed to be some refinement in the breakdown of stakeholder groups. An initial project workshop raised a number of different ways to breakdown stakeholder categories. Landholders could be broken down into private or public, followed by whether or not they had a carbon project, followed by what type of project. In February 2019, there were 59 AD projects and 137 HIR projects across NSW (Baumber et al., 2019) with the large majority

of these concentrated in the Western Division (Figure 2). With approximately 2000 landholders in the Western Division of NSW (Western LLS, 2017), and only 196 projects (it is unknown how many projects involve multiple landholders or how many landholders have multiple projects), there are clear differentiations between landholders as stakeholders. Landholders without carbon farming projects, with AD projects and with HIR projects will have differing perceptions of the scheme. In the Central West there are a limited number of projects, roughly 10-15, with those that employ AD or HIR methodology (approximately 10) situated closest to the western division. Other projects in this region are based on environmental plantings.

Aggregators or carbon service providers could also be categorised in a number of ways, indicating the heterogeneity of this stakeholder group. The following is an example of this breakdown that originated during an initial stakeholder workshop held in Sydney in November 2018:

- Aggregators defined by which methodologies they engage with
- Aggregators defined by which services they offer
- Aggregators defined by the level of risk they share with landholders

The following breakdown is defined by the CER (2019):

- Aggregator owns or controls multiple sites
- Aggregator is a project developer
- Aggregator engages multiple project developers on multiple sites
- Aggregator is an energy retailer
- Aggregator is the landholder and undertakes all aspects of the project

Service providers are also community stakeholders and can be active in providing advice, services and infrastructure for carbon farming. Service providers include rural advisers, financial advisers, farm planners, agronomists, fencing contractors, rural supply services etc. Service providers can also include carbon service providers, however in the study area this service is currently fulfilled by aggregators.

Other stakeholders also include government staff at all scales, including Local Land Services, Department of Primary Industries NSW, Office of Environment and Heritage NSW and Department of Energy and Environment including ERF and CER. Academics and other researchers (including government researchers) are also stakeholders with information who can contribute to understanding adoption of carbon farming.

Through refinement, the team decided on the final stakeholder breakdown:

- Landholders with a C project
- Landholders without a C project
- Public land managers
- Aggregators
- Service providers
- Government
- Government researchers
- Researchers

2. Methods

Stakeholder needs analysis

A mixed-methods, multi-staged approach was employed to conduct this stakeholder needs analysis. A mixture of qualitative and quantitative data was generated from stakeholders from the Central West and Western Division of NSW. This was a multi-staged approach, beginning with a stakeholder focus group held in Sydney, followed by the deployment of a digital online survey coupled with follow-up interviews and a final focus group held with a different group of stakeholders in Bourke.

The research aimed to develop a 'rich picture' or a 'thick description' of the situation in order to better understand the complexity and define problems with a diverse group of stakeholders (Holloway, 1997; Grant et al., 2019). Due to limitations outlined at the end of this section, the data obtained was not suitable for statistical analysis of trends or perceptions across NSW rangeland communities. Instead, the combination of focus groups, survey and interviews helped define a 'rich picture' of the real and potential impacts of carbon farming on the environment, economics, the socio-cultural fabric, personal impacts and production/management. The issues identified through the initial stakeholder focus group informed the design of the subsequent survey, interviews and second focus group. The results of a prior survey in the same region with a similar breakdown of stakeholders (see Cowie et al., 2019) were also utilised to inform the development of each aspect of this research.

Site selection/sampling

The target area for this research was the rangelands of NSW, where the majority of carbon farming projects are located in NSW. Therefore, the geographic focus was limited to the Western LLS and Central West LLS regions (see Figure 3). Within these regions, stakeholders were sampled purposively for focus groups and interviews by key government staff and researchers with extensive experience with carbon farming in the region. The survey used opportunistic sampling with stakeholders needing to opt in to respond. In both cases all efforts were made to attract a diversity of participants and therefore, respondents. Some participants in focus groups also completed the survey, while most interviewees also completed the survey. Table 1 shows the overlap amongst participants in each stage of research.

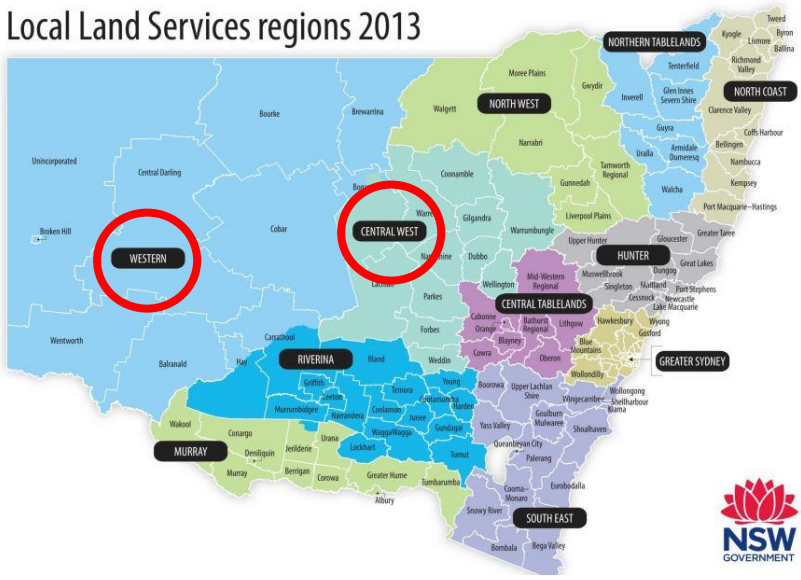

Figure 3: Local Land Services regions in NSW with Western LLS and Central West LLS highlighted.
Source: NSW DPI, 2013

Table 1: Participant overlap between focus groups, surveys and interviews

Research method	Focus Group 1	Survey	Interview	Focus group 2
Focus group 1	14	3	1	2
Survey	3	40	7	6
Interview	3	7	10	0
Focus group 2	2	6	0	16

Survey

An online survey was developed to capture and quantify stakeholders' perspectives on motivations for and barriers to accessing carbon markets, real and perceived benefits and disbenefits of carbon farming, managing risk, information access and needs as well as stakeholder influence over decision-making. The survey was designed to capture quantitative data with closed questions, using multiple choice, sliding scales and Likert scales, as well as sporadic open-ended questions to generate qualitative insights. The survey was developed via Qualtrics and was deployed in digital form in order for stakeholder specific knowledge to be generated. To achieve this, different survey pathways were created based on stakeholder type, resulting in a total of 197 questions in the first survey deployed. 25 respondents answered this survey, but the feedback indicated the survey was too long. After consultation with the project team, the survey was reduced to 118 questions, question logic was used to determine the final set of questions viewed by respondents based on stakeholder type, with landholders with a carbon project being asked the most questions (64 questions). A further 15 respondents answered the shortened survey.

The survey was deployed via WLLS, CWLLS, DPI and through local Landcare networks in the WD and CW and was open online for approximately four months from 25th March 2019 – 31st July 2019. The survey was also posted on special interest and community social media sites and could be answered on a desktop or smart-phone. We offered an incentive to participate in the offer of five $50 gift vouchers. The survey was also sent out to specific landholders known to the project team. While using a digital survey may have inhibited stakeholder participation from those who do not use computers/smart-phones or have good internet access, some of these individuals participated in focus groups and interviews.

The survey generated 40 responses in total, a lower response rate than expected. Of these 40 surveys, 38 generated useful data for analysis. Questions only asked in the longer version of the survey were discarded from analysis. This data was analysed for general trends across the aforementioned themes using excel. Due to this small dataset, the results were analysed for overall trends, and stakeholder views were not compared. Instead these are more evident in the qualitative insights generated during surveys, interviews and focus groups.

Interviews

To generate in-depth understanding of the issues and opportunities associated with carbon farming, a set of 10 in-depth interviews were conducted to complement survey data. This sample size is appropriate for a phenomenological research approach, whereby participants are selected on the basis of their shared experience of the phenomenon being studied (the expansion of carbon farming in western NSW) and their varying individual characteristics and experiences (Moser and Korstjens, 2018). The interviews were conducted in person and over the phone and covered the same themes as the survey, but provided much more rich contextual information. Ten interviews were conducted with a total of seven landholders/managers in the Western Division, two landholders in the Central

West region, three LLS officers in the Western Division, one LLS officer in the Central West and one OEH/NPWS representative. These interview transcripts were transcribed and mined for secondary data to provide insight into major themes that emerged from survey data.

Focus groups

A focus group was held with key stakeholders before and after the deployment of the survey. The first focus group was part of a workshop with key experts to help inform the focus of the research and was held at the University of Technology Sydney, NSW in November 2018. The second focus group was held with participants in Bourke, NSW in May, 2019. A breakdown of participants is provided below in Table 2. This focus group elicited much discussion on issues and opportunities with carbon markets and identified co-benefits associated with carbon farming.

Table 2: Focus group participants

Stakeholder type	Focus group 1	Focus group 2
Farmer with a carbon project	2	3
Farmers without a carbon project	0	6
Aggregator	3	2
Department of Primary Industries, NSW	3	1
Department of Environment and Energy	1	
Service provider	0	1
Department of Science, Information Technology and Innovation, QLD	2	1
Local Land Services	3	2
Total participants	**14**	**16**

Throughout this report, quotes from the surveys, interviews and focus groups will be integrated into the results/discussion. These are coded using S (survey), I (interview) or FG (focus group), followed by the participant number, followed by their stakeholder group. While there was some overlap in participation amongst the research methodologies, during analysis qualitative data from these few respondents was grouped together.

Limitations

The number of surveys we aimed to generate was 150, however we only generated 38 useful and complete surveys. During the survey time, landholders were under considerable stress due to the drought affecting the region, which may have limited the responses. A carbon farming survey on attitudes and behaviours was distributed in early 2019 by the DPI, so there may have been some level of survey fatigue. Our survey was also quite long due to the complexities involved in land management and carbon farming which may have precluded quantity of responses. Not all respondents answered every question and where this is evident in the data presented, a number of respondents count is included.

3. Results

3.1 Stakeholder characteristics

This section pertains to the characteristics of stakeholders who responded to the survey. In total, 38 responses were used in the analysis. The largest stakeholder group was private landholders who numbered 20, followed by government staff, aggregators and government researchers, and service providers (see Figure 4). Public land managers and researchers (academic) were two stakeholder groups who were not captured through participation in this survey.

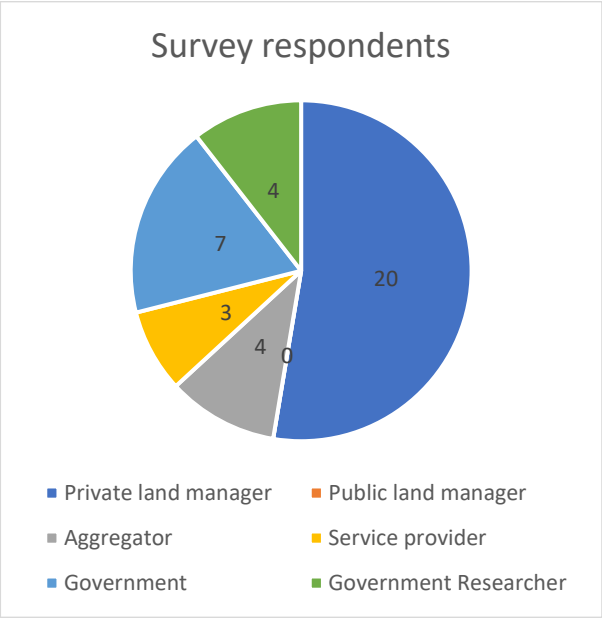

Figure 4: Breakdown of survey respondents

Of the landholders who responded, five listed their residence as the Central West, while 14 resided in the Western Division. On average landholders owned 2 properties and had been managing their property for approximately 33 years (the range being from 70 years to 2 years). Average property size was 25,423ha which is above the average of 10,500ha for the western division (Western LLS, 2017). Half identified their motivations for managing the farm as purely productive while the other half reported a mix of production and conservation motivations, although approximately 90% of all properties were used for production purposes. On average landholders had 2.7 enterprises with the majority (18/20) used for livestock grazing (both cattle and sheep). Nine landholders had mixed farms, with only two of these being pure croppers. On average landholders spent 50-80% of their time on the farm. Nine landholders had carbon farming projects as part of their enterprise mix and it was contributing an average of 40-60% to the income of these properties. When asked about their future plans, no farmers indicated that they were looking to retire, sell the farm or shut the business down. Most respondents were keen to expand land, herd size and enterprises.

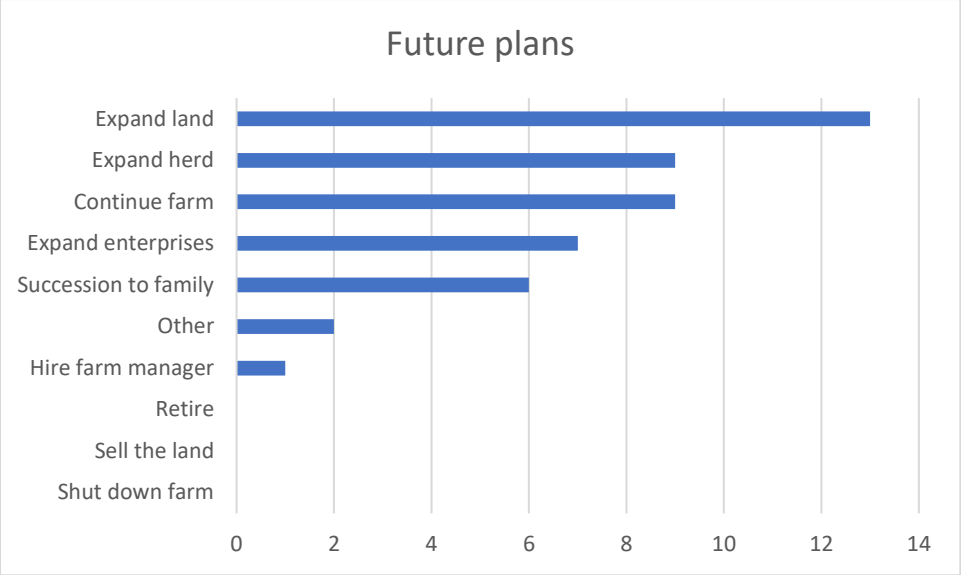

Figure 5: Future plans for the farm

The four aggregators who responded to this survey were project developers who offered nearly all services to landholders – from advice to project design, management, monitoring, auditing and reporting. The three companies who responded are the main aggregators in the Western Division and Central West, including Green Collar, Climate Friendly (who broker 12m ha of carbon farming projects in NSW) and Carbon Farmers Australia (who broker 150,000ha in NSW). All three aggregators had similar practices, in that they all take carbon credits in lieu of payment for services, aggregator payments are taken when ACCUs are generated, and landholders get paid after sale of ACCUs yearly.

The three service providers who responded included a fencing business, a rural financial advisor and an agronomist. Seven government staff responded, most of whom were from Western LLS. Four government researchers from NSW DPI also responded. Of these 11 government-related respondents, only two provided advice on carbon farming sometimes.

Carbon farming projects

Of the 11 landholders who did not have carbon farming projects, four had considered a carbon farming project in the past and four were currently considering a project (see Figure 6). Of the nine with carbon farming projects, six of these were AD projects and four were HIR with no landholders responding to the survey with environmental plantings projects. Four of these were self-managed, three were joint managed with aggregators/carbon service providers and two listed aggregators/carbon service providers as sole managers.

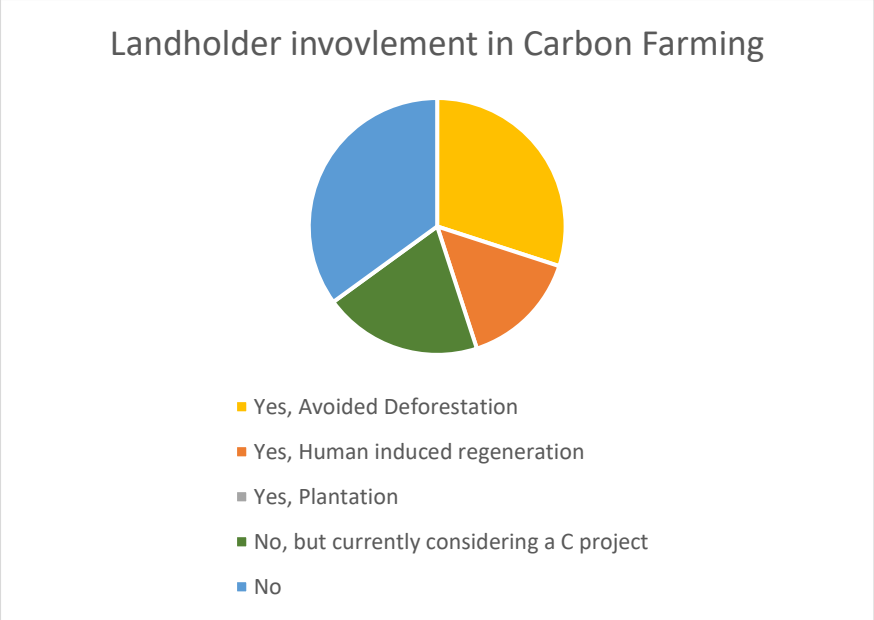

Figure 6: Landholder participation in the CFI-ERF

3.2 Motivations and barriers to adopting carbon farming

Motivations

Key motivations, ranked by all stakeholders, for landholders getting involved in carbon farming were related to the financial incentive and the opportunity to diversify income and increase income. Increasing business resilience, diversifying the enterprise and increasing certainty/decreasing risk were also ranked highly (see Figure 7).

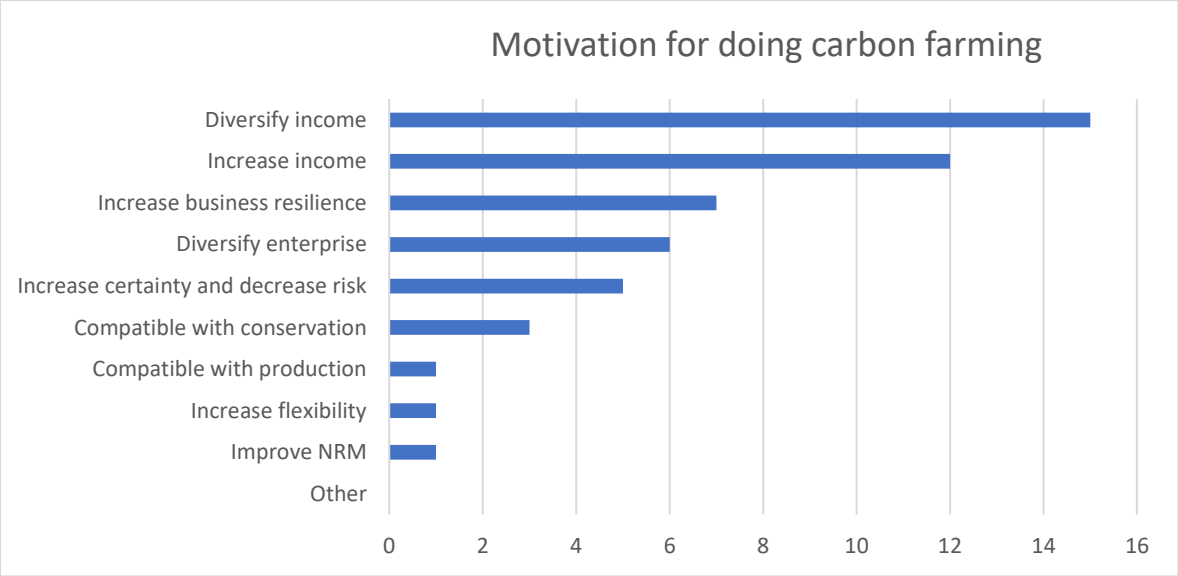

Figure 7: Accumulative scores for top three motivations for doing carbon farming by all stakeholders

Motivations related to getting into carbon farming were varied, and the economic returns were perceived as motivations in multiple ways. For landholders with a carbon farming project, the stability offered by carbon farming via "consistent cash flow" (S19, Landholder with a C project) was a motivation to have a project. For others, production benefits and compatibility with production goals were key motivators for involvement;

> "Controlled system will have a production benefit and add drought resilience to our farm. Planting trees for shelter will also have production benefits by providing an improved environment for animals along with benefits to [illegible]" (S26, Landholder with a C project)

> "Mining and looking to capitalise on all available advantages and [illegible]" (S21, Landholder with a C project)

For some, developing trust and a relationship with an aggregator motivated them to take the leap and sign up to a project;

> "Was difficult to understand at first, is this a pyramid scheme? A Ponzi? [Aggregator] [illegible] something the landholders own. Torrens Title lease here, but no sunset. This was a headache to deal with. [illegible] the Western Australian Act. [illegible] 8 months to figure it out and do the deed. We did the legwork which made it easier for other [illegible] them, but [they] were great to deal with, they actively built trust with us and are really wearing [illegible]" (F2, Landholder with a C project).

Having aggregators share the risk in carbon farming contracts was also mentioned by landholders in both focus groups as a key motivator;

> "[illegible]" (FG1, Landholder with a C project)

> "[illegible]" (FG2, Landholder with a C project)

For others, their existing networks and trust in early adopters led to them considering, and ultimately signing up to, a carbon project;

> "[illegible]" (S42, Landholder with a C project)

Barriers

While production benefits and compatibility with production goals were cited as motivators, in contrast, the key barrier according to all stakeholders, was a perceived incompatibility with production goals and to a lesser extent long-term plans. The following stakeholders explained that carbon farming reduced production flexibility in dry times;

> "In dry times you cut a bit of mulga and mix with grass for digestion. Some people are not in carbon farming [illegible]" (F6, Government)

> "[illegible]" (FG2, Landholder without a C project)

Ranking highly, lack of eligibility and lack of suitable land to engage in the program acted as immovable barriers to involvement. As respondents explained;

> [illegible] (Landholder without a C project)
>
> [illegible] (Landholder without a C project)
>
> [illegible] Landholder without a C project)
>
> [illegible] (Government)

Complexity of the scheme was also a major barrier as was lack of information. Interestingly, political uncertainty and trust in government ranked lower, while market uncertainty, scientific uncertainty, and a perceived negative impact on the farming community hardly rated (see Figure 8).

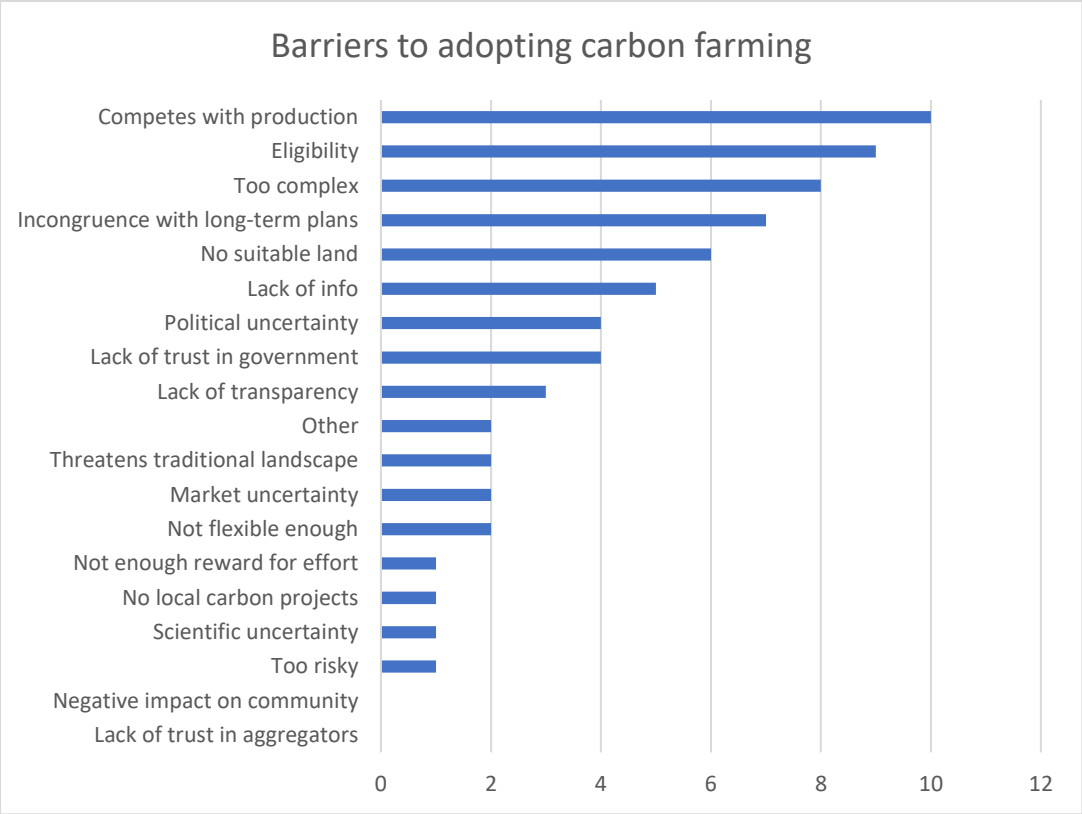

Figure 8: Accumulative scores for top three barriers to adopting carbon farming by all stakeholders

Lack of enough financial incentive to offset trade-offs with production was cited as a key reason by landholders without a carbon farming project;

> [illegible] (Landholder without a C project)
>
> [illegible] Landholder without a C project)

While a farmer with a carbon project expressed this as more of an issue with HIR projects;

> *á wdzy y λ y∃ l∃ l λ y ă ű Ŏ l NJ ō 2 y l y Ř ű K Ŝ NJ Ŝ Ř Y Ŝ l ű LJNJ*
> locked *ώ λ* the balance is not so good per ha, $100 vs $300 at the moment, but this is dependent on the red meat price *é* (FG2, Landholder with a carbon project)

The following landholders explained that lack of information on financial aspects of the scheme was also an issue;

> *á a 2 NJ Ŝ Ŧ dz y Ř ă ű 2 NJ Ŝ Ŧ f Ŝ Ŏ ű ű K Ŝ Ø l f dz Ŝ 2 Ŧ ű K Ŝ f l y*
> information regarding tax breaks/incentives for carbon farming *λ y ∃ Ŝ* (S11, Landholder without a C project)"

> *á ² Ŝ K l Ř ű K NJ Ŝ Ŝ Ř λ Ŧ Ŧ Ŝ NJ Ŝ y ű l ∃ Ŝ y ű ă ó l ∃ ∃ NJ Ŝ ∃ l ű 2 NJ ă*
> another $110,000 and another $370,000. How do we make a decision with no information?
> *a λ y Ř ō 2 ∃* (FG2, Landholder without a C project)

> *á a λ ă λ y Ŧ 2 NJ Y l ű λ 2 y λ ă ă ű λ f f l y λ ă ă dz Ŝ Σ ă ű λ f f ∃ NJ Ŝ*
> (FG2, Landholder with a C project)

The high up-front costs related to establishing a project was described as a barrier to adoption by the following respondents;

> *á t f l y ű l ű λ 2 y ă Ř 2 y 2 ű ∃ Ŝ y Ŝ NJ l ű Ŝ l è Ŝ l NJ f è λ y Ŏ 2 Y Ŝ*
> are up front. There is also no opportunity cost for establishing a plantation project, unlike a HIR project. Plantations *ar 2 Ŝ Ŏ ű ă ∃ Ŝ y Ŝ NJ l ű Ŝ ű ø 2 λ y Ŏ 2 Y Ŝ ă ű NJ Ŝ l Y a*
> (S11, Aggregator)

> *á a l y l ∃ Ŝ Y Ŝ y ű Ŏ K l y ∃ Ŝ K l ă ű 2 K l LJLJ Ŝ y l ă ă 2 2 y l ă ű*
> *ű 2 ō Ŝ* (FG2, Farmer without a C project)

Confidence in government policy to reduce risk in on-farm decision-making was also a concern for the following landholder;

> *á / f Ŝ l NJ ∃ 2 Ø Ŝ NJ y Y Ŝ y ű LJ 2 f λ Ŏ è ű K l ű K l Ř ō λ LJ l NJ ű λ ă l y*
> *ø λ ű K Ŏ 2 y* (S5, Landholder without a C project)

Although it did not rank highly in the survey, some perceived that carbon farming would have a negative regional impact in the long-term and that choosing to opt out of carbon farming was socially responsible;

> *á* [Carbon farming will] have a negative legacy across *Ŧ dz ű dz NJ Ŝ f* (S20, Landholder without C project)

Some farmers responded that they were waiting for a methodology that better suited their property, specifically soil carbon gains under perennial pastures. When asked, what would motivate you to consider carbon farming? The following responses were given;

> *á a 2 y Ŝ è l y Ř* (S12, Landholder without a C project)

> *á ¢ 2 ō Ŝ NJ Ŝ ø l NJ Ř Ŝ Ř Ŧ 2 NJ ∃ 2 2 Ř f l y Ř ă ű Ŝ ø l NJ Ř ă K λ LJ Σ*
> *Ř Ŝ ă λ NJ l ō f Ŝ LJ Ŝ NJ Ŝ* (S17, Landholder without a C project) *ă Ŏ λ Ŝ ă é*

> *á { 2 λ f Ŏ l NJ ō 2 y λ ă ø K Ŝ NJ Ŝ ű K Ŝ Y l 2 2 NJ λ ű è 2 Ŧ 2 LJLJ 2 NJ ű*
> *NJ Ŝ lj dz λ NJ Ŝ l Ř λ* (S21, Landholder without a C project) *Ŏ K Φ é*

The following landholder insinuated that locking carbon in soil was a more valid way to address carbon sequestration and argued that 100 year contracts were ‘unacceptable’;

> *á . l· ă Ŝ Ř 2 y l· Ŏ ŭ dz l· f Ŏ l· NJ ō 2 y f 2 Ŏ ţ dz l· Ŏ ŭ ă Ŝ Ŏ l· Ŧ ŭ Ŏ l· f f*
> commitments for the landholders i.e. paid for the 10 years, com *Ŧ 2 NJ* (S20, *л è Ŝ l· NJ ă*
> Landholder without C project)

This landholder with a carbon project also explained he was awaiting a way to measure and be paid for soil carbon, highlighting the regional and state-wide benefits this would yield;

> *á ! y l· Ŏ Ŏ dz Ŏ ŭ ŭ Ŝ ŭ dz NJ*
> quick and cheap. Carbon can go up and down in these systems, but with good management, it only takes a small step back each time but ultimately builds. The benefits of this beside payment to the country are increased production. At the state level, this would mean a
> *NJ Ŝ Ř dz Ŏ ŭ ŭ 2 y ŭ y Ř dz ă ŭ ă ŭ 2 NJ Y ă l· y Ř ŭ K Ŝ Ŏ 2 ă ŭ ă 2 Ŧ ŭ K*
> Landholder with a C project).

3.3 Benefits of carbon farming

Only three survey respondents indicated that they thought Carbon farming produced more disbenefits than co-benefits in the short-term with four indicating the same for the long-term. On a sliding scale from -100 to +100, this resulted in an average of +46 in the short-term and +37 in the long-term, indicating that people perceived the benefits from carbon farming to wane with time but were overall positive.

Economic benefits

In terms of carbon farming producing financial benefits, most agreed with this in the short-term, but were inclined to neither agree nor disagree with this in the long-term. This is because carbon farming is highly lucrative during the 10-year crediting period. The economic benefits to individuals and community were both expressed in responses;

> “It has given large income to people on poor country where trees were going to grow regardless” (S12, Landholder without a C project)

> “We are producing more than we contracted for so are 2 years ahead in contract and we got in early with a great price” (S19, Landholder with a C project)

> *á / l· NJ ō 2 y Ŧ l· NJ Y ŭ y Ξ LJ NJ 2 Ŏ ŭ Ř Ŝ ă ă Ŝ Ŏ dz NJ ŭ ŭ è Φ ² ŭ ŭ K ŭ K Ŝ*
> *ŭ 2 y y Ŝ l· ŭ* (I2, *ŭ K Ŝ ŭ ŭ Y Ŝ Φ é* Landholder with a C project)

> *á b 2 NJ Ŝ l· f n ŭ y ŭ Ŝ ŭ ŭ Y Ŝ y* the land since the 50s, there was a little spike in the 80s, but carbon
> *Ŧ l· NJ Y ŭ y Ξ K l· ă ō Ŝ Ŝ y* (I3, *Y ŭ y Ŝ Ŏ ŭ 2 y Ŧ 2 NJ ŭ K ŭ ă Φ é* Landholder with a C project)

> *á L K Ŝ l· NJ ŭ ŭ ŭ ă Y l· ţ* (I10, *Y l· f ŭ 2 y l· NJ Ŝ ă 2 dz ŭ ó Ŝ ă ŭ é* Landholder without a C project)

> *á / l· NJ ō 2 y Ŧ l· NJ Ŝ Ř y Ξ K Ŝ l· ă Ŝ Ŏ a y 2 ŭ ŭ l· y* (I2, *Ř Ŝ Ŏ Ŝ Ř LJ NJ Ŝ ă ă*
> project)

Increased economic resilience via diversification of enterprises was expressed by the following landholder;

> [illegible] (I3, Landholder with a C project)

Economic benefits also enabled immediate investment in long-term on-farm infrastructure, for example fencing or land-forming, for increased property resilience;

> [illegible] (S27, Landholder with a C project)

> [illegible] (I2, Landholder with a carbon project)

> [illegible] (I6, Government)

> [illegible] (P62, Landholder with a C project)

The ability to hire on-farm labour and to reinvest money locally were also reportedly economic benefits.

Environmental benefits

The environmental benefits of carbon farming include the wider farm benefits associated with increased infrastructure, for example Total Grazing Pressure (TGP) fencing to keep pests out, fencing to enable holistic management via rotational grazing, water-spreading to rehydrate landscapes and reduce run-off and soil erosion, investment in more bores, and installation of a solar powered and remotely controlled trough watering system. Carbon farmers who were interviewed explained that they wanted to transition to regenerative agricultural practices via the income provided by carbon farming.

The immediate environmental benefits resulting directly from AD or HIR include habitat provision and less soil loss due to wind erosion due to retained or increased vegetation. In the survey responses to the question "will carbon farming reduce wind erosion?", the average response for the short-term impact was 60/100 on a scale of -100 to +100, while the long-term impact was 67/100, both indicating 'somewhat agree'. The following respondent explained that carbon farming could help address land degradation;

> [I am] constantly promoting the opportunities to graziers and industry bodies about how [illegible] (S21, Landholder without a C project)

While this respondent explained that the management and size of land under a carbon project determined the extent of environmental benefit;

> [illegible] (S27, Landholder with a C project)

Production benefits were also reported by the following landholders who mentioned using less chemical to get rid of woody weed and the benefit of regeneration for stock respectively;

> [illegible] [to] increase [illegible] (S14, Landholder with a C project)

> Regenerating vegetation is reducing soil loss and provides a good environment for our [illegible] (S23, Landholder with a C project).

Social benefits

The social benefits of carbon farming were mainly related to a renewed sense of a future in the rangelands. Respondents reported community benefits related to retaining people in the landscape due to increase in viability of income. Some interviewees discussed the fact that they had been able to bring their kids back to the farm with a salary. This had benefits for the whole farm with increased productivity and expansion now feasible goals due to the increased social capital.

> [illegible] to have the next generation continue to work, manage and [illegible] (S32, Landholder with a C project)

> [illegible] (I2, Landholder with a C project)

> [illegible] (K21, Landholder with a C project)

The ability to not only hire family, but to put in place a succession plan, was also a benefit, especially in the rangelands where succession was viewed as an issue by some participants. The ability to achieve goals and move the farm in a desirable direction also added to a sense of responsible stewardship and rural renewal.

Further social benefits tie back into increased investment on-farm and therefore use of local traders, suppliers and contractors. As one respondent explained;

> [illegible] farm and [illegible] evidence of this in the town, not like when you go to cotton towns, it is starting to trickle [illegible] (I8, Government)

> [illegible] (G2, Landholder with a C project)

3.4 Issues with carbon farming

While respondents on average viewed carbon farming as providing more benefits than disbenefits, they were vocal about some of the negative issues they perceived around with carbon farming. Most respondents identified more than one issue related to having and maintaining a project. For example, the following government respondent argued that carbon farming would result in negative economic, environmental and social outcomes all round;

> [illegible] as there is no change in the trajectory of the landscape in terms of productivity, structure and composition. In the guise of HIR projects, significant change in the landscape can be anticipated. These include negative biodiversity outcomes but this is somewhat dependent on the species regenerated. The long-term socio-economic outcomes of these projects is likely to [illegible] (S13, Government)

Economic issues

The main economic issue associated with having a carbon farming project was a lack of understanding and information about taxation requirements. Some landholders did not realise that carbon was taxed as off-farm income and was not considered primary production;

> “ ² K è ƛ ă y˝Ω ű ƛ ű t NJ ƛ Y l· NJ è LJNJ 2 Ř dz Ŏ ű ƛ 2 y˝ K P (Property Vegetation Plan), We have to maintain firebreaks and help monitor the project and it is only 2 y˝ 2 dzNJ t (NJ 2 LJ Ŝ W ű è K á C project) (N, Landholder with a
>
> á D 2 ű o Φ p è NJ ă ó 2 NJ ű K 2 Ŧ Ŏ l· NJ ō 2 y˝ LJ l· è Y Ŝ y˝ ű ă ƛ y˝ 2 y˝ Ŝ out, ō dz ű y˝ 2 ó ó Ŝ Ω Ø Ŝ LJ dz ű ƛ y˝ LJ f l· Ŏ Ŝ ű K ƛ y˝ Ǝ ă Σ l· Ř ƛ Ŧ Ŧ ō l· Ŏ ţ Ř l· ű Ŝ Ř LJ l· è Y Ŝ y˝ ű Ŧ 2 NJ ! 5 Σ ō dz (2, Landholder with a carbon project) ó Ŝ y˝ ű ō l· Ŏ
>
> á . è è Ŝ l· NJ н LJ Ŝ 2 LJ f Ŝ ă l· è Σ LJ f (SGD 2, Aggregator) Ř 2 y˝ Ω ű LJ l· è dz ă Σ

The following landholder explained the financial ramifications of potentially no longer being considered a primary producer via the tax department;

> á / l· NJ ō 2 y˝ Ŧ l· NJ Y ƛ y˝ Ǝ ƛ ă Ŏ f l· ă ă Ŝ Ř l· ă ó K l· ű ű f NJ Ŝ 2 Ŧ ƛ y è Ŝ l· NJ ƛ ű ó l· ă Ŏ l· LJ ƛ ű l· f ű K Ŝ y˝ н л м р ƛ ű ó l· ă y˝ 2 ű Ŏ 2 y ō dz ű ƛ ű ƛ ă ű NJ Ŝ l· ű Ŝ Ř l· ă l· ă ű 2 Ŏ ţ X 2 y˝ Ŝ LJ l· è Y Ŝ y˝ ű l· y˝ Ř ¢ K ƛ ă K l· ă NJ l· Y ƛ Ŧ ƛ Ŏ l· ű ƛ 2 y˝ ă ō Ŝ Ŏ dz ă Ŝ 2 Ŧ è 25% of Ŏ l· y˝ Ω ű ƛ y˝ Ŏ 2 Y Ŝ Ŧ NJ 2 Y LJ NJ ƛ Y l· NJ è LJ NJ 2 Ř dz Ŏ ű ƛ 2 y˝ Σ ű K Ŝ y˝ è 2 dz l· NJ Ŝ LJ dz ű Ŧ dz y˝ Ř ă ƛ y˝ ű 2 l· Ŧ l· NJ Y (FG 2, Landholders with a C project) Y l· Ǝ Ŝ Y Ŝ y˝ ű 2 Ŧ Ŧ ă Ŝ ű l· Ŏ Ŏ 2 d

Other landholders explained the lack of available and informed professional financial advice around managing carbon farming income, with one landholder paying their accountant a fee to spend time studying the requirements;

> á t 2 2 NJ Ŧ ƛ y˝ l· y˝ Ŏ ƛ l· f LJ f l· y˝ y˝ ƛ y˝ Ǝ l· Ř Ø ƛ Ŏ Ŝ X L Ǝ Ŝ ű ű K Ŝ l· Ǝ C Ŝ y˝ ű NJ Ŝ f ƛ y˝ ţ X K l· Ø Ŝ ű 2 LJ l· è ƛ ű ō (FG 2, Landholder with C project) l· NJ Ŝ LJ l· ƛ Ř Ŧ Ŧ Ŝ Ŏ ű ă ű K Ŝ f
>
> á We had two weeks to fix our tax situation so that we did not loose the bulk of the payment ű 2 ű l· È X Y 2 ă ű ă ű NJ Ŝ ă ă Ŧ dz f ű ƛ Y Ŝ 2 Ŧ Y è f ƛ Ŧ Ŝ X ó Ŝ K l· Ř Ŏ l· NJ ō 2 y˝ Ŧ l· NJ Y (12, Landholder with a NCDC project) l· È NJ dz ó Ŝ ă á

Having an enterprise that generates income for a 10 year period, but has a permanence of 100 years was viewed as a potential negative resulting from adoption of carbon farming. Many landholders and other stakeholders raised this issue during the two focus groups.

> “ ¢ K Ŝ ¢ l· È ă ƛ Ř Ŝ 2 Ŧ 2 dzNJ y˝ Ŝ ó ƛ y˝ Ŏ 2 Y Ŝ Σ Ŧ ƛ y˝ Ř ƛ y˝ Ǝ l· Ŏ Ŏ ƛ y˝ Ŏ 2 Y Ŝ ó K ƛ Ŏ K f 2 Ŏ ţ ă 2 dz (S 32, Landholders with C projects) LJ NJ 2 LJ Ŝ W ű è dz LJ Ŧ 2 NJ м л л è

Participants reasoned that once the crediting period is almost over or finished, properties with carbon farming projects will be less attractive to buyers due to having a portion of the land that comes with restrictions and generates little to no income. The saleability of properties was the key concern stakeholders held for the long-term (see Figure 9). In contrast, one aggregator mentioned that they had heard that some buyers were currently actively looking for carbon farmed properties to purchase, presumably to generate income from carbon projects;

> á { 2 Y Ŝ ō l· y˝ ţ ă ă l· è Ŏ l· NJ ō 2 y˝ Ŧ l· NJ Y ƛ y˝ Ǝ l· Ŧ Ŧ Ŝ Ŏ ű ă ű K Ŝ f
> { 2 Y Ŝ ō dz è Ŝ NJ ă Ř 2 y˝ Ω ű ó l· y˝ ű f l· y˝ Ř ó ƛ ű K Ŏ l· NJ ō 2 y˝ Ŧ l· NJ Y

> pNJ ƨ LJ Ŝ NJ ú ƛ Ŝ ă ø ƛ ú K Ŏ I· NJ ō ƨ ʏ Ŧ I· NJ Y ƛ ʏ ∃ ø K ƛ Ŏ K NJ Ŝ I· f f è
> (FG2, Aggregator)

While most respondents focused on the complexity and lack of information around carbon farming rules, some also cited negative economic outcomes that could be classed as disbenefits of carbon farming. These include potential loss of income and loss of investment in grazing (see Figure 9).

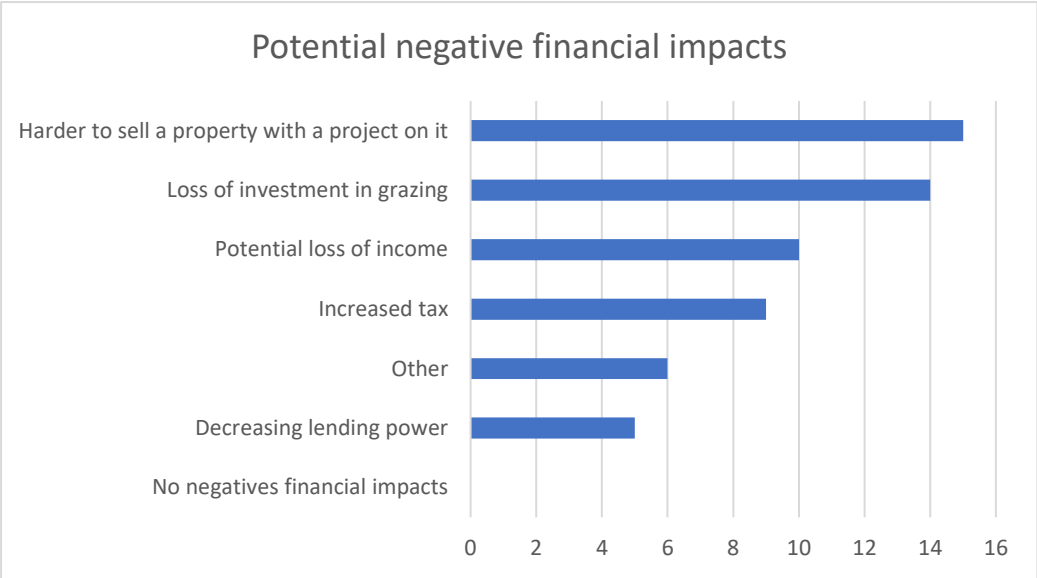

Figure 9: Accumulative scores for potential negative financial impact from carbon farming by all stakeholders

While the survey question on whether financial institutions view carbon farming as a liability or an asset only elicited six responses, more were prone to agree that it was viewed as a liability. The few banks that are more engaged with valuing natural capital were mentioned as pro-carbon farming during focus group discussions.

Many questioned whether ongoing management of carbon farmed areas would happen after the crediting period had ended if there was no further income and therefore no incentive to invest in management;

> ά [ƨ ʏ ∃ ú Ŝ NJ Y Ŏ ƨ ʏ ú NJ I· Ŏ ú dz I· f Ŏ ƨ Y Y ƛ ú Y Ŝ ʏ ú ú ƨ year Y I· ʏ I· ∃ Ŝ Y
> LJ Ŝ NJ Y I· ʏ Ŝ ʏ Ŏ Ŝ (S13, Government) ƛ NJ Ŝ Ř ά

Environmental issues

The main environmental issues associated with carbon farming revolved around the retention and encouragement of INS. The majority of survey respondents agreed that INS was likely to increase in the rangelands due to carbon farming (see Figure 10).

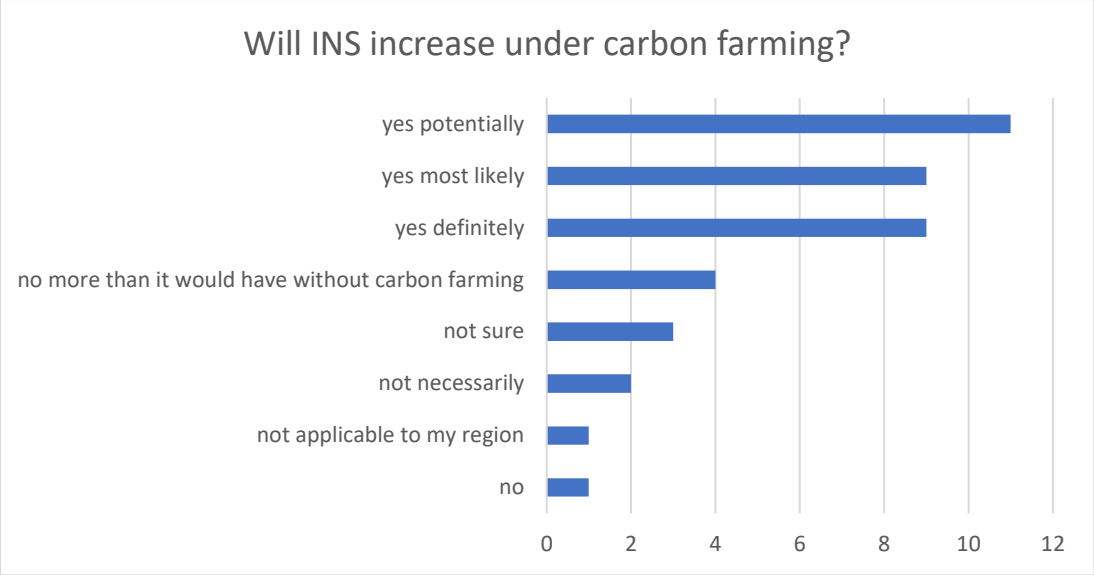

Figure 10: Accumulative scores for the impact of carbon farming on INS by all stakeholders

For many stakeholders in the rangelands, INS is associated with poor management and land degradation. For some landholders without a carbon farming project and government staff, this contradiction was a major issue in the validity of AD and HIR methodologies;

> *ά L l· Y [farming organisation] committee and have a strong interest in carbon because of the ERF & the $$100's of millions wasted on stupid projects based on not clearing land in ό Ŝ ă ű ŜNJ y S22 L [illegible] (I1, Landholder without a C project)*

> *ά ² Ŝ Ω Ø Ŝ ō Ŝ Ŝ y ű NJ è ƛ y ∃ ű 2 ∃ Ŝ ű NJ ƛ Ř 2 Ŧ would have y 2 dzNJ ű 2 ō dzNJ y ƛ ű ƛ y ű K Ŝ Y ƛ Ř Ř f Ŝ 2 Ŧ l· п p Ř Ŝ ∃ NJ Ŝ Ŝ Ř l· è ű ό 2 NJ ű K Y (I12, Landholder without a C project)*

> *“ ² 2 2 Ř è ό Ŝ Ŝ Ř ă K l· Ø Ŝ Ř Ŝ ă ű NJ 2 è Ŝ Ř ∃ 2 2 Ř f l· y Ř Σ ό K è y 2 ű 2 Ŏ 2 y ű NJ 2 f L b { Ŧ 2 NJ н л è NJ Ř G X L [illegible] (I6, Landholder without a C project) ∃ NJ l· ă*

> “I am concerned with the long-term growth of shrubs in the area, as this is/was primarily a grassland landscape. Obviously, there are issues already existing due to the past 100-50 years land management and INS encroachment. However encouraging INS growth in my opinion will be detrimental to the long-term state of [illegible] (I9, Government)

> *ά / l· NJ ō 2 y Ŧ l· NJ Y ƛ y ∃ ƛ ă y 2 ű ∃ 2 2 Ř Ŧ 2 NJ ű K Ŝ f l· y Ř ă Ŏ l· LJ ό Ŝ ă K 2 dz f Ř ō Ŝ ō NJ ƛ y ∃ ƛ y ∃ ō l· Ŏ] 2 LJ Ŝ y ∃ NJ l· ă ă è ό 2 2 Ř f*
> (I5, Government)

However, as evidenced in the survey, the threat of INS is decreased depending on how biodiverse vs monocultural the vegetation is. Stakeholders ‘somewhat’ agreed that INS is a threat as a monoculture while they neither agreed nor disagreed that biodiverse INS was a threat. As the following government representative stated, INS is complicated and, in some cases, can have positive environmental benefits;

> *á b Ŝ Ŝ Ř ű 2 ű Ŝ I· ă Ŝ 2 dz ű L b { Σ L b { ƛ y Ŏ NJ Ŝ I· ă Ŝ ƛ ă f ƛ y ʃ*
> with that stat *Ŝ Y Ŝ y ű K I· ă Ŏ 2 y Ŧ f I· ű Ŝ Ř ű K Ŝ ƛ ă ă dz Ŝ X è Ŝ ă Ŏ I· NJ ō 2*
> *y 2 ű ƛ ű ƛ ă I· ō I· Ř ű K ƛ y ∃ ƛ ă è Ŝ ű* (F612, Government) *Ŝ Ŝ y X ă 2 Y Ŝ*

Stakeholders perceived environmental issues related to carbon farming to varying degrees, but largely environmental threats were perceived to be somewhat benign in the survey. Fire was viewed as 'somewhat' of a threat to carbon farming in the long term, however respondents neither agreed nor disagreed with 'pests are harder to manage', 'weeds are harder to manage' and 'carbon farming will increase water erosion' in either the short or long term.

While fire was perceived to be a rare occurrence in the rangelands, the risk of fire with a 100year contract was discussed by some stakeholders, however it was viewed as a manageable risk;

> *á . ƛ ∃ ∃ Ŝ ă ű ű K NJ Ŝ I· ű ƛ ă Ŧ ƛ NJ Ŝ Σ ō dz ű ű K Ŝ Ŧ dz Ŝ f f 2 I· Ř Ŏ*
> *Y I· y I· ∃ Ŝ Y Ŝ y ű ώ LJ NJ I· Ŏ ű ƛ Ŏ Ŝ ă 6 ƛ Φ Ŝ Φ dz ă ƛ y* (12, Landholder) *Ŧ ƛ NJ Ŝ ō NJ Ŝ I· ʃ*
> with a C project)
>
> *á Ŝ K I· Ø Ŝ Ŧ ƛ NJ Ŝ ō NJ Ŝ I· ʃ ă Σ ă 2 Ŝ Ø Ŝ y ƛ Ŧ I· Ŧ ƛ* (N3 *Ŝ ø Ŝ y ű*
> Landholder)
>
> *á C ƛ NJ Ŝ ƛ ă I- ű Ŝ NJ Y ƛ ʃ ű 2 y I· ű K Ŝ Ø* (S1, Government) *2 y LJ NJ 2 2 Ŝ Ŏ ű ă ε*

Pest management was also mentioned as an ongoing issue with carbon farmed areas;

> *á* The issues with [carbon farming] are pest control and infrastructure management, feral goat control and fencing maintenance *é* (S10, Landholder with a C project)

For one respondent, an increase in land clearing due to carbon farming was viewed as an ironic and bad outcome for the environment;

> *á { 2 Y Ŝ ø ƛ ű K Þ Ŧ NJ 2 Y ! 5 LJ NJ 2 2 Ŝ Ŏ ű ă I· NJ Ŝ y 2 ø Ŝ y I· Ŏ ű ƛ*
> *f I· y Ř* (F6, Government) *Ŧ Ŏ ű Ŝ NJ é*

When survey respondents were asked if they viewed carbon farming as another form of 'locking up the land', the responses ranged from strongly agree to strongly disagree (see Figure 11).

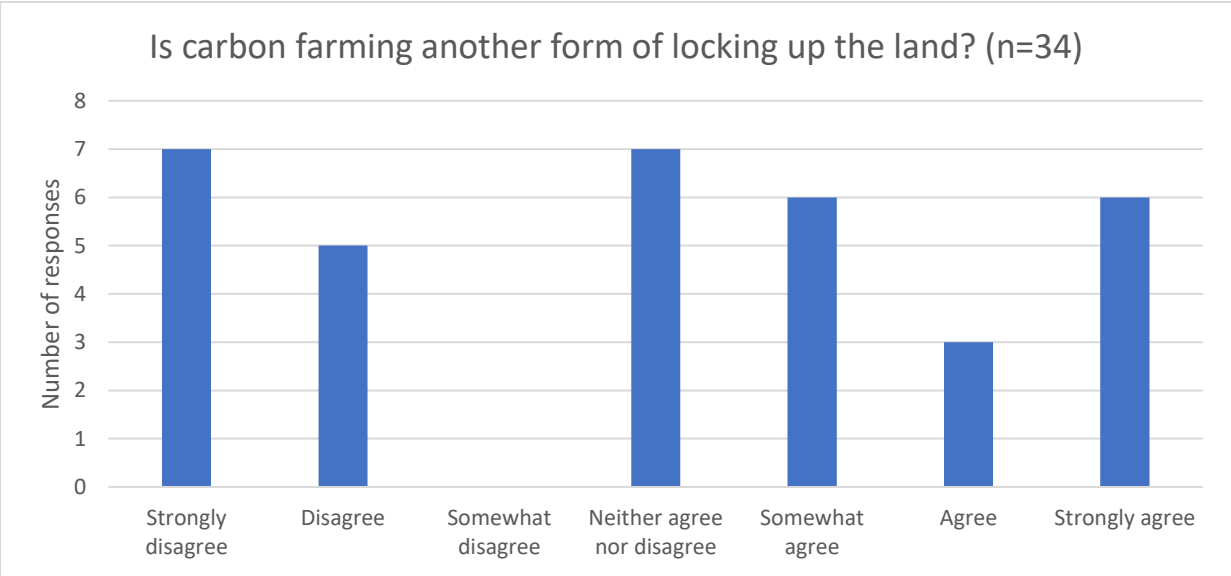

Figure 11: Perceptions of carbon farming as a form of locking up the land

When asked whether carbon farming complements or competes with grazing, an average response of 'somewhat agree' was generated. While most respondents knew that some grazing was permitted under the rules, when asked 'would carbon farming be more attractive if more grazing was permitted', on average, stakeholders agreed with this statement. Most stakeholders agreed that grazing was an important feature, especially for regeneration and soil carbon;

> *á ! y ƛ Y l· f ƛ YLJ l· Ŏ ŭ ƛ ă ŎNJ ƛ ŭ ƛ Ŏ l· f ƛ y l· K Ŝ l· f ŭ K è f l· y Ř*
> included to ensure it's having a positive effec *2 y ŭ K Ŝ Ŏ 2 dz y ŭ NJ è* (S23, *Ŝ Ŧ Φ ∃ NJ 2 dz*
> Government)
>
> *á { ŭ NJ l· ŭ Ŝ ∃ ƛ Ŏ ∃ NJ l· Î ƛ y ∃ LJNJ 2 Ø ƛ ă ƛ 2 y ŭ K l· ŭ l· Ŏ Ŏ 2 dz y ŭ ă Ŧ 2*
> *∃ NJ 2 ø ŭ K* (S27, *ŭ Government ă Ŝ ∃ ŭ*)
>
> *á L ō Ŝ f ƛ Ŝ Ø Ŝ Ř Ŝ LJ Ŝ y Ř ƛ y ∃ 2 y ŭ K Ŝ LJNJ 2 2 Ŝ Ŏ ŭ ō Ŝ ƛ y ∃*
> complimentary to agricultural production, particularly grazing management whereby production can potentially be increased while simultaneously sequestering carbon in grasslan *Ř ă* (S6, *á* Landholder without a C project)
>
> *á I L w l· f f 2 ø ă ∃ NJ l· Î it is up to farmers to manage total grazing pressure o*
> *ŭ K ƛ ă ø ƛ f f ƛ Y* (I6, *Ŝ Government*) *ŭ K Ŝ Ŏ l· NJ ō 2 y ε*

An underlying environmental issue associated with carbon farming was the lack of connectivity between the goals of carbon farming and environmental management in the rangelands. The following stakeholders argue that carbon farming is rigid and needs to take a more holistic approach to land management;

> *á L lj dz Ŝ ă ŭ ƛ 2 y ŭ K Ŝ f Ŝ ∃ ƛ ŭ ƛ Y l· Ŏ è 2 Ŧ Ŏ l· NJ ō 2 y l· ō l· ŭ Ŝ Y Ŝ*
> regrowth projects. I also feel it creates a very narrow view on the very big complex system that is land management and carbon/GHG management. This should be considered holistically. There are viable options for land management that provide mutual benefits in carbon sequestration, increased productivity and increased engagement with the country. Why not invest the time and resources into *ō Ŝ ƛ y ∃ l· ō f Ŝ ŭ 2 Y Ŝ l· ă dz NJ Ŝ* (S23, *l· y Ř ŭ K*
> Government)
>
> *á 9 Ŏ 2 f 2 ∃ ƛ Ŏ l· f LJNJ 2 Ŏ Ŝ ă ă Ŝ ă l· y Ř ă è* (I5, *Ŝ Government*) *NJ Ŝ y 2 ŭ ō Ŝ*
>
> *á ! f f LJNJ 2 2 Ŝ Ŏ ŭ natural capital for just carbon is important* *Ř Ŝ NJ* to remember with natural capital: Don *Ŝ f Ŝ ŭ LJ Ŝ NJ Ŧ Ŝ Ŏ ŭ ƛ 2 y* (S22, *ŭ K Ŝ Ŝ Y Ŝ Y è 2 Ŧ ŭ K Ŝ*
> project)
>
> *á ! f l· y Ř ă Ŏ l· LJ Ŝ K Ŝ l· f ŭ K Y Ŝ Ŏ K l· y ƛ ă Y Σ ƛ Ŧ Ŏ l· NJ ō 2 y Ŧ l· N*
> (I3, Landholder with a C project)

Some explained that there was a lack of best management practice for managing carbon farmed areas for other environmental outcomes other than carbon storage. The following government representatives explained that there was no incentive to produce biodiversity outcomes as part of carbon projects;

> *á h y ! 5 LJNJ 2 2 Ŝ Ŏ ŭ ă Σ y 2 ŭ NJ Ŝ l· f f è* (I6, *y è ŭ K ƛ*) *y ∃ ŭ 2 Ŝ y K l·*

> ά 9 Ŏ 2 ƭ 2 Ǝ ǎ Ŏ ǀ ƭ ű K ǎ ƴ ƴ ǎ ƴ Ǝ ǎ ƴ L b { ǀ NJ Ŝ ǀ ă ƴ Ŝ Ŝ Ř ă ű 2 ď
> Ǝ 2 ǎ ƴ Ǝ ű 2 Ř Ŝ ƭ ǎ Ø Ŝ NJ NJ Ŝ ǀ ƭ ō ǎ 28, Government) ǎ ű è ō Ŝ ƴ Ŝ Ŧ ǎ ű ă

Whereas another government representative viewed this as a capacity issue rather than an incentive issue;

> ά / ǀ NJ ō 2 ƴ Ŧ ǀ NJ Y ǎ ƴ Ǝ NJ Ŝ ǀj dz ǎ NJ Ŝ ă Ŧ Ŝ ƴ Ŏ ǎ ƴ Ǝ ǀ ƴ Ř NJ Ŝ Y 2 Ø ǎ ƴ
> ǀ Ŧ Ŧ Ŝ Ŏ ű L b { ǀ ƴ Ř LJ ǀ ă ű dz NJ Ŝ XY ǎ 2 ƴ ǀ ǎ (EC1, Government) Ř 2 ø ƴ ű 2 Ŏ

Social issues

Social issues related to carbon farming include perceptions of carbon farming as a threat to the rural social fabric. When asked whether they though carbon farming was a threat to a traditional way of life, responses ranged from strongly disagree to strongly agree (see Figure `12).

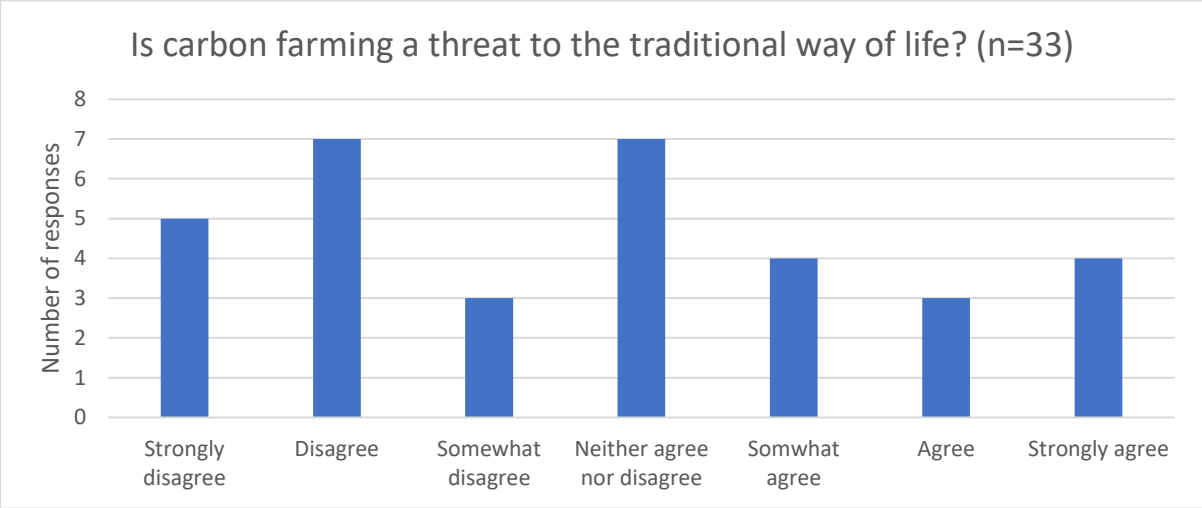

Figure 12: Perceptions of carbon farming as a threat to the 'traditional' way of life

Some respondents explained that their agreement with this statement was due to the perceived lack of compatibility between carbon farming and agricultural production;

> ά L ű K ǎ ƴ ǀ Ŏ ǀ NJ ō 2 ƴ Ŧ ǀ NJ Y ǎ ƴ Ǝ ǎ ƴ Ŏ ǀ ƴ Ř ƴ 2 ǎ ƴ Ǝ Ŝ ƭ ă Ŝ ε
> area is seen as ǎ ƴ Ŏ 2 Y Ŝ ă ű NJ Ŝ ǀ Y (S15, Service provider)

Carbon farming was also perceived as a threat due to the perceived link between increased absenteeism and carbon projects, with the majority of respondents answering 'yes' to 'does carbon farming increase absenteeism?' (see Figure 13).

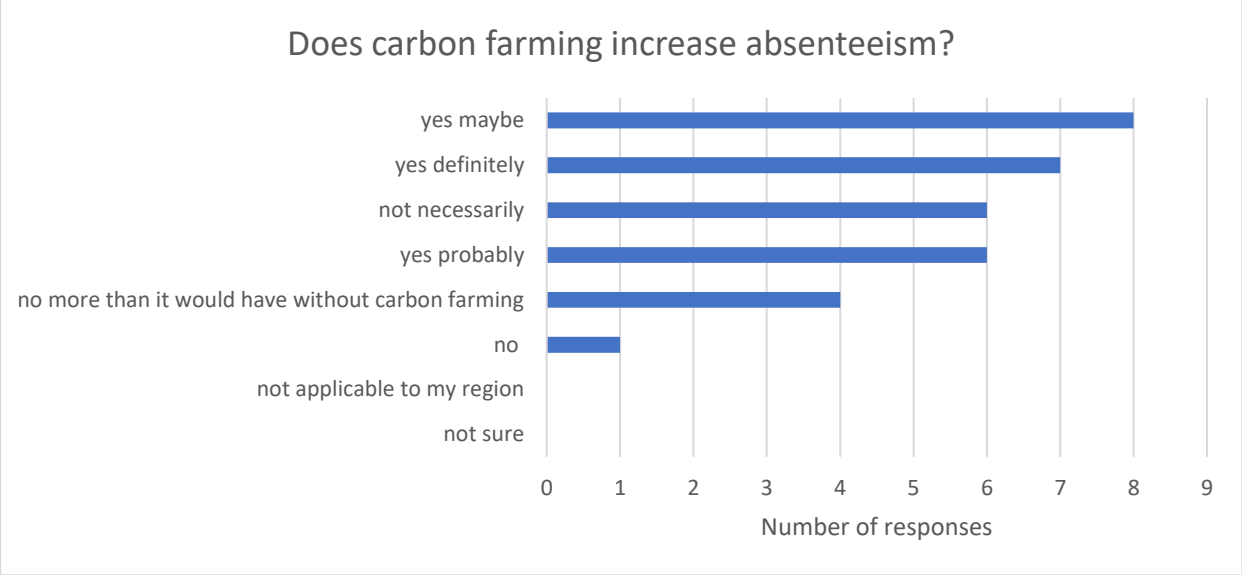

Figure 13: Perceptions of the link between carbon farming and absenteeism

This issue was also raised during interviews and focus groups;

> *á ! ō ă Ŝ y ŭ Ŝ Ŝ ƛ ă Y K l· ă y 2 ŭ Ŏ K l farming, I hear it is a bigger issue á Ŝ l· Ř dz Ŝ Ŧ dz NJ ŭ K Ŝ NJ y 2 NJ ŭ K (I3, Landholder with a C project) á l NJ Ř dz y Ř 2 dz NJ ĺ Ŝ ŭ ε*
>
> *á ² Ŝ K l· Ø Ŝ K Ŝ l· NJ Ř 2 Ŧ LJ Ŝ 2 LJ f Ŝ LJ dz ŭ ŭ ƛ y Ǝ ŭ K Ŝ ø K 2 f Ŝ LJ*
> Some even bought property elsewhere to start farm up again á (FG2, Landholder without a C project)
>
> *á / l· NJ ō 2 y Ŧ l· NJ Y ƛ y Ǝ ƛ ă Ř NJ Ŝ Ø ƛ dz á Ř K Ŝ NJ Ŝ ŭ K Ŝ (FG2, LJ 2 LJ dz Ŝ NJ ŭ*
> Landholder without a C project)

While the following respondent attributes carbon farming to absenteeism, he also attributes it to other changes in the rangelands like the Multi-tenure Act (which allowed multiple and varied land-use in the NSW rangelands);

> *á { 2 Y Ŝ LJ Ŝ 2 K Ŝ f Ŝ Ř ƛ ă Ř y ě Ω ŭ è 2 dz ă K dz ŭ Ω l· ă Ŝ y ŭ Ŝ Ŝ ƛ ă Y K l· ă y 2 ŭ Ŏ K l· ă K ƛ y l· NJ Ŝ X l· ō dz Ř è ƛ Ŧ y Ǝ NJ l LJ NJ Ř 2 Ǝ ă l· NJ Ŝ l· NJ Ŝ l· f LJ NJ 2 ō f Ŝ (FG2, Landholder with a C project) l· y Ř ƛ y*
> Increased absenteeism is true to a certain extent, the Multi-tenure Act has caused absenteeism. [Absentees] are into deer and pigs, something to shoot. The shooters block has carbon in it. Pigs are a major issue
> *2 y l· ō ă Ŝ y ŭ (I4, Landholder with a C project) á*

Absenteeism was linked with a perceived lack of active management of properties which was in turn linked with perceived rural decline with *á f Ŝ ă ă LJ Ŝ 2 LJ f Ŝ NJ dz (I3, Landholder without a C project) ŭ K Ŝ f l· y Ř ă Ŏ* a C project). Lack of active management of carbon farmed areas was recognised by a few respondents;

> *á / 2 NJ LJ 2 NJ l· ŭ Ŝ ă f 2 2 ĺ ƛ y Ǝ ŭ 2 Ŏ l· ă K ƛ y l· NJ Ŝ X l· ō dz Ř è ƛ Ŧ y Ǝ NJ l LJ NJ Ř 2 Ǝ ă l· NJ Ŝ l· NJ Ŝ l· f LJ NJ 2 ō f Ŝ (FG2, Landholder without a C project) l· y Ř ƛ y*
>
> Decreased active land management [the scheme] needs to make sure that Carbon Farming
> *Ŏ 2 y y Ŝ Ŏ ŭ ă f l· y Ř K 2 f (FG2, Landholder without a C project) Ř ō Ŝ ŭ ŭ Ŝ NJ ε*

When asked 'should carbon farming contracts require active management of a property to inhibit absenteeism', the majority of respondents ranged from somewhat agree to strongly agree (see Figure 14).

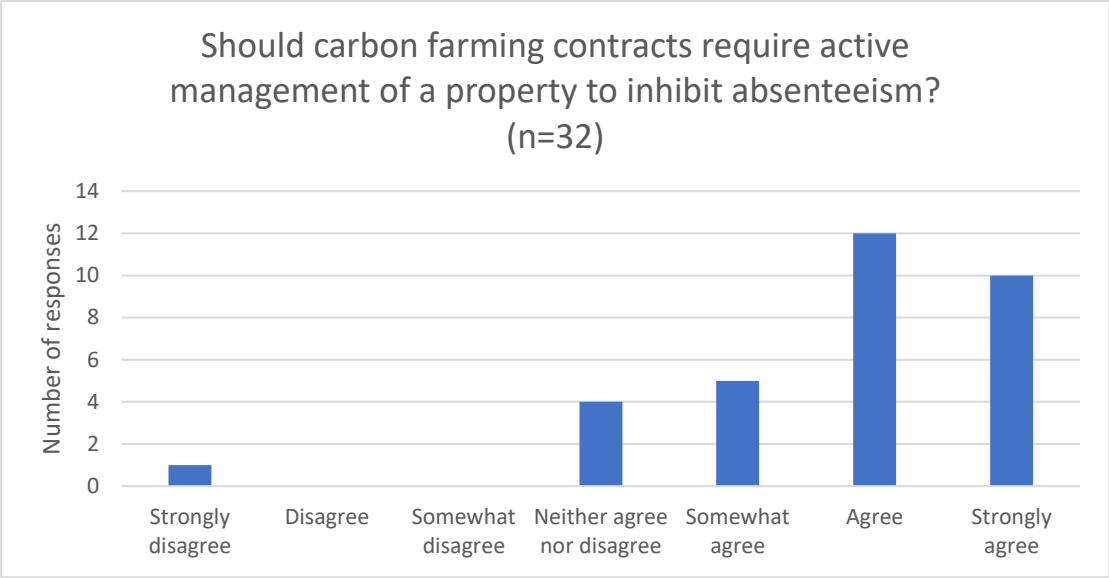

Figure 14: Perceptions of the need for an active management feature in carbon project contracts

Another social issue arising from carbon farming was local community conflict due to the divide between the haves and the have nots; those with carbon farming and increased income and those without. There was also an understanding that while only some were *á ∃NJ l· ō ō ł y˝∃ ű K Ŝ Y 2 y˝ NJdz y˝ y˝* (I9, Landholder without a C project), most were reinvesting in their property. Due to this, a sense of economic inequity was evident in some discussions and interviews;

> *á L ű ł ă ō Ŝ y˝Ŝ Ŧ ł ű Ŧ 2 NJ ű K Ŝ* (FG1, Government) *ű è Ø Ŝ NJ ă dz ă ō Ŝ y˝Ŝ*
>
> *á ¢ K Ŝ Ř 2 f f l· NJ ă ł y˝ Ŏ l· NJ ō 2 y˝ Ŧ l· NJ Y ł y˝∃ è Ŝ ű y˝ 2 NJ Ŝ ă dz f ű ¢ K Ŝ NJ Ŝ l· NJ Ŝ y˝ 2 ō 2 2 Y ł y˝∃ ō* (FG2, Service provider) *Σ ł ű Ω ă Ƨ dz ă ű y˝*
>
> *á D Ŝ y˝Ŝ l· ∃ Ŝ y˝ ű ă l· y˝ Ř ∃ NJ l· Î ł Ŝ* (I19, Landholder with a C project) *Ŝ f ł ∃ ł ō f Ŝ ε*
>
> *á { 2 Y Ŝ LJ Ŝ 2 LJ f Ŝ l· NJ Ŝ Ø Ŝ NJ è ă ű ł f f K l· Ø Ŝ ű K Ŝ ł NJ L b { Σ ō dz ű l* (I8, Government) *∃ Ŝ ű ű ł y˝∃ LJ l·*
>
> *á ¢ K Ŝ NJ Ŝ l· NJ Ŝ l· f 2 ű 2 Ŧ y˝ Ŝ ó Ŏ l· NJ ă* (I2, Landholder with a C project) *2 y˝ ű K Ŝ NJ 2 l· Ř Σ ű K*
> project)
>
> *á ώ a è* family are jealous, they are the have nots *ó* (I4, Landholder with a C project)

Two landholders in the second focus group had suggestions for a more egalitarian approach to paying farmers for carbon;

> *á ² K è ∃ ł Ø Ŝ ă 2 Y Ŝ LJ Ŝ 2 LJ f Ŝ ō dz Ŏ ţ Ŝ ű f 2 l· Ř ă K ² K è Ř 2 y˝ Ω 2 y˝ ű K Ŝ* (FG2, Landholder without a C project)
>
> *á L Ŧ Ŝ Ø Ŝ NJ è 2 y˝ Ŝ ł ă Ř 2 ł y˝∃ ł ű Σ ó K è y˝ 2 ű LJ NJ 2 Ø ł Ř Ŝ Y ł y˝ Ø 2 f Ø Ŝ Ř Σ* (I5, Landholder with a C project)

A couple of respondents expressed this conflict in terms of perceived 'double dipping' from government coffers;

> *ά { 2 Y Ŝ ώ Ŏ l· NJ ō 2 y ∓ l· NJ Y Ŝ NJ ă ϭ ∃ 2 ű Y 2 y Ŝ è ∓ NJ 2 Y* ct, *ű K Ŝ ∓ Ŝ y ó Ŝ f f ű K l· ű Ω ă* (I6, Government staff) *ř 2 dz ō f Ŝ ř λ LJ LJ λ y ∃*

> *ά ¢ K Ŝ NJ Ŝ λ ă ű K λ ă λ Ř Ŝ l· ű K l· ű ó Ŝ l· NJ Ŝ* But at Sandcare *Ψ ă Ŝ ά λ y ∃ Y 2 y LJ Ŝ 2 LJ f Ŝ ó 2 dz f Ř l· ă ʅ Σ Ψ ó K è l· NJ Ŝ è 2 dz K Ŝ NJ Ŝ Σ è 2 dz Ř 2 y* ourselves, are we *Ŝ y ű λ ű f Ŝ Ř ű 2 ∃ 2 ű 2 ∓ NJ Ŝ Ŝ Ŏ 2 dz NJ ă Ŝ ă K L Ř 2 ō NJ l· y Ř 2 Ŝ Ř ł* (R2, Landholder with a C project)

The impact this conflict has had on carbon farmers has been local social division and accusatory comments. The following landholder explains that he was called a hypocrite for retaining INS;

> *ά ώ L ϭ K Ŝ f LJ Ŝ Ř Ř Ŝ Ó Ŝ f 2 LJ ű K Ŝ L b { LJ f l· y Σ l· y Ř ă λ y Ŏ Ŝ K è LJ 2 Ŏ NJ λ ű Ŝ l· y Ř K l· Ó Ŝ ō Ŝ Ŝ y l· ă ʅ* (S4, Landholder with a C project) *Ψ ά K l· ű λ ă ű K Ŝ*

While this landholder explains the loss of friendships resulting from having a carbon project;

> *ά t Ŝ 2 LJ f Ŝ 2 dz ă ű Ř 2 y Ω ű ű l· f ʅ ű 2 dz ă l· y è Y 2 NJ Ŝ X ∓ NJ λ Ŝ y Ř l· ă ʅ l· lj dz Ŝ ă ű λ 2 y l· y Ř è 2 dz ó l· y ű ű 2* (I2, Landholder with a C project) *K Ŝ f LJ Ŝ Ó Ŝ NJ è 2 y Ŝ Σ*

In contrast others saw carbon farmers as a *ά ă Ŝ Ŏ NJ Ŝ* (I4, Landholder with a C project) who kept their success to themselves;

> *ά t Ŝ 2 LJ f Ŝ ó Ŝ NJ Ŝ LJ Ó Ŝ Ř è Ř dz NJ λ y K ∃ ű K Ŝ ∓ λ NJ ă ű ∓ Ŝ ó è Ŝ l· NJ ă LJ NJ λ Ó l· Ŏ è Ó Ŝ NJ ă dz ă LJ dz ű ű λ y ∃ λ y ∓ G2 NJ Y l· ű 2 ō l· Ŏ ʅ λ y ű 2* (F2, Landholder without a C project)

During interviews it was mentioned twice that during the charity Haydrive, carbon farmers were told they were not invited to partake and that it was for the less fortunate in the community. Likewise, a rural financial counsellor explained that she was advised by management to turn carbon farmers away;

> *ά L Ř 2 y ч ű ∃ Ŝ ű λ y Ó 2 f Ó Ŝ Ř ó λ ű K ű K Ŝ Ŏ 2 y ű NJ l· Ŏ ű ō dz ű* income and not enough income. [With] carbon farming not being Primary Production these *Ŏ f λ Ŝ y ű ă l· NJ Ŝ y 2 f 2 y ∃ Ŝ NJ Ŝ f λ ∃ λ ō f Ŝ ű 2 l· Ŏ Ŏ Ŝ ă ă ű K Ŝ* (S15, Service provider)

Feeling a sense of exclusion from parts of the community and feeling judged by others was expressed by some carbon farmers. This was often linked to the public register of projects available on the CER website (2019), where details of the project including number of ACCUs generated were visible. This meant neighbours could look up a project and estimate the income levels of carbon farmers. A handful of stakeholders mentioned this during discussions and interviews;

> If I had millions in property ownership, no one would know, but because it is carbon, everyone *Ŏ l· y ∓ λ* (I3, Landholder with a C project) *2 dz ű*

> *ά 9 Ó Ŝ NJ è 2 y Ŝ K Ŝ NJ Ŝ ʅ y 2 ó ă K 2 ó Y dz Ŏ K Ŝ Ó Ŝ NJ è 2 y Ŝ λ ă Y l·* (I5, Government)

3.5 Co-benefits

While there are a number of benefits associated with carbon farming, as previously evidenced, environmental co-benefits have the potential to be paid for via ecosystem services schemes. When survey respondents were asked if co-benefit payments would incentivise greater uptake of carbon farming, the vast majority (32 of 33 respondents) agreed that it would (see Figure 15);

ά ⁄ ƣ Ŝ ƴ Ŝ Ŧ ƛ ŭ ă Ŏ ƣ ƶ ť Ř ŭ ƛ LJ LJ ǀ (FG1, Aggregator) ŭ ƛ ƣ ƴ ƛ ƴ Ŏ ǀ NJ ō ƣ ƴ

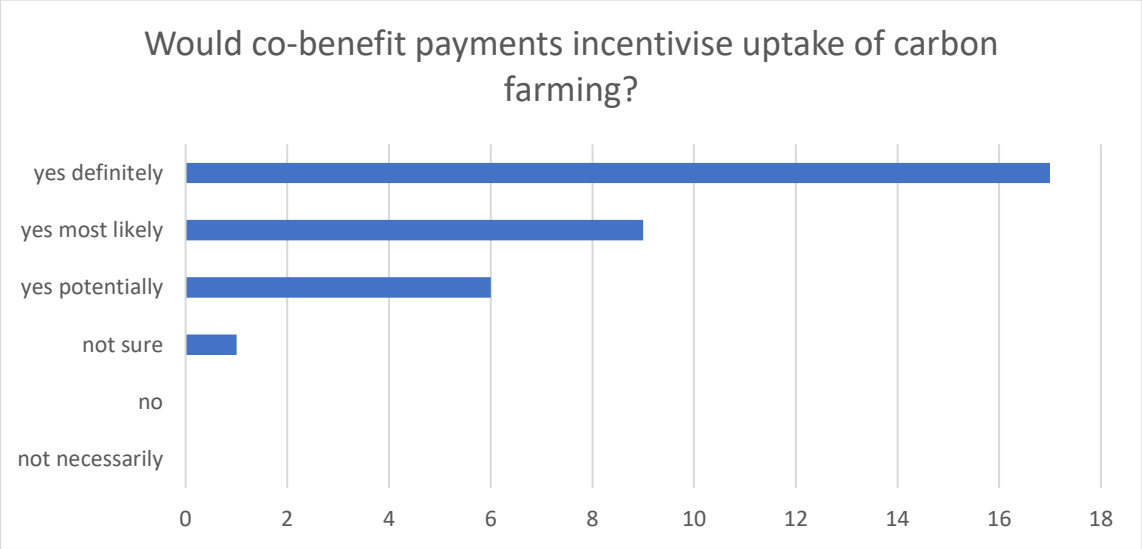

Figure 15: Responses to the question, would co-benefit payments incentivise uptake of carbon farming? (n=33)

Survey participants were asked to rate different features that could attract a co-benefit payment. The most popular were payments for soil retention, biodiversity and water quality, while co-benefit payments for scenic beauty/landscape aesthetics were deemed to be less attractive (see Table 3). This could be due to the production benefit associated with improved environmental outcomes.

Table 3: Average ratings for attractiveness of co-benefit payments

Co-benefit	Payment attractiveness rated out of 100
Reduced soil loss	79/100
Biodiversity	79/100
Improved water quality	76/100
Scenic beauty/Landscape aesthetics	58/100

Co-benefit payments were viewed as crucial by some respondents who argued that without these payments, carbon farming would lead to land degradation in the landscape;

> *ά L Ŧō Ŝ Ŏ ƣ Ŝ Ŧ ƛ ŭ LJ ǀ è Y Ŝ ƴ ŭ ă Ř ƣ ƴ Ω ŭ K ǀ LJ LJ Ŝ ƴ ŭ ƣ ƛ ƴ Ŏ Ŝ ƴ ŭ ƛ Ø Ŏ ǀ NJ ō ƣ ƴ Ŧ ǀ NJ Y Ŝ Ř ǀ NJ Ŝ ǀ ă ø ƛ ť ť ō Ŝ ŭ (K6, Government) Ř Ŝ ∃ NJ ǀ Ř Ŝ*
>
> *ά I L w K ǀ ă LJ ƣ ŭ Ŝ ƴ ŭ ƛ outcomes. It should have more specific parameters according to the landscape in which it is being applied, so that landholders are rewarded for regenerating species with co Ŝ ƴ Ŝ (F13, Government)*

The following government researcher explained that without co-benefit payments, there was no incentive to manage these areas effectively beyond the contracting period;

> [illegible] benefits would ensure management post-contract period. Should landholders be paid for biodiversity in addition to carbon? This could make opportunities for growing more carbon because the CER do not know what to do with the 100 [illegible]
> (FG2, Government researcher)

While the following government representative explained that there was a lack of information available on environmental co-benefits;

> [illegible] benefits from carbon farming are less documented and highlighted. The information that is available promotes carbon farming projects as a good opportunity for carbon sequestration and receive payments for it. The co-benefits should also be highlighted so that in the long-term there are also ecological outcomes from e.g. natural regeneration and re [illegible]
> (S26, Government)

Beyond co-benefits, some stakeholders explained that they though a carbon payment scheme needed to be much broader and more holistic in approach;

> [We need] a whole farm planning method that takes into account all carbon stored across the landscape i.e. soil, forest, stock etc and measured as a change over time from multiple [illegible] (S15, Aggregator)

> We need to understand carbon as part of the whole farm system and generate carbon [illegible] (FG2, [illegible] Landholder without a carbon project)

3.6 Uncertainty and risk

Of the nine landholders who responded to the survey and who had a carbon farmed project, four indicated that they had experienced no complications so far. Of the other five, two mentioned increased risk and increased uncertainty, while one mentioned increased stress related to increased uncertainty. The risk of going into carbon farming over other enterprises was ranked by only a handful of survey respondents (n=5) as these questions were directed towards landholders with carbon farming projects and aggregators and were deleted during the question cut back process mid-project. On average these few respondents ranked 25year contracts as 'less risky' and 100year contracts as 'somewhat risky'. As the proceeding respondent identified;

> [illegible] between a 25yr project and a 100yr project, and [illegible] yet the risk factor is markedly different. (T17, Government)

When survey respondents were asked how worried they were about their financial liability at the end of a project if carbon was not sequestered, as well as their responsibility if there was a short-fall in carbon, responses ranged from 'slightly worried' to 'not worried at all'.

The unknowns and complexities inherent in the scheme and the associated potential risks were discussed by respondents as key themes in all research methods. Signing a legally binding contract for at least a 25year period in light of this uncertainty was a key barrier, concern and issue for all

stakeholders. For some, the complexity of carbon farming made decision-making using unknown variables a challenge;

> [Carbon farming] is [illegible] (FG2, Landholder with a C project)

> [illegible] (S12, Aggregator)

Feelings of uncertainty were directly related to a lack of confidence in government policy, and the ERF's framework and methodology;

> [illegible] (S11, Government)

> [illegible] government policy uncertainty (election coming up), drought, technical restrictions, [illegible] (S11, Aggregator)

> [illegible] have found that there is a lot of uncertainty in the future direction of carbon farming (Government policy). The framework that projects are based on is a bit sketchy, you don't look a gift horse in the mouth [illegible] (S19, Landholder with a C project)

> [illegible] long-term uncertainty [illegible] (FG2, Landholder with C project)

As the last two quotes conclude, accepting uncertainty and mitigating risks are aspects of carbon farming that carbon farmers have had to accept. Likewise, aggregators also explained that they have to operate in a similar fashion;

> [illegible] (FG2, Aggregators)

For aggregators in particular, the methods available and applicability of methodologies in the landscape were key weaknesses of the program;

> [illegible] (S18, Aggregator)

> [illegible] requirements increasing costs and [illegible] (S72, Aggregator)

> [illegible] (S18, Aggregator)

> [illegible] at, can we sequester carbon on 120ha? We could be accessing carbon more than we [illegible] where there is not much carbon in the system and the landholder is constrained by [illegible] (FG1, Aggregator)

> [illegible] Aggregator)

Uncertainty related to drought and worsening conditions in the rangelands also shaped risk perceptions;

> [illegible] Landholder with a C project)

> *ά L b { λ ă Ř è λ y∃ λ y ű K λ ă Ř NJ 2 dz ∃ K ű Σ ó K l· ű K l· LJLJ Ŝ y ă* farmers financi*l· f f è* (FG2, Government)

Uncertainty and a lack of understanding carbon pricing and carbon markets, as well as the ramifications of a potential global market, were also cited as issues;

> *ά t NJ λ Ŏ Ŝ 2 Ŧ Ŏ l· NJ ō 2 y λ ă l· ű K* (S1, Landholder with a C project) *but the Second Project is Ŧ λ È Ŝ Ř ō l· ă Ŝ Ř 2 y* (I3, Landholder with a C project)

> *ά ώ L Ω Y 6 Ŏ 2 y Ŏ dŜ ŭ dz NJ Ŝ Ř Y l· ō N 2 ŭ dz Ŝ ŭ ă Ŧ l· y Ř* (S19, Landholder with a C project)

Uncertainty and risk around meeting contract obligations was a key topic of discussion. Most stakeholders had questions regarding requirements of contracts and the long-term viability of contracts;

> *ά ² K l· ű ă 2 NJ ű 2 Ŧ Ŏ 2 y ű NJ l· Ŏ ű ă l· f f 2 ó ó K l· ű ă 2 NJ ű 2 Ŧ ∃ N* obligation if the *Ŏ l· NJ ō 2 y λ ă* (V5, Government) *λ Ŝ Ø Ŝ Ř K ε*

> *ά ² K l· ű K l· LJLJ Ŝ y ă λ Ŧ ű Ŝ NJ* a 100 year contract, how are the next 90 years *∃ dz l· NJ l· y* (I6, Government)

> *ά ² K l· ű K l· LJLJ Ŝ y ă λ Ŧ L ó l· y ű ű 2 ō NJ Ŝ l·] Y è Ŏ 2 y ű NJ l· Ŏ* contracted obligation? (FG2, Landholder without a C project)

In response to this, one landholder in the second focus group discussion brought up a case in Queensland where landholders had been taken to court, had their contract revoked, and had to pay back a percentage of the revenue.

During the second focus group, this last question was discussed with a government representation stating *ά è 2 dz Ŏ l· y 2 LJ ű 2 dz ű 2 Ŧ м л л* years in your contract *Ŝ l· NJ Ŏ 2 y* (ά 20% carbon *y Ř Ŏ K Ŧ l· NJ Y λ y ∃* however an aggregator responded *ά y 2 è 2 dz Ŏ l· y Ω ű*. This exchange *K l· ű l· y è Y* and discussion around changes to taxation during the CFI-ERF period, led to some respondents claiming *ά K 2 ó Ŏ l· y ó Ŝ Y l· y l· ∃ Ŝ NJ λ ă] λ Ŧ ű K Ŝ* (FG2, Landholder *Ŝ 2 ă ű ă l· N* with a C project).

Uncertainty related to the behaviours of financial institutions in response to carbon farming now and in the future also added to a sense of confusion;

> *ά D NJ Ŝ è l· NJ Ŝ ŭ l· λ ŭ 2 ŭ Ŝ Ŝ NJ ō K λ Ŏ K ō l· y] ă Ř 2 y Ω ű* and *λ* [illegible] *K 2 ó Ř 2 NJ λ ă* (I4, Landholder with a C project)

While the following landholder explained that the benefits and risks were still unknowns due to the relative infancy of the program, although some red flags were emerging;

> *ά ¢ K Ŝ ō Ŝ y Ŝ Ŧ λ ŭ ă y* project/providers *NJ Ŝ* along with government agencies that think that carbon farming [has] unrivalled benefits and no risk going forward should be held to account in the immediate term. As the benefits/risks have not been properly appraised as the data both environmentally, socially and financially will not be in for some years to come. Some red flags are starting to emerge that may only be realised once the creation period & (income producing years) are fulfilled in the form of "good tenure'" and saleable income. Along with this is a much greater risk of the availability of finance from bank and other financial institutions to present & future property's that have a carbon abatement contract on it for a considerable amount of time post the income years from a CER contract. It is a fact that

> the bank lending to property's with carbon abatement contract already installed upon them will only lend for the period that a CER contract is in place. Post this period the owner will be required to submit mo[illegible] (S34, Landholder with C project)

Aggregators in this landscape were largely trusted and respected by other stakeholders. The survey revealed that all landholders with carbon farming projects and aggregators were sharing risk and indicated that risk sharing was ranked 'very important' to their business. Aggregators were noted for their personal approach, hiring local people, listening to landholders and conducting intense on-the-ground monitoring of carbon projects;

> [illegible] and school days and are always at the show. They tick the trendy box, they employ on values and have employed local people. When they come out to conduct vegetation surveys they [illegible] (I6, [illegible] Government)

As previously mentioned, a key factor in this landscape that mitigated uncertainty and motivated adoption was the shared risk and partnership between landholders and aggregators.

3.7 Information quality and quantity

All stakeholders (minus aggregators due to their assumed knowledge) were asked to rate their knowledge of carbon farming. Out of 100 points, the average score was 57, indicating that the need for information is average amongst these respondents – some were very familiar while others rated their knowledge very poorly. On average, service providers (n=3) rated their knowledge 30/100; government officers (n=9) rated their knowledge 49/100; government researchers (n=2) rated their knowledge 92/100; and landholders without a C project[1] (n=11) rated their knowledge 52/100. For better uptake there is much room for improving information and knowledge of carbon farming across the landscape.

Of those with carbon projects, most found out about carbon via a direct approach from aggregators (5) or aggregator promotion (2); others found out via neighbours (3) and other land managers (1); rural service providers also informed landholders (2), with only one landholder citing government (LLS/DPI/OEH/DoEE) as the instigator for carbon farming. Another landholder stated they had learnt about carbon farming first through a private regenerative agriculture consultancy, Resource Consulting Services (RCS). For all stakeholders, the survey found that rural financial advisers were the main source of information, followed by aggregators/carbon service providers and 'other' (which was usually espoused to be a form of self-research on the internet) (see Figure 16).

[1] Due to an oversight in the skip logic of the survey, Landholders with a C project were not asked this question.

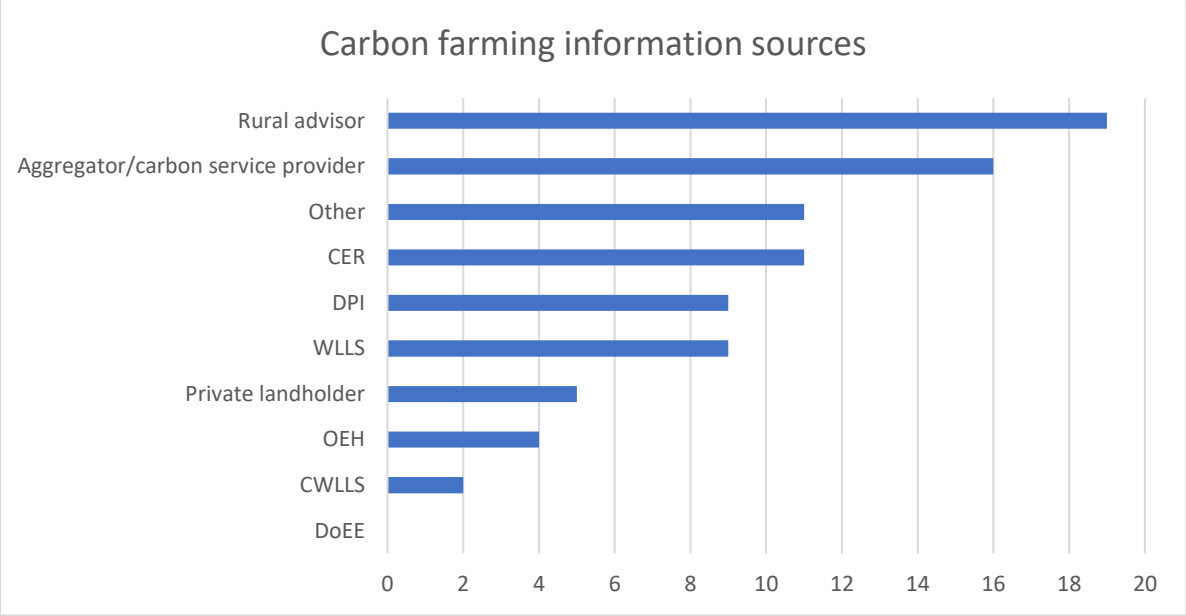

Figure 16: Sources of information on carbon farming

We also asked respondents to rank information from each of these sources on a scale of 0-100 in terms of both quantity and quality of information provided (see Table 4). Central West LLS followed by CER followed by Western LLS were ranked as having the best quality information in comparison to the other sources, while Western LLS, DPI and Central West LLS were ranked as providing the most information in comparison to other sources.

Table 4: Sources of information ranked by quantity and quality provision

Information source	Quality (ranked out of 100)	Quantity (ranked out of 100)
Central West LLS	66	65
Clean Energy Regulator	56	49
Western LLS	55	68
Department of Primary Industries, NSW	53	67
Aggregators/Carbon service providers	52	55
Department of Environment and Energy	51	55
Private landholders	51	52
Rural advisers	35	33
Office of Environment and Heritage, NSW	25	32

Overall, the highest rankings for quality and quantity of information were 66/100 and 68/100 respectively. Therefore, Table 4 depicts a huge gap in quantity and quality of information, with no excellent, independent sources listed by participants. This lack of information was expressed by the following respondent;

> *á ! Ǝ ƎNJŜ Ǝ l· ű 2NJă l·NJŜ 2dzű ű K ŜNJŜ ű 2 Y l· ʮ Ŝ l· ōdzŎ ʮ Σ ű*
> government have no capacity, NRM bodies (in QLD) are conflicted, the State Government has only recently become engaged" (FG1, Government)

Most interestingly, comparing Figure 16 with Table 4 uncovers a high discrepancy in information; while rural advisers were the most consulted source regarding carbon farming information, they were also ranked second to the bottom in terms of quantity (33/100) and quality of information (35/100) on offer. This points to landholders seeking advice from accessible advisers in the landscape only to find a dearth of advice on carbon farming. This point was raised during the first focus group;

> *" ² ƛ ű K 2dzű ƛ y Ŧ 2NJY l· ű ƛ 2 y Σ ű K ŜNJŜ ǿ 2 y Ω ű ō Ŝ LJŜNJY ƛ ă ă*
> trusted advisor level" (FG1, Aggregator)

One service provider also noted this in the survey responses;

> *á L NJŜ l· f f è y Ŝ Ŝ Ř ű 2 ʮ ƛ 2 ǿ ʮ 2 ű Y 2 NJŜ l ō 2dzű Ŏ l·NJ ō*
> *¢ K Ŝ ƛ YLJ l· Ŏ ű ƛ ă Ø l·NJ ƛ 2dz ă l· y Ř L K l· Ø Ŝ (S15, Service ű K Ŝ ō Ŝ y*
> provider)

This is a key stakeholder group which could be targeted for information dissemination. Rural advisers are in need of carbon farming literacy so that they can provide planning and management advice that integrates carbon farming. This would be of great benefit to landholders and potentially increase uptake of carbon farming.

CWLLS was rated the best in terms of quality and quantity about carbon farming, however this source was used and ranked by only two landholders who did not have carbon farming projects. While the majority of landholders in this study resided in the Western Division, only 2 of the 15 landholders living there sought information on carbon farming from the Western LLS. In terms of the type of information provided, Western LLS provided;

> *á ! ǿ l·NJŜ y Ŝ ă ă 2 Ŧ ű K Ŝ Ŝ È ű Ŝ y ű 2 Ŧ Ŏ l·NJ ō 2 y Ŧ l·NJY ƛ y Ǝ T*
> *Ŝ È ű Ŝ y ă ƛ 2 y Ŝ Ø Ŝ y ű ă ǿ K ƛ (S8, Government Researcher) Ŏ l·NJ ō 2 y Ŧ l·NJY ƛ y*
>
> *á 9 Ø Ŝ y ű ă ű K l· ű LJNJ 2 Ø ƛ Ř Ŝ Ř l· Ŏ Ŏ (S13, Government) 2 ű K ŜNJ ƛ y Ŧ 2NJY*
>
> *á ¢ Ŝ Ŏ K y wledge in the Western Division is there, but there are social problems with*
> *Ǝ Ŝ ű ű ƛ y Ǝ ƛ ű 2 (FG1, Government) y Ř K 2 f Ř ŜNJ ă ε*

Other government staff explained their lack of capacity for advising on certain aspects of carbon farming;

> *á ! ă l· Ŧ 2NJY Ŝ Ŝ 2 ǿ ŜNJ Y Ŝ ű and financial knowledge of the*
> implications of carbon farming. This information is difficult for us to find" (S13, Government)

> *á ² Ŝ K l· Ř ă 2 Y l· y è f l· y Ř K 2 f Ř ŜNJ ă l· ă ʮ ƛ y Ǝ dz ă any Ø ŜNJ è ű*
> of which remain uncertain to this day. There was a dearth of impartial knowledge in the
> *f l· y Ř ă (S8, Government)*

> *á L y Ŧ 2NJY l· ű ƛ 2 y ƛ ă l· y ƛ ă ă dz Ŝ ƛ y ű K ƛ ă NJŜ Ǝ ƛ 2 y Σ ǿ Ŝ*
> carbon methodologies and contract requirements" (S17, Government)

> *á t NJ 2 Ř dz Ŏ Ŝ NJ ă ó ł f f 2 Ŏ Ŏ l· ă ł 2 y l· f f è Ŝ y lj dz ł NJ Ŝ l· ō 2 dz ú Ŏ* concepts and provide further resources and contacts if they wish to explore further. Similar *ó ł ú K 2 ú K Ŝ NJ Ǝ 2 Ó Ŝ NJ f Y Ŝ y ú ă ú l· Ŧ Ŧ Φ é* (S23, Government)

This lack of capacity in government to provide required knowledge was explained by some as a lack of *á ă ú NJ l· ú 2 dz ú Ŏ 2 NJ 2 ó Ŝ K l· f Ŧ 2 Ŧ (FG2, Government). Another government representative explained, á L y Ŝ l· NJ f è Ř ł Ŝ Ř ó K Ŝ y L Ŧ 2 dz y Ř 2 dz ú ú K l· ú ó Ŝ NJ Ŝ ł y 2 dz NJ NJ Ŝ Ǝ ł 2 y X (FG2, Government). This was similarly reflected in responses from landholders;*

> *á ² K Ŝ NJ Ŝ Ř 2 è 2 dz Ǝ 2 ú 2 Ŧ 2 NJ ł y Ŧ 2 K C l· NJ Y Ŝ NJ ă l· NJ Ŝ y 2* who knock on their door, maybe even gullible. There was no one to go, only two LLS staff had *l· y è] y 2 ó f Ŝ Ř Ǝ Ŝ (I27, Landholder with a C project)*

Most rated aggregator information quantity and quality very high, while a few low scores dragged the averages down – those who tended to rate them highly tended to be landholders with carbon projects. Reasons for these high scores are provided below;

> *á* They are up to date with current government regulations and inform me on most changes to *ú K Ŝ Ŏ l· NJ ō 2 y ă Ŝ Ŏ ú 2 NJ l· y Ř (S19, Landholder with a C project)*

> *á* [We provide information on] eligibility criteria, project requirements and restrictions, ongoing management of a carbon project, access to markets, revenue forecasts, project *LJ NJ 2 LJ 2 y Ŝ y ú NJ Ŝ lj dz ł NJ Ŝ Y Ŝ y ú ă Σ l· Ŏ Ŏ Ŝ ă ă ú 2 Y (S11, NJ] Ŝ ú ă l* Aggregator)

Although, a lack of financial advice, as mentioned previously, was still an issue for some who sought answers from aggregators;

> *á ώ ! Ǝ Ǝ NJ Ŝ Ǝ l· ú 2 NJ 6 Ŏ 2 dz f Ř y 2 ú Ǝ ł Ø Ŝ dz ă Ŧ ł y l· y Ŏ ł l· f l· Ř* (I2, Landholder with a C project)

In the survey respondents were asked where they would go for more information if a new method became available. Aggregators listed DoEE, CER, and specialists whereas landholders listed aggregators/Carbon service providers, LLS, DPI, Carbon Link and the National Farmers Federation (NFF). However, one landholder suggested that Landcare should be used as a conduit for such information;

> *á ² 2 dz f Ř LJ NJ Ŝ Ŧ Ŝ NJ l· y 2 NJ Ǝ l· y ł ă l· political and not for profit as this [l· y Ř Ŏ ó 2 dz f Ř ł y ă ú (I1, Landholder without a C project)*

Topics that landholders wanted more information on varied greatly, but these revolved mostly around financial advice and understanding contractual arrangements and options;

> *á [2 y Ǝ ú Ŝ NJ Y ă ă Ŝ Ŏ dz NJ ł ú è 2 Ŧ Ŏ 2 y ú NJ l· Ŏ ú l· y Ř (S5, LJ l· è Y Ŝ y* Landholder without a C project)

> *á / 2 ă ú Σ LJ 2 ú Ŝ y ú ł l· f ł y Ŏ 2 Y Ŝ Σ NJ dz f Ŝ ă l· y Ř NJ Ŝ Ǝ ă Σ f 2* criteria, land suitability, time line, risks, measurements, sequestration rates in region and cost of measurements, management requir *Y Ŝ y ú Σ ł Y LJ l· Ŏ ú 2 y Ŧ dz NJ Ŝ ă l· t (S20, Landholder without a C project)*

> *á L Ŧ ű K Ŝ NJ Ŝ ø l· ă Y 2 NJ Ŝ ƛ y Ŧ 2 NJ Y l· ű ƛ 2 y 2 y ű l· È NJ dz f Ŝ ă LJ Ŝ 2 LJ f Ŝ l· ă ţ ű K Ŝ NJ ƛ Ǝ K ű (FG2, Aggregator) y ă 2 y Ŏ Ŝ ű K Ŝ è Ǝ Ŝ ű*
>
> *á { LJ l· ű ƛ l· f f è Σ ø K Ŝ NJ Ŝ ƛ ă ű K Ŝ Ŏ l· NJ ō 2 y K ² K l· ű ă 2 NJ ű 2 f ƛ ţ (FS2, Landholder without a C project)*

The following landholder suggested that the whole program needed careful explanation to build confidence in the whole program;

> *á L y Ŧ 2 NJ Y l· ű ƛ 2 y y Ŝ Ŝ Ř ă ű 2 ƛ y Ŏ f dz Ř Ŝ f Ŝ Ǝ l· f ă Ŝ Ŏ dz NJ ƛ ű è*
> Aggregators, CER, methodologies, Frameworks, ERF, basic understanding of carbon and why a tree can hold it and why it equals dollars. Need to be shown it is a bonafide system. Need information on the pros and cons of having an aggregator manage your project vs doing it
> *è 2 dz NJ ă Ŝ f Ŧ é (S4, Landholder with a C project)*

Understanding management requirements was also explicitly mentioned by some stakeholders;

> *á a*
> are understanding of what is allowable under a carbon farming project and how to actively manage the carbon estimation areas to ensure transition into forest cover. Clarity from the Clean Energy Regulator on their stance on carbon leakage and what is allowed vs exclusion
> *l· NJ Ŝ l· ă ø 2 dz f Ř l· ă ă ƛ ă (S11, Aggregator) K 2 f Ř Ŝ NJ ă Ǝ NJ Ŝ l· ű f è Φ é*
>
> *á L Ŧ ø Ŝ Ŏ 2 dz f Ř Y l· ƛ y ű l· ƛ y Ŏ dz NJ NJ Ŝ y ű Ŧ l· NJ Y ƛ y Ǝ LJ NJ l· Ŏ ű ƛ Y l· y l· Ǝ Ŝ ű K Ŝ Ŧ l· NJ Y ō è (S13, Landholder without a C project) 2 y Ŏ NJ Ŝ Ř ƛ ű ă Φ*
>
> *á ² K Ř Ŝ ă ō Ŝ ă ű Y l· y l· Ǝ Ŝ Y Ŝ y ű LJ NJ l· Ŏ ű ƛ Ŏ (FS2, Landholder without a C project) f ƛ ţ Ŝ 2*

However, the following landholder insinuated that clarity in information at the local scale was needed;

> *á ! ű l· K ƛ Ǝ K f Ŝ Ø Ŝ f ƛ but when you try to look into more detail around cost, methods, measurement and potential economic benefit the detail becomes clunky and Ř ƛ Ŧ Ŧ ƛ Ŏ dz f ű ű 2 dz y (S6, Landholder without a C project) Ř Ŝ Ŧ ƛ ű ƛ Ø Ŝ f è Φ é*

Stakeholders also wanted more information on soil carbon methodology and co-benefits;

> *á a 2 NJ Ŝ ƛ y Ŧ 2 NJ Y l· ű ƛ 2 y l· y Ř ă dz LJ LJ 2 NJ ű ƛ ă NJ Ŝ lj dz ƛ NJ Ŝ Ř Ŧ 2*
> carbon and co-
> *ō Ŝ y Ŝ Ŧ ƛ ű ă NJ Ŝ f l (S8, Government researcher) K Ŝ l· f ű K é*
>
> *á Ω { 2 ƛ f / l· NJ ō 21 y*
> page at a glance info sheet to give enough information to
> *Ŝ y Ŏ 2 dz NJ l· Ǝ Ŝ Ǝ Ŝ (S15, Service provider) Ŝ ƛ y Ŧ 2 é*

3.8 Validity of carbon farming as a tool to address climate change

In closing comments in all research methods, some respondents offered thoughts on the validity of carbon farming as a means of addressing climate change. The following stakeholders questioned the motive behind carbon offsetting in general;

> *á L ă ƛ ű ø K l· ű ƛ ă ō Ŝ ă ű Ŧ 2 NJ f l· y Ř K 2 f Ř Ŝ NJ ƛ (S16, h NJ ű K*
> Government)
>
> *á L ƛ ű K Ŝ f LJ ƛ y Ǝ ű 2 Y l· (S2, Service provider) ō Ŝ ű ű Ŝ NJ LJ f l· y Ŝ ű K é*

> *ά L K I· Ø Ŝ I· LJNJ 2 ō t Ŝ Y ø ƛ ű K ō Ŝ ƛ y ∃ LJ I· (FGB, Landholder Ř 2 ƛ ű ó C*
> without a C project)

While the proceeding respondents viewed the scheme as beneficial at both a national and regional scale;

> *ά / I· y y 2 ű NJ Ŝ I· Ŏ K I· y è t I· NJ ƛ ă (S18, Landholder)*

> *ά / I· NJ ō 2 y Ŧ I· NJ Y ƛ y ∃ ƛ ă 2 y Ŝ 2 Ŧ ű K Ŝ ō Ŝ ă ű Ŏ 2 y Ŏ Ŝ LJ ű ă*
> (S10, Landholder with a C project)

4. Discussion: creating an enabling environment for carbon farming

4.1 Social cultural acceptance and local perceptions

Understanding how carbon farming has been received in the rangelands landscape of NSW presents a complex, layered and nuanced narrative. The impacts and issues are multifaceted and wide ranging, covering the economic, environmental and social dimensions of rural land-use change. Opinions about the role of carbon farming in the rangelands were divided on almost every issue. However, the immediate and dramatic impact it has had on people, landscapes and livelihoods since the CFI started in 2011 is undeniable.

Economically, carbon farming has 'upped the ante' and provided huge reward for those who were willing to take the gamble. Many referred to this as a much-needed injection of cash into the local economy. Individually, landholders have diversified enterprises and incomes, spreading risk and increasing farm-level resilience. Reinvestment in grazing infrastructure and environmental works on properties has been fast-tracked, and some farmers are using income to buffer and realise a transition towards a regenerative agricultural system. Being able to afford labour, contractors, machinery, and property expansion were enabling improvements to the farmscape. While there may need to be more time before there is evidence of a regional economic benefit – at this stage these benefits are largely visible on farm (hiring family members) and to a much lesser extent, in community (buying materials to improve infrastructure from local traders). Whether carbon incomes were being felt in the wider community was contested, with some saying the trickle-down effect had not yet really been felt. However, the on-farm sense of security and renewal provided through this income was bringing children back to working on the farm and inspiring long-term goal-setting and succession planning.

However, the huge economic returns also created a perceived division in the community between those who were eligible for a project and those who weren't. The contrast between those with lucrative incomes and those struggling to survive in the landscape had created local unrest and resentment. Due to this carbon farmers reported being formally and informally excluded from community events like the Haydrive in Cobar and made to feel like they didn't deserve other pockets of government funding, such as those provided through Landcare and LLS.

While economic returns offered a huge positive, the downside of this was the complex taxation rules attached to carbon farming, general lack of awareness about these rules and the lack of professional financial advice about carbon farming available in the community. In the case of AD, 100 years' worth of income was being paid up front over 10 years, however this income was being taxed as yearly income. There are questions here for the Australian government who are effectively gleaning back much of the income in huge tax returns. Furthermore, carbon farming income was not considered to

be 'on-farm' income or primary production. With landholders having to prove at least 55% of yearly income being generated from on-farm income in order to be considered a primary producer, the huge yearly lump sum payments were nullifying primary producer status. This then had ramifications for carbon farmers when trying to prove productive value of capital assets to financial institutions, implications for insurance eligibility, and excluded these farmers from accessing farm-offset accounts and rural financial hardship counselling.

The lure of economic returns from carbon farming had also sparked another perceived local phenomenon, increased absenteeism. Reports of corporates, 'George St' farmers, and other opportunists buying up properties to lock into carbon or putting existing properties entirely under carbon farming, were anecdotal but rife. This was linked to perceptions of social, environmental and productivity decline due to a perceived lack of active management required for carbon farming on absentee-owned lands (Jassim, 2018). The actual impact of carbon farming on absenteeism would need to be closely interrogated to cancel out other contextual reasons for absenteeism.

While other studies (Dumbrell et al., 2016; Torabi et al., 2016b; Fleming et al., 2019) found economic incentives to be secondary motivators to get into carbon farming, behind environmental and production benefits, in this study economic incentive dominated motivations, with secondary motivations related more to perceived compatibility with existing enterprises and long-term goals. Whereas environmental and production benefits of carbon farming were recognised, the economic benefits enabled progress towards environmental and production goals across the whole farmscape.

Similarly, while political and policy uncertainty was found to be the key barrier to entering carbon farming in other studies (Dumbrell et al., 2016; Kragt et al., 2017; Salas Castelo, 2017), this study identified that eligibility and perceived incompatibility with existing enterprises were cited by landholders without a project as the key barriers to adoption. Pannell et al. (2006) has stressed how perceived incompatibility with existing farm operations, along with other perceptions of trialability, act as universal barriers to adoption of new innovations. Beyond these barriers, a lack of information and therefore understanding of the scheme and its variations and complexities has also inhibited widespread adoption. Program attractiveness (characteristics and design) was low due to this lack of clarity and transparency, both factors that are crucial when trying to assess compatibility (Torabi et al., 2016a; Liu et al., 2018).

In this landscape a key feature in the uptake of carbon farming was the strong presence of a handful of aggregators. In contrast to Jassim's (2018) finding that landholders in QLD lacked an 'honest broker', it was found in NSW that the aggregators that were present built trust, reputation and integrity within the community. The effort of aggregators to generate networks based on trust, their presence in the landscape, their extensive monitoring of sites, their ethical business values and their risk-sharing practices were all integral to them becoming the key instigator of adoption. Further to this, aggregators targeted early adopters who then helped others adopt. These findings confirm Torabi et al.'s (2016a) assertion that local networks and trust are key structural aspects that can enable or disable uptake of carbon farming. However, while aggregators were one of the most common sources of information on carbon farming, they were perceived as providing a lower quality and quantity of information than Local Land Services (LLS) and the Department of Primary Industries (DPI), indicating that there is still work to be done by aggregators in building trust with communities affected by carbon farming.

Other than the community divisions caused by uneven changes in income, another key issue which instigated division in perceptions of carbon farming was related to mixed understandings of INS as either good or bad for the rangelands. Perceptions around bad management now being rewarded

generated bewilderment and resentment in the community. Understandably, for many landholders carbon farming represented an about-turn in policy. Instead of incentivising the removal of INS (which continues to happen via LLS), suddenly it was worth millions, but only if you had filled out the paperwork before July 2010. This policy flip coupled with restrictions on eligibility maddened community members who personally felt the inequities inherent in the roll-out of the program. A lack of focus on soil carbon and rewarding practices which had a positive impact on soil carbon compounded this feeling for some. While AD and HIR were viewed as encouraging INS, soil carbon was viewed as encouraging native pastures and was perceived to have better win/win results for production and environment.

This lack of universal eligibility, coupled with a lack of available and accessible information led to miscommunications and mistrust within the community. This then results in negative community narratives circulating around adoption of carbon farming, inhibiting local acceptance amongst non-adopters and strengthening the divide with adopters (Torabi et al., 2016b; Jassim, 2018). A lack of impartial information can exacerbate the long-lasting impact of these narratives (Liu et al., 2018).

Further to this, local acceptance of a carbon offsetting scheme should also align with the overarching logic behind the scheme. Dumbrell et al., (2016) found that landholders who had some experience with the Carbon Farming Initiative (CFI) (the predecessor of the ERF), and who had experienced the negative effects of climate change, were more likely to adopt carbon farming practices. Dumbrell et al., (2016) also found that only 35% of respondents in their survey agreed that carbon farming was an appropriate way to address climate change. While this was not explored in this study, some respondents did mention that reliance on offsetting as a way to combat climate change was not an appropriate or timely response. Beyond this, basic belief in climate change and therefore climate change mitigation was viewed as a barrier to local acceptance;

> *á 9 f ƛ ∃ ƛ ō ƛ f ƛ ŭ è ƛ ă l· ō l· NJNJ ƛ Ŝ NJ Σ ō dz ŭ ă 2 Y Ŝ l· NJ Ŝ Ŝ f ƛ ∃ Ŏ K l· y ∃ Ŝ l· y Ř ŭ K Ŝ ă Ŏ ƛ Ŝ y Ŏ Ŝ 2 T (FG1, Government researcher)*

While this study did not explore climate change 'beliefs', Berry et al., (2018) found that, in the NSW rangelands, a 'belief' in climate change is not necessarily a pre-requisite for instigating local actions that aid with adaptation, increase socio-ecological resilience, and provide a range of other local benefits and co-benefits.

4.2 Incentivising and securing long-term gains via co-benefit payments

Social acceptance and increased uptake of carbon farming could be instigated through promoting payments for co-benefits. Co-benefits such as increased biodiversity, increased ground cover, soil health and water quality have high potential to be delivered alongside carbon mitigation on carbon farmed sites (Lin et al., 2013; Evans, 2018; Baumber et al., 2019). Some research states that promoting the environmental co-benefits of practices or framing carbon farming outside of financial incentives will help increase adoption (Dumbrell et al., 2016; Kragt et al., 2017; Fleming et al., 2019). While we agree that this may be the case, we take the position of Torabi et al. (2016b) who state that payments for these co-benefits as ecosystem services on top of existing carbon payments will actually incentivise carbon and biodiversity outcomes and potentially create an enabling environment for rapid uptake. Rather than just promoting co-benefits, they need quantifying, valuing and payment for long-term, ongoing management and success. Torabi et al. (2016b) found that the most attractive arrangement for landholders would be a scenario under which contract participation was not for a specific timeframe and through which carbon and biodiversity credits were stacked (as opposed to bundled).

Co-benefit payments are especially important for overcoming perceived barriers to adoption and disbenefits of carbon farming. These payments would ensure that carbon farmed areas are actively managed in a way that maintains and improves ecosystem processes and stock and flow of services. This would counter the perception that carbon farmed areas can be locked up and left to become degraded blights on the landscape. Co-benefit payments could also consider the whole farming system and could reward good land management across the landscape. With current methodologies for soil carbon estimation in the rangelands regarded as impractical, co-benefit payments could value practices that improve soil health including carbon storage. This would improve social acceptance via increased eligibility for payment and therefore greater spread of economic benefit resulting in a more egalitarian program.

Most crucially for AD and HIR projects, co-benefit payments would guarantee the continuation of carbon farmed areas beyond the crediting period (when income and aggregator risk sharing ends) and these parts of the landscape would remain assets long into the future. In this way properties would be more valuable and asset-rich, giving incentives to buyers and financial institutions to positively value carbon farming. While it is hopeful, ongoing payments for co-benefits could potential retain carbon sinks beyond the life of ERF contracts, contributing to emissions reduction into perpetuity.

4.3 Information needs

Stakeholders expressed a strong need for impartial information, advice and knowledge of carbon farming. This study clearly shows that the quality and quantity of available information is severely lacking in the rangelands. While there is more support and advice available now than there was in 2011, aggregators reported that even people with carbon farming projects still had many unanswered questions. Provisioning this information gap should be a key priority of the government going forward. The following is a list of information needs as expressed by participants. This list could be used to help develop a decision-making tool for landholders:

- Financial information – for example, ATO tax requirements, accountants with experience with carbon farming
- Information on revoking contracts and range of consequences for not meeting carbon contract obligations
- Information on aggregator types, different contract types and different schemes
- Time frame models and step-by-step procedures on what to do to instigate and register a carbon farming project
- Prioritisation maps at a landscape level – what levels of carbon storage are possible where? What areas should we prioritise for both carbon and co-benefits? Which co-benefits?
- Calculator to see potential return on carbon based on very rough estimates
- Scenario modelling to help identify risks and actions to mitigate risks
- Aids for decision-making processes
- Carbon footprint calculator to calculate carbon emitted vs sequestered on the farm – (this could be used as a marketing tool or for management decisions)
- Market updates and information on entering other carbon markets
- Markets for co-benefits
- Best management practice for different methodologies in different contexts – also for targeting specific co-benefits
- A grazing pressure calculator to optimise management of HIR areas
- More information on markets for carbon neutral products, for example beef

- Whole farm system case studies – how and why was carbon pursued, what did the journey to registering a project look like, management plans for carbon areas, where and how was money reinvested into the property, how were diverse enterprises managed, what challenges arose and how they were overcome
- Energy calculator to determine adaptation and mitigation on the farm
- Regular updates on important functions and new methods
- A dedicated discussion forum for posting and answering questions, sharing information

5. Conclusion and recommendations

This study aimed to understand motivations and barriers for adoption of carbon farming, to identify benefits and disbenefits and to identify information needs. It was found that a combination of environmental, economic and social perks and pitfalls shaped the realisation of carbon farming in the NSW rangelands. Differing perceptions, different values, perceived conflicts, regional renewal, rural decline, confusion, complexity, uncertainty, risk and a dearth of information shaped the views of respondents. In order to facilitate improved access to carbon markets, there are a number of recommended actions that could be taken by the government:

- A demystification campaign is required to provide clarity and reduce confusion and miscommunications around carbon farming. This could be in the form of a Q&A with a panel made up of a range of key stakeholders including a representative from a financial institution. This could be filmed and uploaded to Landcare websites and distributed widely via social media. A blog series based on answering key questions that emerged through this research would also be beneficial.
- Actively working to improve the carbon-farming literacy and capacity of rural advisors and financial advisors as a key information source that could help to demystify carbon farming.
- A myth-busting campaign that addresses negative narratives and brings together the 'haves' and 'have nots' could help mend local divisions.
- Clear information about generating ACCUs from soil carbon and the practical limitations of this methodology in the rangelands.
- Development and promotion of best management practice for co-benefits – this could be promoted through provision of short training courses and also promoted via Landcare.
- Promote co-benefit payments in terms of incentivising best management practice and ensuring ongoing value and income generation from carbon project sites.
- Develop a set of social indicators to measure social benefits – this could include assessing labour hours, measuring the extent and benefit of new infrastructure on the farm, the formulation of a succession plan or long-term goals, the impact of carbon farming on the community - Jassim (2018) suggests that Social Impact Assessments should be used to determine impact on and benefits for the community.
- Development of a tool for improving carbon market access should include interactive functions for landholders.
- Explore the potential for clusters/collective areas to engage in cross-property projects to increase returns on carbon and co-benefits and reduce transaction costs.
- Explore community suggestions for policy improvement, improved program design, and improved roll-out strategies.

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