Environmental Science and Policy 73 (2017) 115–123

Contents lists available at ScienceDirect

Environmental Science and Policy

journal homepage: www.elsevier.com/locate/envsci

Motivations and barriers for Western Australian broad-acre farmers to adopt carbon farming

Marit E. Kragt[a,b,c,*], Nikki P. Dumbrell[a,1], Louise Blackmore[a,c]

[a] UWA School of Agriculture and Environment, University of Western Australia, Crawley, WA 6009, Australia
[b] Centre of Environmental Economics and Policy, University of Western Australia, Crawley, WA 6009, Australia
[c] Centre of Excellence for Environmental Decisions, University of Western Australia, Crawley, WA 6009, Australia

ARTICLE INFO

Keywords:
Climate change mitigation
Carbon farming
Emissions reduction policies
Land management
Policy adoption

ABSTRACT

Carbon farming policies aim to contribute to climate change mitigation, but their success strongly depends on whether landholders actually adopt desired practices or participate in offered programs. The Australian Government's Carbon Farming Initiative and Emissions Reduction Fund policies were designed to incentivise the adoption of carbon farming practices. Although these policies have been active since December 2011, farmer engagement has been limited, and net emissions reductions low as a result. We surveyed broad-acre farmers in the Western Australian wheatbelt to explore their drivers and barriers to adopting carbon farming practices and participating in carbon farming policy programs. Drivers of adoption included knowledge and perception of co-benefits (for yield, productivity, and the environment), knowing another adopter, and believing that changes to farm management are an appropriate method to reduce Australia's greenhouse gas emissions. Barriers to adoption included lack of information, uncertainty and costs. The key barrier to participation was policy and political uncertainty. The determinants of adoption and participation that we identify in our study offer important insights into how to best ensure the success of Australia's land sector-based climate change policies. We conclude that, to increase landholder engagement, the co-benefits and climate change benefits of carbon farming practices must be actively promoted, and additional information is needed about the costs associated with adoption. Information diffusion is best achieved if it actively leverages landholder social networks. Finally, our results indicate that landholder buy-in to carbon farming could be greatly enhanced by achieving more continuity in Australian climate change policies and politics.

1. Introduction

Carbon farming programs aim to combat climate change by encouraging land managers to adopt 'carbon farming practices'. These practices may involve either sequestering carbon in soils/vegetation, or reducing emissions. To sequester carbon in vegetation, land managers can plant trees, protect remnant vegetation, restore native vegetation or reforest degraded lands (Evans et al., 2015; Polglase et al., 2013; van Kooten et al., 1999). Sequestration in soil can involve adopting minimum or no-till cropping, retaining crop residues, or increasing the amount of land under pasture relative to crop (e.g. Grace et al., 2010; Kragt et al., 2012; Sanderman et al., 2010). To achieve emissions reductions, farmers may change fertiliser management, implement savannah/crop residue burning regimes, and manure management; or reduce methane emissions from livestock and rice production (Howden and O'Leary, 1997; Thornton and Herrero, 2010).

Technical assessments show considerable (global) potential for such changed agricultural practices to mitigate climate change, and at low costs (Canadell and Schulze, 2014; Crossman and Bryan, 2009; Evans et al., 2015; Lal, 2004). This has increased political optimism about the potential for the agricultural sector to abate greenhouse gas emissions. In Australia, for example, the conservative Liberal-National coalition proposed that the agriculture/land sectors could, by 2020, sequester at least 150 million tonnes of CO_2 equivalents (CO_2e) in agricultural soils annually for a price of $10 per tonne of CO_2e (The Coalition, 2010). In 2011, the Australian Government introduced a package of climate change mitigation policies that included the Carbon Farming Initiative (CFI; Parliament of the Commonwealth of Australia, 2011). The CFI allowed farmers and other land managers to earn carbon credits through approved sequestration or emissions reductions activities (DCCEE, 2012). Farmers and land managers could then sell the carbon credits in the voluntary carbon offset market (DCCEE, 2012). To be

* Corresponding author at: M089/35 Stirling Highway, Crawley, WA 6009, Australia.
E-mail addresses: marit.kragt@uwa.edu.au (M.E. Kragt), nikki.dumbrell@adelaide.edu.au (N.P. Dumbrell).
[1] Present address: The Centre for Global Food and Resources, Level 5, 10 Pulteney Street, The University of Adelaide, SA 5005, Australia.

http://dx.doi.org/10.1016/j.envsci.2017.04.009
Received 4 November 2016; Received in revised form 16 March 2017; Accepted 13 April 2017
Available online 28 April 2017

approved, mitigation activities had to meet three key criteria: additionality (the activity was not required by law or already a common practice activity), leakage (the activity did not increase emissions elsewhere in the economy), and in the case of sequestration, permanence (the activity could store carbon in the long-term) (permanance requirement; DCCEE, 2012). Once approved, eligible activities were called ‘methodologies’. After a change in government in 2013, the CFI was incorporated into a new policy: the Emissions Reduction Fund (ERF; Parliament of the Commonwealth of Australia, 2014). The ERF operates across the whole Australian economy, not just within the land sector. The ERF uses a reverse auction scheme whereby the government purchases mitigation from project participants, who offer varying quantities of mitigation and prices per tonne of CO_2e. The government purchases mitigation from the lowest-cost providers.

As of the 6th of May 2016, 348 ERF projects had been contracted by the government (Clean Energy Regulator, 2016). Project participants funded by the ERF include commercial carbon abatement providers, energy companies, businesses, indigenous land corporations, local councils and a few individual farmers (Clean Energy Regulator, 2016). The majority of the contracted projects (185) are vegetation projects, such as regenerating native forests, reforesting cleared lands, or establishing permanent native-species plantations on cleared land. A further 146 projects are emissions avoidance projects such as capturing and combusting methane gas from landfill (86 projects) or early dry season savanna burning (47 projects). Only 17 agriculture projects were contracted: 7 soil carbon sequestration and 10 emission avoidance projects.

A mandatory statutory review of the original CFI found that during its lifetime (during which farmers received a carbon price of about $23/t$CO_2$e) Australia’s greenhouse gas emissions fell by 10 million tonnes of CO_2e (an average rate of approximately 2.5 million tonnes per year; Climate Change Authority, 2014). Only 5% of this emissions reduction came from vegetation-based projects, and just 1% from agriculture. The quantity of abatement achieved was well short of what some had proposed the agricultural sector could deliver. For example, Lal (2004) states that soil carbon sequestration can be a win-win mitigation strategy that could offset 5–15% of global fossil fuel emissions. The amount of abatement provided by the CFI has partly been restricted by the relatively slow approval of methodologies, thereby limiting the range of activities for which credits could be claimed, especially in the first years of the CFI (Climate Change Authority, 2014). Other constraints were policy uncertainty and doubt about the future price of credits (Climate Change Authority, 2014). Although some authors have analysed how the CFI policy’s characteristics could present barriers to its success (e.g. Macintosh, 2013; Thamo and Pannell, 2015), little work has been done on the importance of farmer engagement with the scheme. Carbon farming policies have received political support, but their ultimate success will depend on improved adoption of carbon farming and participation in the policies by land managers. Understanding farmers’ drivers and barriers to adopt and participate in carbon farming is therefore vital for future policy success.

In this paper, we provide an evaluation of the drivers and barriers that affect the uptake of carbon farming by broad-acre farmers in Western Australia (WA). Our approach explicitly recognises the importance of stakeholders in shaping policy implementation. We draw on quantitative and qualitative information from farmer surveys to identify the key factors that drive engagement with carbon farming. Finally, important implications for the design and implementation of carbon farming policies are identified.

2. Literature review – farmers’ adoption of new practices

A landholder’s involvement in carbon farming can involve adopting a carbon farming practice and/or participating in a carbon farming policy program. We define *adoption* of carbon farming as a landholder changing their behaviour to land use or management practices that can capture carbon in soils or vegetation for long periods of time. Adopting carbon farming does not necessarily entail participation in a formal carbon farming policy scheme. We define *participation* in carbon farming as a landholder carrying out land management changes for climate change mitigation within the framework of a formal carbon farming policy program, administered by a government or other agency.

In this section, we briefly review the main themes from the literature on adoption and participation in a land management context. The main factors that drive the adoption of land management practices include characteristics of: (1) the land management practice itself; (2) the farm or landholding; (3) the farmer or landholder; and (4) the context, most particularly the social context. A category that becomes relevant in the case of participation in land management programs is (5) characteristics of the program.

2.1. Characteristics of the practice

Two key characteristics of practices that impact their uptake are (i) the relative advantage they offer compared to the practices they supersede, and (ii) how easy they are for landholders to trial within their existing farming system (Pannell et al., 2006). Additionally, adoption is more likely where relative advantage encompasses multiple benefits (e.g. financial advantages, productivity gains, and environmental benefits; Moon and Cocklin, 2011; Rogers et al., 2012). Reimer and Prokopy (2014) find that participation in incentivised conservation programs is strongly driven by environmental benefits, even more so than to financial incentives.

2.2. Characteristics of the landholding

Certain characteristics of the landholder’s property can also impact their adoption of new practices or participation in programs. For example, numerous studies indicate that farm size and profitability are positively associated with adoption (e.g. Prokopy et al., 2008; Rodriguez-Entrena et al., 2014) and participation (e.g. Atari et al., 2009; Bremer et al., 2014; Ma et al., 2012). Microclimatic conditions and natural resource endowments can play a role in the participation decision, as does farm type because some farm types (e.g. cropping farm versus livestock farm) may be more suited to different conservation activities (Atari et al., 2009).

2.3. Characteristics of the landholder

Socio-demographic or attitudinal characteristics of the landholders exposed to the particular practice or program can play a role in the adoption and participation decisions. Socio-demographic characteristics include education, income, agricultural training, years of farming experience, and having children who will ultimately inherit the property (Atari et al., 2009; Prokopy et al., 2008; Rodriguez-Entrena et al., 2014). Important attitudinal characteristics include a farmer’s attitude towards their own knowledge and skill, towards the environment, conservation, and climate change, as well as perceptions of future risks and financial conditions (Bremer et al., 2014; Greiner and Gregg, 2011; Greiner et al., 2009; Markowski-Lindsay et al., 2011; Morgan et al., 2015; Prokopy et al., 2008). For example, Markowski-Lindsay et al. (2011) observe that family forest owners in Massachusetts are more likely to participate in carbon markets if they believe that forests can help reduce the impact of climate change. Also, it has been shown that positive environmental attitudes and environmental awareness can be positively associated with adoption of agricultural best management practices (Prokopy et al., 2008).

2.4. Characteristics of the context

The context in which a particular practice or program is situated could be defined in different ways; social, geographical, political,