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Motivations and attitudes influence farmers' willingness to participate in biodiversity conservation contracts

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ABSTRACT

Increasingly, voluntary conservation programs are targeted at farmers to contribute to biodiversity conservation through tailored on-farm conservation activities. Such programs are part of a growing suite of agri-environmental or payment-for-environmental services schemes, which can be an effective and efficient way of complementing the formal nature reserve system, provided they attract sufficient participation. In countries with little or no experience with such schemes there is an absence of observable participation behaviour and the use of stated choice methods is required to inform program design. This research employs the theory of planned behaviour to help explain attitudinal and motivational influences on farmers' choices to participate in conservation contracts. The paper reports the findings of a choice experiment involving farmers – more specifically pastoralists and graziers – across north Australia's rangelands. The experiment gauged their willingness to participate in conservation contracts and estimated the influence of contract attributes, business characteristics and personal aspects. Personal aspects included motivations and attitudes, for which constructs were derived from Likert-type scales through factor analysis. Latent class modelling was used to illustrate the various influences of motivations, attitudes and preferences on stated contract participation. The findings assist in tailoring the design, negotiation and roll-out of PES-style conservation initiatives for farmers in northern Australia to incentivise participation. The research highlights the opportunity for paid-for private conservation on parts of large pastoral stations and the need for contract tailoring to biodiversity requirements while responding to the motivations and attitudes of landholders and land managers. It also emphasises the key role that suasion measures play in shaping biodiversity-relevant attitudes and consequently participation by landholders in private conservation.

1. Introduction

The expansion and intensification of agriculture is a root cause of biodiversity decline worldwide (Wood et al., 2000). Agriculture triggers fundamental changes in ecosystems, affecting in particular plant species composition, vegetation structure, soil chemistry, and consequently the fauna depending on these ecosystem fundamentals. To safeguard some ecosystems and associated biodiversity, governments in many countries have set aside land for the purpose of biodiversity conservation and designated a system of protected areas and national parks, thus limiting the expansion of agriculture and other forms of development. While successful in the preservation of some species at the local and regional scales, this strategy by itself, however, is generally unable to provide systematic biodiversity conservation because of inadequate size and connectivity of conservation areas, and coverage of ecosystems (Margules and Pressey, 2000; Mora and Sale, 2011; Rands et al., 2010). In recent decades, some countries have started to enlist the help of farmers in the biodiversity conservation effort, by encouraging and subsidising the re-creation and restoration of farmland habitats and land use practices that enhance biodiversity on private land (Morris and Potter, 1995). Such agri-environmental schemes (AES) have been particularly prevalent in Europe and northern America (e.g. Baylis et al., 2008; Primdahl et al., 2003). Conceptually, AES are payments-for-environmental-services (PES) schemes, which have also gained widespread traction in developing countries (Pattanayak et al., 2010; Wunder et al., 2008).

For AES to be effective and make a discernible and positive difference to biodiversity, programs have to achieve sufficient participation by farmers across a landscape (Merckx et al., 2009). It is often assumed that achieving sufficient area coverage is simply a question of available scheme funding, based on the neoclassical economic theory that farmers are profit maximisers and will therefore adopt a different land use practice or participate in an AES if

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the conservation payment is sufficiently high to compensate for resulting opportunity and transaction costs, and deliver a financial advantage. Analysis of participation in AES in the USA, Europe, Australia and South America has shown that the level of stewardship offered to landholders as part of a conservation contract is only one consideration influencing the participation decision (Bremer et al., 2014; Sorice et al., 2013). Other contract features also influence participation, including duration of contracts, whether and how they influence land tenure security and whether there is an option to exit the contract (Broch et al., 2013; Espinosa-Goded et al., 2010; Sorice et al., 2011). Personal factors also influence participation. There have been reports of widespread 'cultural' resistance by farmers to participation in AES (Burton et al., 2008; Defrancesco et al., 2008) while research into AES participation across Europe found that conservation orientation was equally as important as financial motivation (Wilson and Hart, 2000). Personal factors include values, attitudes, motivations and perceptions and various social–psychological models and theories have been developed to explore and explain their influence on farmer behaviour (Beedell and Rehman, 2000; Burton, 2004; Greiner and Gregg, 2011; Johansson et al., 2013; Reimer and Prokopy, 2014).

In Australia, AES have been offered in some regions to deliver priority environmental outcomes such as biodiversity conservation and water quality protection. With some notable exceptions, in particular Victoria's BushTender program (Stoneham et al., 2003), many have proved both ineffective and inefficient as they have been unable to entice sufficiently high rates of adoption of conservation practices by private landholders (Hajkowicz, 2009). One explanation is that they ignored key adoption factors such as the influence of non-monetary contract attributes and the characteristics of the target audience.

There is a need for new AES to be implemented in northern Australia, which still holds vast natural assets, including a diverse endemic flora and fauna (Woinarski et al., 2007b). Here, land use practices associated with over-grazing, changed fire regimes and spread of exotic plant and animal species are causing widespread environmental degradation and biodiversity decline and the formal conservation estate is insufficient to safeguard the biodiversity into the future (Garnett et al., 2010; Woinarski et al., 2007b). The vast majority of land is managed by farmers – pastoralists and graziers – who could join the conservation effort by being incentivised to implement on-farm conservation actions and biodiversity-friendly land use practices (Greiner et al., 2009a). If AES-style conservation programs in northern Australia are to be effective, their design needs to be guided by a comprehensive understanding of relationship between land use practices and biodiversity, and the factors that influence farmers' participation in AES. Policy design that considers the personal dimensions of decision making is likely to be more effective than policy that ignores these factors (Manner and Gowdy, 2010; Ahnström et al., 2009).

This paper contributes to the literature on a number of levels. It reports the results of empirical research to support an understanding of the personal dimensions governing northern Australian farmers' land use decisions. It tests theories about motivational and attitudinal influences on farmer behaviour. It also reports the results of a choice experiment and illustrates and quantifies the association between different types of farmer motivations and attitudes and willingness to participate in AES for biodiversity conservation.

In Section 2, the paper showcases the geographical setting of the research and farming systems, and provides a synopsis of the literature on the role of motivations and attitudes in decision making. Section 3 details the social survey and choice experiment conducted and data analytical methods employed. Section 4 details and interprets the research findings. Section 5 offers discussion of the findings and concludes with recommendations for AES design in the case study context and more generic sense.

2. Background

2.1. Geographical context: the tropical savannas of northern Australia

Tropical savannas are grassland ecosystems with or without tree/shrub cover and cover around 1.9 million km^2 of land right across the Australian continent. Australia has about one-third of remaining tropical savannas globally (Woinarski et al., 2007b). While they may appear relatively intact compared to landscapes in other parts of Australia, their ecological condition and some components of biodiversity have widely declined since European settlement (Lewis, 2002). Land use practices, in particular over-grazing, changed fire regimes and spread of exotic plant and animal species are causing widespread environmental degradation and biodiversity decline (Woinarski et al., 2007a, 2011).

The prevalent land use system is extensive cattle grazing. The combination of low soil productivity, seasonally restricted water availability, highly variable rainfall and hot summer temperatures restrict crop and horticulture production to small pockets of land. Grazing properties are very large, typically encompassing around 200–10,000 km^2 of land, and herds of 3000–30,000 head of cattle (DAFF, 2014). The majority of these stations are family owned but there are many corporation owned stations also, with some agglomerations holding millions of hectares of land. Stocking rates vary regionally between approximately 3 and 10 head of cattle per km^2 and income from cattle sales and transfers typically ranges from $5 to $12 per ha (DAFF, 2014; Gleeson et al., 2012).

The existing reserve system in the Australian tropical savannas occupies a relatively small proportion of the landscape, reserves are discontinuous (largely surrounded by pastoral lands) and geographically concentrated in wet tropical (northern) parts. There are some very large conservation reserves in Australia's tropical savannas (notably Kakadu National Park, at about 20,000 km^2). However, even large reserves are not large enough, on their own, to maintain viable populations of many endangered species and the ecological processes necessary to them in the long term and even the largest existing reserves in the area are losing some biodiversity (Parr et al., 2009; Woinarski et al., 2010).

The principal land management tool available to graziers is cattle and principally, two types of contributions to biodiversity conservation are possible. Firstly, the pursuit of the idea of a multi-tenure reserve systems (Fitzsimons and Wescott, 2008) would see land taken out of cattle production and managed by the pastoralist exclusively for biodiversity conservation. Secondly, conservation of many species of animals and plants is compatible with grazing to some extent provided grazing land management respects the needs of these species. Consequently, certain grazing systems could be eligible for inclusion in an AES (Woinarski and Ash, 2002).

This research focuses geographically on the dry tropical savannas, which are almost exclusively used as rangelands for cattle grazing (Fig. 1). It is an area of approximately one million km^2. A successful strategy for safeguarding north Australia's biodiversity relies on conservation contributions made by the graziers and pastoralists who manage these rangelands (Woinarski et al., 2007b).

2.2. The influence of personal factors on land use decisions

Farmers make land-use decisions not only in a business context but also in a personal context. Economic theory stresses the extrinsic drivers of decision making, in particular product prices and input costs. The personal context refers to intrinsic motivations for decision making (Ingram et al., 2013). It relates to individual and social conditions in which the farmer operates, including personal capabilities such as knowledge, skills and power, and attitudinal and psychological dimensions.