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Factors that influence the adoption of improved coconut management practices in Batticaloa district: A Logit Model Approach

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Abstract: A study was conducted to investigate the factors that influence the adoption of improved coconut management practices in Batticaloa district. A random sample of 100 coconut growers was interviewed for this purpose. Logit model was used to estimate the relationship of adoption decision and the socioeconomic factors of farmers. Results showed that that farm land extent, age, membership with social organization and participation in organization activities are the most significant factors affecting the adoption of improved coconut management practices.

Keywords: Coconut growers, Coconut management practices, Logit model

Introduction

The agricultural research systems are generally responsible for generating and developing innovations for increasing agricultural productivity. Technology development and transfer play a crucial role in attaining the main goal to increase agricultural output, productivity and farmers' income. Adoption of recommended technologies implies that technologies are relevant to the farmers' circumstances. If farmers become aware of technologies or modifications in the use of resources that are relevant to their circumstances and can improve their farm production and thus their welfare, they will most likely adopt these changes (World Bank, 2001).

The coconut, popularly known as 'Tree of life', in the form of tender nuts and dry fruit as food, drink, oil and milk has been used by human and their immediate ancestor species nearly by a half a million years. Sri Lanka is the largest coconut consuming country (70 – 80% of the coconut utilized for domestic consumption). Among the coconut producing countries in the world, Sri Lanka maintains the fourth position, having a total extent equivalent to 20% of the cultivable land in the country. Coconut being a smallholder's crop, approximately 75% of the extent comes under holdings with an area less than 8 ha. Coconut benefits people of all socio-economic strata in numerous ways by its multitude of uses. It is providing livelihood for nearly 500,000 people in three main sectors of production, processing and marketing. Coconut industry is currently values at Rs. 75 billion with a contribution of 1.4% to the GDP. Annual coconut production in Sri Lanka varies between 2500-3000 million nuts, of which 74% of the production comes from the small holdings. Thus, coconut is one of the important crops for national economy (Jayasekara, 2011). Coconut cultivation is an integral component of the rural economy of Eastern Sri Lanka. The total extent of coconut cultivation land is 7, 858 ha and the average annual production was 22, 360, 320 nuts in the year 2009 in the Batticaloa district.

There is a potential for increasing coconut production in the district through the use of better technologies. The improved coconut management practices are introduced, yet with low adoption rates. These include new seedling varieties, fertilizers and corresponding cultivation practices. However, new production technologies cannot be functional unless they are applicable in farm conditions, financially profitable, economically feasible, socially acceptable,

sound to environments, sustaining to natural resources and widely adopted by farmers over large areas. A supply of appropriate technology is essential if extension services are to be worthwhile (Munyu *et al.,* 2002).

The World Bank (2001) reported that poor understanding by researchers and extension staff of the circumstances of farm households and poor linkages between researchers, extension staff and farmers are associated with an inability of applied research institutions to develop or adapt a technology that is appropriate for many of the common farming systems. According to Rogers (1995), the rate of adoption of new technologies depends on socioeconomic characteristics, personal factors and communication behavior of the farmers.

There is a need to provide feedback to researchers, extension agents and policy makers about the soundness of the new management practices and the constraints that limit their adoption, to promote the adoption of new practices and to have a positive socio-economic impact at the farm, at national and regional levels. Taken these factors into consideration a study was designed to investigate the factors that influence the adoption of improved management practices by the coconut growers in Batticaloa district.

Methodology

The population of this study consisted of coconut growers in Batticaloa district. 100 numbers of coconut growers were randomly selected for this study purpose. Questionnaire survey was employed to collect the primary data. Secondary data necessary for the study also obtained from the relevant sources.

To investigate the factors explaining technology adoption, the data were analyzed using the limited dependent variable regression. Adoption is treated as a binary variable, either adopted or non-adopted of recommended management practice. Yi is defined as a sequence of dependent binary random variable taking the values of 1 or 0. For this present study the following regression model as described by Maddala (1992) was used.

$$y_i^* = \beta_0 + \sum_{j=1}^{k} \beta_j \chi_{ij} + u_i$$

$$y_i = \begin{cases} 1 \text{ if } y^* > 0 \\ 0 \text{ otherwise} \end{cases}$$

Where

y_i^* is an underlying latent variable, x's are the socio-economic factors, u_i is the error term.

y_i is a variable measuring the adoption/non adoption of improved coconut management practice

The logit model was used to assess the objectives of this study depending on adoption rate of improved coconut management practices and degree of adoption, where the probability of adoption depends on the characteristics of the farmers. If the coefficient of a particular variable is positive, it means that higher values of that variable result in a higher probability of adoption, while a lower value of a particular variable implies a lower probability of adoption (Sarap and Vashist, 1994). To represent the adoption of these practices, the dependent variables for plant density, seedling treatment, fertilizer management and pest management were treated as binary variables, whereas the recommended practice is either adopted or not. The components of the coconut management practices used in the analysis are represented as follows:

Table 1: Components of improved coconut management practices

Variables	Descriptions
Plant density	If farmer adopt the correct plant density practice 1 if not 0
Seedling treatment	If farmer adopt the seedling treatment practice 1 if not 0
Fertilizer management	If farmer adopt the fertilizer management practice 1 if not 0
Pest management	If farmer adopt the pest management practice 1 if not 0

The following variables were taken in the analysis as independent variables.

Table 2: Independent variables used

Variables	Descriptions
Gender	Farmer's gender male 1 or female 2
Age	Farmer's age in years
Family size	The number of family members
Farming experience	Experience with farming activities in years
Monthly income	Total family income from coconut sale in Rupees
Land extent	Extent of coconut land in acre
Membership with social organization	Having membership 1 or not having membership 2 with social organization
Participation in organization's activities	Participation 1 or non participation 2 in organization activities

Results and Discussion

Profile of coconut growers

The study has shown that most of the people involved in coconut cultivation in Batticaloa district were males (70%), with more than 50 years of age. Nearly half of the coconut growers (50%) had the farming experience more than 15 years and 40% of the growers had 11 – 15 years of farming experience. Around 80% of the coconut growers had 4-6 family members in their family. Almost all the farmers (98%) had their membership with coconut related social organization and among them only half of the coconut growers were regularly participated in their organizational activities.

Table 3: Estimates of logit model for the adoption of improved Coconut management practices

Variables	Plant density	Seedling treat--ment	Pest manage--ment	Fertilizer manage--ment
Gender	30.1163	56.3142	-37.8308	74.2919
Age	0.9567	1.3799	-1.16070	-0.2559
Family size	-19.4783	-21.0465	39.3936	-36.0951
Farming experience	-1.6921	-0.0700	-1.6245	1.2641
Monthly income	-0.0015	0.0012	-0.00188	0.00063
Land extent	-74.6825	32.2694	52.0066	45.8079
Membership with social organization	-40.3027	53.3545	-12.0303	0.2327
Participation in organization's activities	20.0169	-66.6789	3.0599	-43.8601

Table 3 shows the estimates of logit model for adoption of improved coconut management practices.

Adopting plant density

Adoption of correct plant density is largely influenced by gender, age and social participation of the coconut growers in the district. This is supported by Griffin *et al.,* (1995) indicated that rate of adoption of a new management practice is associated with the farmer's socio-economic characteristics. Adoption of practicing correct plant density for cultivation is negatively associated with Family size, farming experience, monthly income, land extent and membership with social organization related to coconut cultivation

Adopting seedling treatment

Five out of eight variables are positively influenced and could explain the adoption of coconut seedling treatment. Family size, farming experience and social participation are negatively influenced the adoption of seedling treatment among the coconut growers in the Batticaloa district. Increasing family size will decrease the adoption scores as a result of the pressure on the household to use its low income to feed itself rather than investing it in modern inputs and innovations, which may be saddled with risks and uncertainties. This is supported by Igdan *et al.,* (1988) explained that more innovative farmers, tend to have smaller families.

Adopting pest management

Adoption of pest management is largely influenced by Family size, land extent and social participation. And it is negatively associated with gender, age, farming experience, monthly income and membership with social organization of the coconut growers in the Batticaloa district. A negative relationship between age and adoption of improved pest management practices exists due to younger farmers being more likely to be willing to innovate; older farmers may be less willing to adopt new practices. These results are in accordance with the result of Neil and Lee (1999). Also, Kebede *et al.,* (1990) argued that the adoption of agricultural management practices in developing countries is influenced by economic and social factors.

Adopting fertilizer management

Adoption of improved fertilizer management practices are influenced by the coconut farmer's gender, farming experience, monthly income, land extent and membership with social organization. This result supported by the result of Kebed *et al.,* (1990), Jarvis (1981) and Sarap and Vashit (1994) who found that adoption of a new technology significantly influenced by the farm land extent. Age, family size and participation in social activities are negatively associated with adopting improved fertilizer management practices. As the age increases, it seems to exist less interest in adopting a new technology. Old framers are more confident in their endogenous knowledge of farming practices.

Conclusion

This study attempted to determine the factors that affects the adoption of improved coconut management practices and analyzed the influence of the socioeconomic factors explaining the adoption. Logit model was used to quantify the effects of these factors on the adoption of management practices. Results show that farm land extent, age, membership with social organization and participation in organization activities are the most significant factors affecting the adoption of improved coconut management practices. An understanding of how individual characteristics tend to influence adoption decisions can improve the effectiveness of technology in enhancing growth in productivity. The results of the present research have implications for national agricultural policy. They could be used by policy-makers to extend their objectives by increasing the rate of technology adoption, creating the conditions that would encourage farmers to adopt new technologies.

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