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Factors affecting adoption of improved management practices in the pastoral industry in Great Barrier Reef catchments



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ABSTRACT

Substantial efforts are being made by industry and government in Australia to reduce adverse impacts of pastoral operations on water quality draining to the Great Barrier Reef. A key target is to achieve rapid adoption of better management practices by landholders, but current theoretical frameworks provide limited guidance about priorities for improving adoption. In this study information from direct surveys with landholders in the two largest catchments draining into the Great Barrier Reef has been collected and analysed. Study outcomes have important implications for policy settings, because they confirm that substantial variations in adoption drivers exist across landholders, enterprises and practices. The results confirm that the three broad barriers to adoption of information gaps, financial incentives and risk perceptions are relevant. This implies that different policy mechanisms, including extension and incentive programs, remain important, although financial incentives were only identified as important to meet capital and transformational costs rather than recurrent costs.

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1. Introduction

Private landholders in Australia are increasingly being involved by government in programs to improve the management and protection of environmental assets (Whitten et al., 2013). This includes the pastoral sector, which is targeted as the largest land user in Australia and also a source of pollutants and pressures on environmental resources (Bohnet et al., 2011; McIvor et al., 1995). Efforts to generate environmental improvements are very dependent on landholders adopting better management practices or engaging in specific programs to improve biodiversity protection or other goals, thus understanding factors that will influence adoption and rates of participation are important in predicting and achieving improved environmental outcomes (Whitten et al., 2013; Cary and Roberts, 2011; Pannell et al., 2006).

These issues can be illustrated with the Reef Rescue program in Australia, where the main goal of the program is to reduce pollutants from agricultural practices being discharged into Great Barrier Reef (GBR) waters. Changed management underpin these anticipated improvements, with takeup of better practices expected to deliver reductions in sediments, nutrients and pesticides by 2013.

The government program is encouraging adoption through information provision and grants programs; in some catchments regulations also stimulate adoption through requirements for property and farm planning. Targets under Reef Plan are that 50% of landholders in the grazing sector will have adopted improved pasture and riparian management practices by 2013 (Australian and Queensland Governments, 2013; Department of Premier and Cabinet, 2011). Clearly factors affecting the adoption of better management practices will have a major influence on whether or not those targets can be reached.

Current theoretical frameworks provide limited guidance about priorities for increasing adoption of management practices that generate environmental improvements. Much of the adoption literature has been focused on improving productivity in the agricultural sector, with a major focus on identifying and revealing information on private production benefits so that profit signals then drives landholder adoption (Malcolm, 2004). In recent decades a change in focus towards managing more sustainably and achieving environmental protection goals has made adoption issues more complex in two key ways. First, focusing on actions that achieve environmental benefits means farmers will not necessarily receive short or medium term payoffs from changing management practices, limiting the private incentives for adoption (Whitten et al., 2013; Pannell et al., 2006). Second, practice adoption is now confounded with factors affecting participation in the number

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of different government-funded programs to promote adoption, ranging from extension programs through to payment for ecosystem services (PES) schemes and market based instruments (Cary and Roberts, 2011).

The broad adoption literature has identified a wide range and diversity of factors that can affect landholder decisions (e.g. Prokopy et al., 2008; Baumgart-Getz et al., 2012). The literature relevant to uptake of agri-environmental practices has been summarised by Pannell et al. (2006), while factors relevant to landholder adoption in GBR catchments have been identified by Herr et al. (2004), Lockie and Rockloff (2005), Greiner et al. (2009), Greiner and Gregg (2011), Marshall et al. (2011), Januchowski-Hartley et al. (2012) and Moon (2013). However identification alone is not sufficient for program design. Policy makers need to know which factors are relevant for a cohort of landholders, the extent to which targeted practices are compatible with landholders and enterprises, the mechanisms needed to encourage adoption and the extent to which support programs have to be specialised. With these issues in mind, three key research questions were identified relevant to policy settings in the Great Barrier Reef catchments. The first was to assess the extent to which landholders had homogeneous drivers and motivations relevant to practice adoption; the more homogeneous the group, the more relevant would be standard programs to support adoption. The second was to identify whether perceptions of different risks to enterprises affected adoption; sustainable practices in farming generally have implications for risk and uncertainty in production and profitability. The third was to understand if factors affecting adoption remained consistent across different management practices of interest; variations in drivers would imply that support programs would need to be tailored to key practices of interest.

The goal of this paper is to provide a framework for going beyond the simple identification of key adoption drivers for better grazing practices in GBR catchments so that the need for policy specialisation across both groups of landholders and different practices can be assessed. To achieve this the research draws on surveys of landholders in the two largest grazing catchments of the Fitzroy and Burdekin systems that drain into the GBR waters. The paper is structured as follows. A brief review of the case study issues and grazing management is provided in the next section, followed by a review of relevant adoption issues in Section 3. The analysis of three key research questions is reported in Section 4, and final conclusions follow.

2. Grazing management issues in the Great Barrier Reef catchments

Discharges of sediments, nutrients and pesticides from agricultural lands in Queensland have been identified as having key impacts on the health of the Great Barrier Reef (Thorburn et al., 2013). As demonstrated in Fig. 1, much of the sediment discharge, together with nutrient loads associated with the soil movement, have been shown to originate from the grazing lands in Burdekin, Fitzroy and Burnett Mary regions, largely through hillslope, streambank and gully erosion processes (McKergow et al., 2005; Brodie et al., 2003). Across all the GBR catchments approximately three quarters of fine sediments exported are generated from grazing lands (Thorburn and Wilkinson, 2013).

The pastoral industry dominates land use in the GBR catchments, particularly the Burdekin and Fitzroy catchments. Grazing enterprises are largely open grazing systems characterised by extensive property sizes and low input management, focused on beef production for both export and domestic markets. The region has a summer dominant but highly variable rainfall pattern, both within and between seasons. Land condition is largely driven by the

interactions between grazing pressure and landscape characteristics such as soils, vegetation and pasture composition on the one hand, and fluctuations in rainfall patterns and climate events on the other (O'Reagain et al., 2009; Ash et al., 2011, 1995; McKeon et al., 2004). Land condition is particularly susceptible to decline during drought periods, particularly when high stocking rates and grazing pressures are maintained (Bartley et al., 2010; McKeon et al., 2004; Johnston et al., 2000).

The development of the Reef Rescue program by the Australian and Queensland governments is the latest in a number of strategies designed to improve protection of the GBR and reduce agricultural emissions draining into it from adjacent catchments. Under the Reef Rescue program, direct grants for landholders are used as a key mechanism to achieve practice change for actions that will reduce the emissions of sediments and associated nutrients from grazing lands. This has involved identification of key management practices that are likely to generate the required improvements.

MacLeod and McIvor (2006) and Thorburn et al. (2013) have identified key grazing management strategies that would deliver improved environmental outcomes. These include: appropriate utilisation (grazing) rates of vegetation through better management of stocking rates, maintenance of ground cover, soil condition and pasture biomass, wet season spelling to improve pasture condition, forage budgeting to ensure cover levels are adequate from year to year, and preventing selective overgrazing of preferred or vulnerable areas in the landscape.

The assessment of land condition in the northern Australian grazing industry has been simplified through the ABCD land condition framework, where "A" condition land is in excellent to good condition, "D" condition land is generally poor and "B" and "C" condition land lie between these extremes. A similar approach has been taken for assessing management practices, where "A" practices are those practices likely to maintain land in very good condition or improve land in lesser condition, "D" practices are those likely to degrade land condition, and "B" and "C" practices lie between these extremes (Australian and Queensland Governments, 2013). The core focus of the Reef Plan goals is to generate improvements through increasing landholder adoption of better management practices, with 50 per cent of landholders in the grazing sector expected to have adopted improved pasture and riparian management practices by 2013.

3. Factors affecting adoption

The international literature on adoption reveals a range of non-financial factors are important to explain varying rates of take-up. Prokopy et al. (2008) identified from a review of over 25 years of research relating to best management practices for soil conservation in the United States that education levels, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks were key drivers for adoption. Baumgart-Getz et al. (2012) report a meta-analysis of factors relating to adoption of agricultural BMPs in the United States, where access to and quality of information, financial capacity, and being connected to agency or local networks of farmers or watershed groups were identified as key drivers. In Australia, research has identified that the adoption of more sustainable agricultural management practices was often associated with socio-economic characteristics such as income, debt, education, and social participation (Productivity Commission, 2003; Cary et al., 2002).

Studies focused on adoption of more sustainable agricultural practices in GBR catchments have identified that the socio-economic background of landholders as well as attitudes influenced adoption rates (Herr et al., 2004; Lockie and Rockloff, 2005;

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