# A logistic analysis of the factors determining the decision of smallholder farmers to intercrop: A case study involving rubber–tea intercropping in Sri Lanka

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## Abstract

The factors influencing the decision of smallholder farmers to adopt new farming technologies were studied with reference to rubber–tea intercropping in Sri Lanka. Rubber–tea intercropping has been recommended previously to rubber farmers as a means to improve productivity and income during the early pre-tapping phase of rubber growth. Although crop trials have shown that the two crops are agronomically compatible and potentially produce a combined economic yield superior to the yield of a sole crop grown on the same area of land, there is little evidence of widespread adoption of this practice among smallholder farmers in Sri Lanka. The aim of the study was to determine the major factors that influence the decision to undertake rubber–tea intercropping and to construct a predictive model that describes the likelihood of adoption of intercropping by traditional smallholder rubber growers. A rapid rural appraisal (RRA) was undertaken based on semi-structured interviews of 90 smallholder farmers in the main rubber growing low wet zone of Sri Lanka. Among a number of factors shown to significantly influence the decision to intercrop tea with rubber, three were shown to operate independently, namely level of income, source of income (i.e. solely from own farm or from farm plus additional off-farm enterprises), and availability of land considered suitable for

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tea cultivation. A statistical model developed through correlation and logistic analysis, which predicts the likelihood of a smallholder adopting intercropping based on these factors, is presented and discussed. The most likely combination of circumstances (82% probability) under which rubber–tea intercropping is practiced is shown to be where the farmer's income is greater than Rs. 10,000 per month, where the farmer's income is based solely on own farm enterprises, and where more than 80% of the farmer's land area was judged to be suitable for tea cultivation. Conversely, 30% of smallholder farmers that chose not to intercrop did possess land suitable for tea cultivation. Qualitative responses to the RRA indicated that limitation of technical knowledge was the main problem subsequently faced by rubber farmers who had adopted rubber–tea intercropping. Results indicate that there is need for both income support through farm subsidies and further agricultural extension services, if rubber–tea intercropping is to be adopted more widely in Sri Lanka. The wider usefulness of the developed logistic model in determining the likelihood of adoption of intercropping by smallholder farmers is discussed.

## 1. Introduction

The promotion of new sustainable technologies for adoption by smallholder farmers is a major challenge faced by agricultural extension services throughout the world. There have been a number of recent reports in which the decision-making process by farmers involved in adopting new technologies has been quantitatively analysed using a logistic modelling approach. These include an assessment of factors influencing adoption of integrated pest management for coffee in Colombia (Chaves and Riley, 2001), adoption of fertiliser use in Africa (Green and Ng'ong'ola, 1993) and introduction of intercropping in India (Rajasekharan and Veeraputhran, 2002). In this paper we employ a similar statistical modelling approach to assess the factors that influence the decision to adopt rubber–tea intercropping by smallholder farmers in Sri Lanka.

Rubber is currently the second most important economic crop in Sri Lanka (after tea) and currently contributes 0.4% of the national GDP (Anon, 2001). Due to land reform the majority of rubber in Sri Lanka is today grown on small farms, of which over 75% are defined as "smallholdings" with a land area of less than 20 ha. Following the economic recession in South-East Asia in the late 1990s natural rubber prices dropped to a 30-year low in mid-1997 and world consumption fell by 3% between 1997 and 1998 (Tillekeratne and Karunanayake, 2000). As a consequence of the subsequent marked decrease in income for rubber growers in Sri Lanka, many have either failed to replant with rubber or plan not to do so once the useful tapping life of their current crop comes to an end. One possible approach that may assist rubber farmers to improve their income while maintaining rubber production is to intercrop rubber with alternative cash crops. Recent surveys have established, however, that only about 30–40% of rubber