



Farmer perspectives of the on-farm and off-farm pros and cons of planted multifunctional riparian margins



Fleur J.F. Maseyk^{a,b,*}, Estelle J. Dominati^c, Toni White^d, Alec D. Mackay^c

^a Centre for Biodiversity and Conservation Science, School of Biological Sciences, The University of Queensland, Brisbane, QLD, Australia

^b ARC Centre of Excellence for Environmental Decisions, The University of Queensland, Brisbane, QLD, 4072, Australia

^c Land and Environment Group, AgResearch, Grasslands Research Centre, Private Bag 11008, Palmerston North 4442, New Zealand

^d Land and Environment Group, AgResearch, Ruakura Research Centre, Private Bag 3123, Hamilton 3240, New Zealand

ARTICLE INFO

Article history:

Received 11 December 2015

Received in revised form 1 October 2016

Accepted 12 October 2016

Available online 20 November 2016

Keywords:

Ecosystem services

Environmental policy

Natural capital

Pastoral farming

ABSTRACT

The planting of riparian margins is a policy option for pastoral farmers in response to land use induced environmental issues such as declining water quality, stream bank erosion, and loss of aquatic and terrestrial habitat. We elicited the views and experiences as to pros and cons of planting riparian margins from two sets of dairy farmers from Taranaki, New Zealand: those who are or have planted riparian margins, and those who have not yet done so. Those farmers who have planted riparian margins identified 21 positive aspects of riparian margin plantings and 11 negative aspects of riparian margin plantings. Perceived benefits identified by this group include water quality, increased biodiversity, the provision of cultural ecosystem services, immediate direct benefits to farm management and the farm system, and in some instances increased productivity on-farm. In contrast, those farmers that had fenced but not planted their riparian margins did not consider that riparian margin plantings could add further benefits to that which could be achieved by excluding stock from waterways, and associated only negative perceptions with riparian margin plantings. Planting riparian margins is not cost neutral and will not deliver anticipated environmental benefits in every situation. However, we argue that riparian margin plantings are an important ecological infrastructure investment that needs to be captured within a wider policy framework, the benefits of which extend beyond the mitigation of a single negative externality generated by land use practices, such as nutrient loss, and contribute to a multifunctional landscape.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Conversion of forested landscapes to provide for the development of agriculture has occurred throughout the world (Tanentzap et al., 2015). While this whole-scale transformation of landscapes has increased food production, it has come at a cost to system functions, many of which underpin the provision of other ecosystem services which food and water security and human health are also reliant upon (Bommarco et al., 2013; Costanza et al., 2014; Gordon et al., 2010). Spatial separation of land used for food production, from land used for other ecosystem services including biodiversity protection (i.e. land sparing (Fischer et al., 2008)) has reduced social-ecological flexibility of agricultural landscapes by favouring food production in most cases at the cost of all other functions

* Corresponding author at: Centre for Biodiversity and Conservation Science, School of Biological Sciences, The University of Queensland, Brisbane, QLD, Australia.

E-mail addresses: f.maseyk@uq.edu.au (F.J.F. Maseyk), estelle.dominati@agresearch.co.nz (E.J. Dominati), toni.white@agresearch.co.nz (T. White), alec.mackay@agresearch.co.nz (A.D. Mackay).

(Meadows et al., 2008). Emphasising productivist notions of land use restricts the transition to multifunctional landscapes (Wilson, 2008).

In agricultural landscapes, land management interventions aimed at improving diversity are increasingly being regulated or otherwise incentivised to mitigate the environmental impacts of agricultural practices and facilitate transitions to greater 'multifunctional agriculture' (Wilson, 2009). An example of an intervention is using riparian zones to separate agricultural practice from waterways. Riparian zones (herein riparian margins) are the margin of land adjacent to waterways where direct interaction between terrestrial and aquatic ecosystems occurs. Riparian margin habitat is not found anywhere other than the riparian zone and has a disproportional influence on ecosystem function relative to the size of the catchment (Collier et al., 1995).

Functioning riparian margins are the source of ecological processes such as filtering the flow of nutrients and provision of organic input into aquatic food webs (Bennett et al., 2014). Utilising riparian margins as production land heavily compromises their ecological functionality, and removes the ability to spatially separate the

detrimental impacts of land use from the receiving environment. The exclusion of livestock from riparian margins and waterways can have immediate environmental benefits (Parkyn et al., 2003) by protecting banks from erosion and waterways from the direct input of nutrients and bacteria. Retired, grassed riparian margins of an adequate width for local soil and slope variables also provide a buffer to the input of sediments, nutrients, pathogens, and pesticides transported by overland flow into waterways, reducing contaminant and sediment loadings in-stream (Collier et al., 1995). While retired single-tier grassed margins create beneficial buffers, diverse, multi-tiered riparian margin vegetation builds on and enhances the benefits provided by grassed margins increasing both riparian margin functionality and in-stream values (DairyNZ, 2012). Multi-tiered riparian margins additionally buffer flood flows and reduce their effect in-stream, maintain a microclimate, increase terrestrial and in-stream habitat, structural complexity, and biodiversity, increase terrestrial carbon inputs into the aquatic system, maintain food webs, and provide shade which maintains lower summer maximum in-stream temperatures and prevents nuisance plant growth (Collier et al., 1995; Moller et al., 2008).

Management of riparian margins is considered to provide a public benefit (Buckley et al., 2012; Cooper et al., 2009) and is increasingly becoming embedded in policy and industry standards internationally, including in Europe under The European Union Nitrates and Water Framework Directives; in Ireland under the Agricultural Environmental Options Scheme; and in New Zealand under the Sustainable Dairying: Water Accord. Beyond the public benefits generated by riparian margins there is evidence to suggest planted riparian margins also provide a wide range of ecosystem services directly useful on-farm (a private benefit). The ability for incentives to effect change depends in part on the strength of the incentive farmers require to adopt a new practice (Pannell, 2004). Recognising that integrating riparian margins into the farm system can self-generate incentive through the provision of private as well as public benefits is therefore critically important for developing policy or industry practice change incentives.

Programmes to reinstate lost vegetation are driving landscape transformation and manipulation of system function. We were principally interested in benefits and values that farmers perceive or experience to be associated with riparian margin plantings on their farms, and how these values are linked to farmer willingness and motivations to plant riparian margins or not. To better understand these values, we invited dairy farmers from Taranaki, New Zealand to participate in half-day workshops to explore their perspectives on the pros, cons, benefits, values, and liabilities arising from the reinstatement of woody vegetation within riparian margins. In particular we aimed to answer the following three questions:

1. What values, benefits, costs, constraints, and liabilities (pros and cons) do farmers perceive to be associated with the planting of riparian margins?
2. What do farmers see as the influence of planted riparian margins on the operation of the farm and its biological and financial performance?
3. How do identified values influence farmer's motivations for planting riparian margins and are there additional motivational factors?

Knowledge of the private-public benefits experienced by farmers can assist in refining current or developing future policy-driven land management interventions.

2. Methods

2.1. Riparian margin management in New Zealand

The reintroduction of vegetation (natural capital stocks) is a necessary component of replacing lost biological and structural diversity across large areas of New Zealand as historic and contemporary agricultural practices have led to substantial loss of native vegetation (Ewers et al., 2006; Lee et al., 2008; Myers et al., 2013; Walker et al., 2006). Native landscapes in lowland New Zealand have been almost completely replaced with systems dominated by exotic species introduced from the Northern Hemisphere by European settlers from the early-mid 1800s. While exotic dominated systems can deliver most functions and services necessary for food production, this shift has come at a cost to the provision of other ecosystem services. Intensification of farming practices over recent decades has accelerated the shift towards single-use landscapes where food provision is favoured over other services.

There is currently no overarching regulatory obligation or subsidised incentive scheme to compel or encourage New Zealand farmer's to exclude riparian margins from the productive areas of their farm systems (Tanentzap et al., 2015). The statutory responsibility for controlling land use sits at the local government level administered by regional councils. Local government driven riparian margin management in New Zealand typically involves the retirement of the margin from the farm system, or 'set-back' requirements for several land use activities involving discharges into the environment such as the application to land of herbicides, pesticides, fertilisers, or effluent. Retirement of margins is typically focused on dairy systems, horticulture, and commercial forestry while set-back restrictions for discharges can also apply to other farm systems (e.g. sheep and beef). The width of a retired riparian margin varies greatly between regions and between farms and is often a farmer-negotiated distance that can be as narrow as <1 m, and is often determined independent of the influence of adjacent slope characteristics. Under some policies or programmes, the management of riparian margins may also include planting native riparian vegetation, and it is this activity that our study focuses on. Local authorities (regional and territorial councils) also have responsibilities for the protection and maintenance of existing remnant native vegetation on-farm, including riparian margin vegetation in some cases. However, these approaches are highly variable (Maseyk and Gerbeaux, 2015) and there remains no national policy to retain or increase native vegetation (Welsch et al., 2014).

The industry-led initiative, 'Dairying and Clean Streams Accord' (Clean Streams Accord) was signed by Fonterra (New Zealand's largest dairy cooperative), the Ministry for Agriculture and Forestry, the Ministry for the Environment, and Local Government New Zealand in 2003. The Clean Streams Accord operated at a national level to address the environmental impacts of dairy farming on waterways and included targets for stock exclusion, and effluent and nutrient management. The Clean Streams Accord was replaced by the 'Sustainable Dairying: Water Accord' (the Water Accord) in 2012. While sitting outside of legislative requirements, compliance with the Water Accord is mandatory as an industry condition of supply.

2.2. States of riparian margins

We conceptualise three typical states of riparian margins: 1. *Farmed*, margins are utilised for farm productivity (e.g. cropping or grazing livestock to the waters edge); 2. *Retired*, productivity is separated from the riparian zone leaving a single-tier ungrazed grass strip; and 3. *Retired and vegetated*, multi-tiered riparian margin habitat including a diversity of plant forms is established and

Download English Version:

<https://daneshyari.com/en/article/6461276>

Download Persian Version:

<https://daneshyari.com/article/6461276>

[Daneshyari.com](https://daneshyari.com)