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Adoption of environmental innovations: Analysis from the Waipara wine industry

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Abstract

The Greening Waipara Project developed and introduced a number of ecologically and environmentally-focused practices to the Waipara vineyards and wineries of North Canterbury, New Zealand. This paper describes the practices that were introduced to the Waipara wine industry as part of the Greening Waipara Project and evaluates the adoption of these environmental innovations by wine businesses. In addition, this paper examines the sustainability of these practices in terms of business costs and benefits. Data for the evaluation was obtained from a survey of vineyards and wineries in the Waipara region. Results reveal that adoption of the environmental innovations is relatively low and varies across wine growing properties. Furthermore, the costs associated with the innovations tend to outweigh the benefits gained by the businesses.

Keywords: Adoption; Environment; Innovations

1. Introduction

Feder and Umali (1993) noted that as environmental issues in agricultural businesses have gained attention, increasing focus is being applied to examining the adoption of environmental innovations. Clearly the need for the adoption of environmental practices and innovations is greater than ever, especially in agriculture where the level and severity of environmental problems continue to rise. Conventional wine production practices result in similar environmental issues to those incurred in other agricultural businesses, including groundwater depletion, water pollution, effluent run-off, toxicity of pesticides, fungicide and herbicide use, habitat destruction, and loss of natural biodiversity. This study adds to the current knowledge regarding the adoption of environmental innovations, specifically in the wine industry.

Waipara is a rapidly growing wine region located north of Christchurch on New Zealand's South Island. The Greening Waipara Project began in 2005 and around 32 of the Valley's vineyards and wineries are now participating. The Project stemmed from initiatives by Lincoln University's Bio-Protection Research Centre, the Waipara Valley Winegrowers Association, the Hurunui District Council and Landcare Research to make use of 'nature's free services'. In addition, the Greening Waipara Project was initiated because the Waipara wine region is less well known than other high profile wine regions within New Zealand and one aim was to give Waipara wines a clear point of difference. The Project has developed and introduced seven environmental innovations that could be implemented by wine companies in the Waipara region. These practices are based on utilising nature's services in areas including pollination, biological control of pests, weed suppression, improved soil quality, filtering of wastes and conservation of native species. The Project has issued brochures which claim that the adoption of the practices will reduce agrichemical and labour costs, support eco-tourism, and help with the marketing of Waipara wines.

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This paper examines how many of the vineyards and wineries have adopted the innovations and the implications of the implemented practices in terms of business costs and benefits. The remainder of this paper is structured as follows. Firstly, details are provided of the seven environmental innovations developed by the Greening Waipara Project. A review of the environmental innovation literature includes both a focus on agriculture in general and a specific focus on the wine industry. Details of the research method adopted in this study then follow. Presentation of the results is followed by the discussion and conclusions.

2. Greening Waipara environmental innovations

The Greening Waipara Project developed and introduced a total of seven environmental innovations for Waipara vineyards and wineries to adopt. One of these innovations was based on the use of biological control practices to control leafrollers (*Planotortrix* and *Ctenopseustis* genera) in vineyards. The wine industry in New Zealand has identified leafrollers as an important insect pest as they cause leaf, flower and fruit damage, and open berries to infection by the fungus *Botrytis cinerea* (Berndt et al.,2006). Crop losses attributed to leafroller damage in the New Zealand wine industry have been estimated to cost up to NZ$360/ha in a dry year and significantly more in wetter seasons (Lo and Murrell 2000). The usual practice to control leafrollers in vineyards is the application of a broad-spectrum insecticide. The Greening Waipara Project innovation used inter-row plantings of flowering plants (e.g. buckwheat) to attract parasitoid wasps, a natural enemy of leafrollers, into the vineyards. Research at trial sites revealed that adding annual flowering plants, such as buckwheat, into a vineyard ecosystem increased the impact of parasitoids on leafrollers (Berndt et al., 2006).

Another innovation introduced by the Greening Waipara Project involved the plantings of native groundcovers to control under vine weeds and thus reduce the need for herbicide applications. Other benefits that were expected to arise from these plantings included increasing the diversity and abundance of beneficial insects, reduced runoff and improved soil structure. A third innovation focused on the restoration of natural habitats in and around vineyards and wineries. The aim of this innovation was for the native plant species to assist with the conservation of native fauna and flora, as well as soil retention, weed suppression and eco-tourism. The Project has planted more than 20,000 native plants into the Waipara Valley. Other innovations developed by the Greening Waipara Project included the use of mulches (i.e. pea straw, linseed straw and grass clippings) under vines to manage Botrytis, improvements in the filtering of winery waste water, and the development of windbreaks through hedging.

The seventh innovation involved the introduction of Biodiversity Trails on selected winery properties. These Trails were established to provide winery customers with a unique and informing experience at Waipara wineries. Each Trail was developed close to a tasting room or restaurant and led the visitor through areas of vines and native plants, and included information boards where they could learn more about biodiversity and Greening Waipara.

3. Adoption of environmental innovations

Mosher (1978) formally defined adoption as the process through which a person is exposed to, considers, and finally rejects or accepts and practices an innovation. More recently, Rogers (2003) defined adoption as the implementation of transferred knowledge about a technological innovation. Adoption can thus be thought of as the final stage of the technology transfer process. Adoption occurs when a person has decided to make full use of a new technological innovation as the best way to address a need (Rogers, 2003). This would suggest that wine producers with the greatest need to resolve or control a problem would be most likely to adopt a related innovation. Feder and Umali (1993, p. 216) defined an innovation as "a technological factor that changes the production function and regarding which there exists some uncertainty, whether perceived or objective (or both)".

The characteristics of an individual innovation influence the rate of its adoption. These characteristics are the levels of relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003). Relative advantage can be measured economically, but can also include advantages in terms of prestige, convenience or satisfaction. Compatibility is achieved when an innovation is consistent with existing values, past experiences and the needs of the potential adopters. Complexity is the degree to which an innovation is difficult to understand, implement and maintain. Trialability relates to whether the innovation can be experimented with on a limited basis, whilst observability is the degree to which the results of the innovation are visible to others. Prior research suggests there are numerous factors which influence whether an agricultural innovation is adopted or not, and many of these can be seen to relate to the innovation characteristics developed by Rogers (2003).

Vanclay and Lawrence (1994) suggested that there are fundamental differences between commercial innovations and environmental innovations which affect adoption by agriculturists. Sassenrath et al. (2008) also noted that some innovations are driven by a desire to improve yields, whilst others are concerned for the environment. Environmental innovations are those which focus on improvements to land management. Although environmental innovations may result in some direct economic benefits, the costs associated with the adoption of these