FACTORS AFFECTING USE OF STRAIGHT FERTILIZER: EVIDENCE FROM KAGAMA-KATIYAWA COLONIZATION SCHEME

by

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Abstract

The application of straight fertilizers (SF) in crop production has several advantages over fertilizer mixtures.Since 1990, the government has made an effort to promote application of straight fertilizers, which far from satisfactory results. Therefore, a field study was carried out in the Kagama-Katiyawa colonization scheme to identify farm level factors that influence the adoption of straight fertilizer by farmers. A sample of 90 farmers was randomly selected for the study. They were interviewed using a constructed questionnaire during the maha season 2001/2002. Data was analyzed using Probit model. The study revealed that adoption of SF is encouraging in the study area with 53% of the farmers resorting to SF. The Probit co-efficient showed that there was a significant relationship between the adoption of SF and farmer training, farmers' knowledge on SF, extent of lowland cultivated by farmers and the availability of SF. Farmers' age, their education level, credit availability and membership of farmer' organization have no significant relationship with the adoption of SF. Conducting farmer training classes and field demonstrations and facilitating the availability of SF at the village level are proposed as measures to promote usage of SF.

Introduction

Fertilizer application in agriculture at optimum levels is economically viable. Fertilizer is used both in the straight and mixed forms. However, there are two major issues concerning the use of fertilizer mixtures in crop production. Firstly, they cannot be used optimally when organic matter is added and secondly it is difficult to adapt them to soils with a varying degree of nutrient content (Amarasiri, 1992). Fertilizer mixtures are often adulterated or mixed with impurities resulting in a lesser supply of nutrients and lower crop yields (Nanayakkara, 1989). Since 1990, straight fertilizers (SF) have been recommended for all the crops including paddy as a measure to overcome these problems. Moreover, application of SF is more economical and reliable than the application of fertilizer mixtures (Dissanayake, 2001). Hence, it helps to improve the efficiency of fertilizer use. The main varieties of SF used in Sri Lanka are urea, triple super phosphate and muriate of potash. During the last decade, an effort has been made by the Department of Agriculture and other relevant institutions to promote the application of SF in crop production. But, results have been far from satisfactory. The technology of the application of SF has not been widely accepted by the farmers. The available information indicates that the farmers continue to rely on fertilizer mixtures such as basal and top dressing mixtures (Review of Fertilizer, 1999; Dissanayake 2001). Therefore it is important to identify farm level factors that influence the adoption of SF. An understanding of these factors would help in promoting the use of SF at the farm level. Accordingly, the present study was designed with the following objectives.

Objectives

(1) Determine the extent of adoption of SF in paddy cultivation

(2) Investigate the farm level factors affecting the adoption of SF

(3) Suggest possible recommendations to promote the application of SF

Theoretical Framework

This study for this paper was guided by the theory of diffusion of innovation postulated by Rogers (1962). He defines the adoption process as 'the mental process an individual passes from first hearing about an innovation to final adoption'. As Feder *et. al.* (1982) argue it is a decision making process determining the extent and intensity of use of the new technology at various stages of the adoption process. Therefore, diffusion perspectives consider farmers as decision-makers and that their adoption behavior is influenced by personal characteristics. There is a growing body of literature on diffusion and adoption of agricultural technology which demonstrates the adoption of farm innovations on the basis of personal and economic characteristics of the farmers. Some of these characteristics are age (Leuthold, 1996), number of children in the family (Alleyne and Verner, 1966), education level of farmers (Gross, 1949), farm size (Van den Ben, 1975) labour availability (William and Johnson, 1974) and credit availability (Von Pischke, 1978). These empirical studies confirm tha t numerous factors influence the adoption of innovations by farmers . The adoption behavior mo del presented by Legans, (1979) is frequently used as a conceptual framework in adoption studies (Figure 1). This model indicates a number of variables associated with adoption of new technology. However, the empirical results indicate that the relationship between these factors and farmers' decision regarding the adoption of new agricultural practices is not consistent.

Research Methodology

The study was carried out in the Kagama-Katiyawa colonization scheme in the Anuradhapura district. The study area was purposely selected as it is located close to the Field Crop Research and Development Institute and In-service Training Center at Mahailupplallama. These two institutes, which come under the purview of the Department of Agriculture, promote utilization of SF among farmers. The colonization scheme comes under two Agrarian Service Center areas namely Ipalogma and Katiyawa. For management and administrative purposes, this colonization scheme has been divided into 10 tracts. The scheme consists of 2,361 acres of lowland and 2,184 acres of highland. At present, there are 2,483 farm families with a total population close upon 10,000.

The study is based on a sample survey of 90 farmers. These farmers were randomly selected from the farmer's list, obtained from Katiyawa, and Ipalogama Agrarina Service Centers. Information needed for the study was collected using a structured interview schedule. The survey was carried out during the *maha* season 2001/ 2002. The main crops cultivated in the colonization scheme are paddy, chili and big onion. Therefore, fertilizer application to these crops was considered, in this study.

Adoption of a new technology could be measured at individual farm level or in the context of the aggregate level. Adoption at individual farm level is the degree of use of a new technology when the farmer has full information about the new technology and its potential. The aggregate level of use of a specific new technology within a given geographical area is measured as aggregate adoption (Mansfield, 1996). In this study, the adoption was measured at the individual farm level in a given time period. Numerical value of zero is given to non-adopters and one is given for adopters. The independent variables considered in the study were farmers' age, family size,

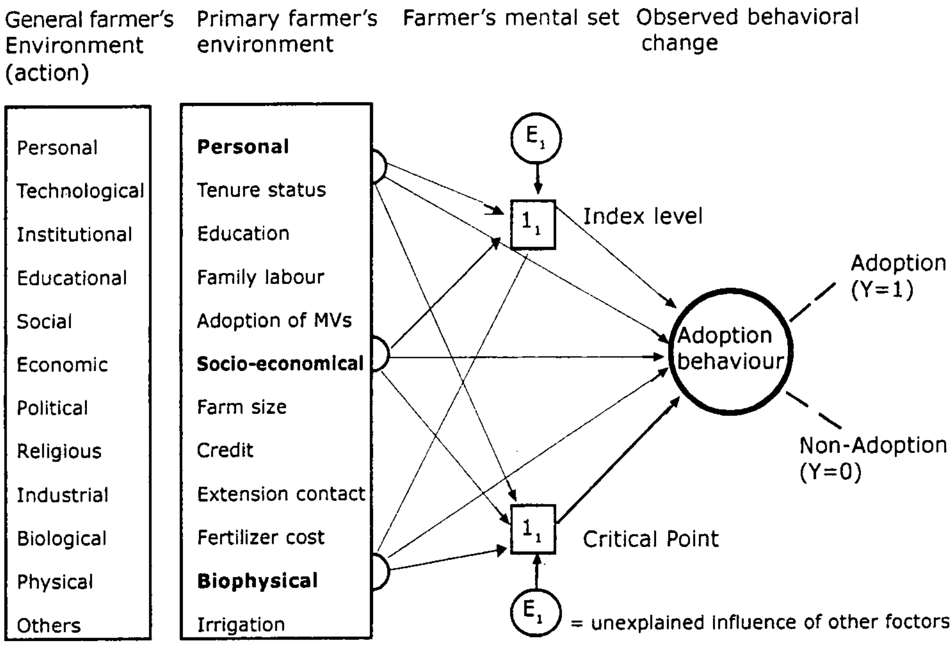

Figure 1. Adoption behaviour model (adapted from Leagans, 1979)

education level, extent of lowland cultivated, membership of farmers' organization, agricultural credit, farmer training, farmers' knowledge on SF and availability of SF. Probit model was used in the analysis of data. This model is considered appropriate for analyzing the determinants of a choice between two discreet alternatives. Since the dependent variable is not continuous, ordinary least squire method is not appropriate (Amerniya, 1981; Maddal, 1983). Many authors (Falusi, 1974; Comer *et.al.*, 1999) have used this model to study farmers' adoption behaviours.

Empirical Model

The following model explains the relationship between the adoption of SF and farmers' socio-economic characteristics. In this model, the dependant variable is constrained to lie between 0 and I.

ADOPTIONi = bO + bIEDUCATION+b2AGE+b3CREDIT+b4LOWLAND+
B5TRAINING+b6KNOWLEDGE+b7FO+b8AVAILABILITY+ei

Where dependant variable is;

ADOPTION = I if farmer is an adopter
= 0, otherwise

and independent variables;

1. EDUCATION: Farmers' educational level
2. AGE: Farmers' age in years
3. CREDIT: =I, if farmer receives credit
   = 0, otherwise
4. LOWLAND : Extent of lowland farmer owns
5. TRAINING : = 1. if farmer received training on fertilizer application
   = 0, otherwise
6. KNOWLEDGE = I, if farmer has some knowledge on SF
   = 0, otherwise
7. FO = I, if farmer is a member of farmers' organization
   = 0, otherwise
8. AVAILABILITY= I, if SF available at village level
   = 0, otherwise

ei = error term

The average education level of adopter and non-adopter farmers was almost the same (8.5 and 8.6). However, the operational holdings of the two farmer groups were considerably different. Adopter farmers' operational holding size is smaller than that of the non-adopter farmers. Average age of adopter farmers (49 years) was a little higher than that of the non-adopter farmers (43). The average family size of adopter farmers (4.8) was almost similar to that of non-adopter farmers (4.6).

Probit analysis was used to estimate the model and four variables were significant with expected sign. These were farmer training, farmers' knowledge on SF, extent of lowland cultivated and availability of SF at village level. The positive sign with the training variable suggests that the farmers who have received training were more likely to adopt SF. The estimated model also revealed that farmers' knowledge on SF had positively influenced the adoption of SF. The extent of lowland cultivated was negatively related to farmers' use of SF. This suggests that farmers who have a large extent of lowland are less likely to use SF. Though education promotes adoption of innovations, this variable was not significant in this study. However, the education level of farmers had a positive sign with the adoption of SF.

As seen in Table 3, the majority of farmers (61.9%) do not use SF due to lack of awareness on usage. The estimated probit coefficient also indicated that thee is a positive relationship between the adoption and farmers' knowledge on SF. This suggests that farmers' awareness on SF has to be enhanced. This could be achieved through conducting farmer training classes and demonstrations at the village level. In addition, mass media such as radio and television programs also could be used to make farmers aware of the utilization of SF and its advantages. A considerable number of farmers (33.3%) do not use SF because of difficulties in mixing fertilizer. SF sometimes has to be mixed before application. This requires labour and farmers need to weigh fertilizer according to the field and crop requirement. Some farmers (21.4%) reported that they do not use SF due to labour requirement in fertilizer mixing (Table 3). On the other hand, 16.6% of non-adopter farmers reported that fertilizer mixtures are easier to use than SF. Some non-adopter farmers (11.9%) gave no particular reason for their abstinence. They reported that they do not want to use SF. It is likely that they are reluctant to accept new practices. The unavailability of SF at the village level also has discouraged farmers from using it. Among the non-adopter farmers, 16.6% reported the unavailability of SF at the village level as a reason for their reluctance to use SF.

Table 2. Determinants of Adoption of Straight Fertilizer : Probit Coefficients

Independent Variable	Probit Co-efficients
Constant	0.373 (0.327)
Education	0.146 (-0724)
Age	0.002 (0.013)
Credit	-0.396 (-1.254)
Lowland	-0.289 (-1.812)**
Training	0.765 (2.206)**
Knowledge	1.492 (3.648)***
Farmer's Organizations	0.412 (1.220)
Availability of SF	1.377 (3.056)***

Note

1. Numbers in parentheses are t-statistics
2. Number of sample farmers = 90

, * Significant at 5% and 1% respectively,

Non-adopter farmers were asked why they do not use SF, for which they gave various reasons. These reasons are summarized in Table 3.

Table 3. Reasons for non-applying of straight fertilizers

Reason	Frequency	Percentage
Lack of awareness on usage of SF	26	61.9
Difficulties in fertilizer mixing	14	33.3
Labour requirement	09	21.4
Unavailability of straight forms at the nearest sales points	07	16.6
Fertilizer mixtures are easy to use	07	16.6
Reluctance to accept new practices	05	11.9

Conclusion and Recommendation

Factors influencing the application of SF in the Kagama-Katiyawa colonization scheme were examined using a Probit regression model with data collected from randomly selected 90 farmers. The result revealed that the application of SF is encouraging in the study area. Application of SF was introduced 12 years ago and as a result, a considerable number of farmers (53.3%) has used SF in their farms. However, 46.7% of farmers continue to rely on fertilizer mixtures. Probit analysis indicated that four variables i.e. farmers' training, their knowledge on SF, extent of lowland cultivated by farmers and the availability of SF at the village level have a significant positive relationship with the farmers' use of SF. The other variables i.e. farmers' age, family size, their education level, credit availability and membership of farmers' organization had no significant relationship with farmers' use of SF. The majority of non-adopter farmers (61.9%) reported that they are not well aware of the advantages of application of SF. A considerable number of them (33.3%) mentioned that they do not apply SF because the process is troublesome, and they need to mix different fertilizers according to their field conditions. Unavailability of SF at the village level also had discouraged farmers from using it. Therefore, supply of basic fertilizers to sales centers located in rural areas promotes the application of SF. The study showed that farmers' knowledge on SF is crucial to adoption. The relationship between adoption of SF and training of farmers is positive and significant. Thus conducting farmers training classes and field demonstrations would promote the adoption of SF.

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