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Factors influencing adoption of improved grassland management by small-scale dairy farmers in central Mexico and the implications for future research on smallholder adoption in developing countries

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ABSTRACT

There have been limited recent advances in understanding of what influences uptake of innovations despite the current international focus on smallholder agriculture as a means of achieving food security and rural development. This paper provides a rigorous study of factors influencing adoption by smallholders in central Mexico and builds on findings to identify a broad approach to significantly improve research on and understanding of factors influencing adoption by smallholders in developing countries. Small-scale dairy systems play an important role in providing income, employment and nutrition in the highlands of central Mexico. A wide variety of practices and technologies have been promoted by the government public services to increase milk production and economic efficiency, but there have been very low levels of uptake of most innovations, with the exception of improving grassland through introduction of grass varieties together with management practices. A detailed study was conducted with 80 farmers who are already engaged with the use of this innovation to better understand the process of adoption and identify socioeconomic and farm variables, cognitive (beliefs), and social–psychological (social norms) factors associated with farmers' use of improved grassland. The Theory of Reasoned Action (TRA) was used as a theoretical framework and Spearman Rank Order correlation was conducted to analyse the data. Most farmers (92.5%) revealed strong intention to continue to use improved grassland (which requires active management and investment of resources) for the next 12 months; whereas 7.5% of farmers were undecided and showed weak intention, which was associated with farmers whose main income was from non-farm activities as well as with farmers who had only recently started using improved grassland. Despite farmers' experience of using improved grassland (mean of 18 years) farmers' intentions to continue to adopt it was influenced almost as much by salient referents (mainly male relatives) as by their own attitudes. The hitherto unnoticed longevity of the role social referents play in adoption decisions is an important finding and has implications for further research and for the design of extension approaches. The study demonstrates the value and importance of using TRA or TPB approaches to understand social cognitive (beliefs) and social–psychological (social norms) factors in the study of adoption. However, other factors influencing adoption processes need to be

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included to provide fuller understanding. An approach that would enable this, and the development of more generalisable findings than from location specific case studies, and contribute to broader conceptualisation, is proposed.

1. Introduction

Numerous studies investigating reasons for adoption and non-adoption of innovations amongst small-scale farmers in developing countries have focused on socio-economic and farm characteristics (e.g. level of education, age, gender, household income, farm size, land tenure, land characteristics, market access, level of infrastructure, access to extension and credit) (Cain et al., 2007; Doss and Morris, 2001; Lapar and Ehui, 2004) and on identifying relationships between characteristics and adoption. These studies have not taken into account cognitive and social–psychological factors that can influence farmers' decisions, including the role of other people's opinions. Rehman et al. (2007) reported that relatively little research has addressed the role of these factors in adoption or rejection of decisions. However, some authors have conducted studies that do include the cognitive and social–psychological factors through the Theory of Reasoned Action (TRA) and the Theory of Planed Behaviour (TPB) (e.g. Garforth et al., 2004, 2006; Rehman et al., 2003, 2007; Sambodo and Nuthall, 2010) and such studies have provided interesting and useful findings on farmer decision making on technology adoption. Garforth et al. (2004) argue that relevant farmers' beliefs and salient referents can be used as sources and channels of knowledge and communication to technology transfer. Using TRA, and in contrast to most adoption research, this study focuses on an innovation that has been successfully and widely adopted and on farmers that have used it and are considering whether to continue to do so. This provides the opportunity to develop better understanding of adoption processes and the factors that affect them.

In the highlands of central Mexico, as in many areas of the world, smallholder farming plays an important role in providing food, income and employment. Small-scale dairy farms in central Mexico are a key contributor to national milk production and rural livelihoods (Arriaga-Jordán et al., 2002). However, levels of production and profits are low (Cervantes et al., 2007; Espinoza-Ortega et al., 2007) and the government has between 1996 and 2011 sought to improve small-scale dairying through a series of research and extension programmes (SAGARPA, 2001). A range of innovations were promoted i.e. seed of improved varieties, tractors, mechanical irrigation systems, milking machines, hammer mills, artificial insemination, data recording and improved male and female cattle, but levels of uptake have generally been low (Martinez-Garcia, 2011). However some technologies are widely practiced including use of fertilizers, herbicides, de-worming, vaccines and improved grassland (Martinez-Garcia, 2011). Of six crop or forage related technologies identified and studied in central Mexico (Martinez-Garcia et al., 2012), improved grassland had the highest level of adoption among small-scale dairy farmers. Increased milk production, increased fodder availability and decreased animal feed costs were the main reasons reported for adoption. A previous study (Fadul-Pacheco et al., 2011) found that small-scale dairy farms which had adopted improved grassland were more sustainable.

This study involved 80 small-scale dairy farmers who are already engaged with the use of improved grassland. It is important to note that throughout this research (including research activities with farmers) the term "use of improved grassland" involves the management practices that need to be carried out by farmers on the grassland during the next 12 months. These are necessary in order to enable continued improved forage yields to be achieved including applying manure, irrigating and cutting grassland previously planted with improved varieties (see Section 3.1). Farmers have the option of continuing to make these investments of time and inputs every year, or of reverting to lower input systems, as some have done. In addition to this, focusing on intention during the next 12 months was considered appropriate for the research because: there is considerable variation in the length of time since different farmers first started using improved grassland (i.e. between two and 50 years) and it would not be feasible for farmers to be asked to attempt to recall what their attitudes, beliefs and relationships with social referents were several years ago when they made the initial decision; several authors (Fagerberg, 2003; Leeuwis and Van den Ban, 2004; Oladele, 2005) have shown that adoption should not be viewed as a simple single decision but rather as a decision making process over time and that farmers often try technologies, adapt them, and continually decide whether to continue using them. Focusing on the next 12 months may provide further insights on this and in particular by examining *strengths* of intention (measured using a bi-polar five points Likert type scale) and also comparing responses of farmers who have started using improved grassland recently versus those had been using them for a longer period.

The aims of this study therefore were to: 1. Determine the strengths of farmers' intention to use improved grassland on their farms over the next 12 months. 2. Identify socioeconomic and farm characteristics of the small-scale dairy farmers associated with intention. 3. Understand beliefs and salient referents which underlie farmers' decisions to use improved grassland and 4. Identify drivers and specific salient referents. Further, the paper seeks to use this in a wider context to help improve understanding of adoption processes and of what influences adoption, contribute to theory, and highlight areas warranting further research.