Adoption of Eco-friendly Technologies by FFS in Rice Farming

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ABSTRACT

Rice is the staple food for more than 65 per cent of the people in India and cultivated under diverse climatic conditions. To meet the increasing needs of population, on sustainable basis the efforts required are immense and multidimensional. The current thrust is on eco-friendly technologies, whose objective is to exploit only renewable resources to control pollution to tolerable levels and to recycle wastes for future needs with conservative perspective. Hence, a study was undertaken to find out the demographic features of FFS respondents and the relationship of these characteristics with their knowledge and adoption level on eco-friendly technologies in rice disseminated through FFS. Variables such as education, innovativeness, scientific orientation, risk orientation, extension participation, institutional support, mass media utilization, trainings attended, group interaction and knowledge have shown significant and positive relationship with adoption of eco-friendly technologies in rice. While promoting eco-friendly technologies through FFS method, these variables are to be given adequate attention in planning, designing, implementation of programmes for increasing the efficiency of outreach.

Key words: *Eco-friendly technologies; Adoption; Rice farming;*

The modern agriculture has been promising to meet out the increased food needs of alarmingly growing population, but the problems associated with them are high cost of agri- inputs especially inorganic or chemical fertilizers, plant protection chemicals, stagnated yield levels and degradation of natural ecosystems. In order to mitigate the health hazards and to bring out natural balance and protection of ecosystem, promotion of eco-friendly technologies through proper skill development by farmers is necessary which can be achieved through promotion of FFS in which farmers had scope of observing natural ecosystems and their role in control of pests and diseases and conservation of environment. The advent of chemical intensive farming and its prevalence in Kerala for the past 50 years have resulted in the near stagnant levels of productivity noticed in economically important crops such as coconut, cashew, pepper, coffee, tea, cardamom and arecanut (*Sasidharan and Kumar, 2012*). The State has given priority to address this issue through annual plans made during 2010-11, 2011-12, resulted two important schemes namely "Sustainable Development of Rice Based Farming System" and "Macro Management in Agriculture – Rice Development Programme". These two schemes targeted to promote rice cultivation through group farming system enabling farmers to adopt improved production technology and scientific package of cultivation suited to each agro-climatic condition and promoting eco-friendly method of pest management like use of bio-pesticides, releasing of predators and parasites and fungal/bacterial pathogens to control pests. There are various factors influencing stakeholders of rice farming in adopting eco-friendly cultivation practices. The role played by these factors is very significant in view of the eco-system upkeep. Hence, the study was conducted with an objective to identify the factors influencing farmers' adoption behaviour of eco-friendly farm technologies in rice.

METHODOLOGY

The present study was carried out in Palakkad district of Kerala State during 2014-15 to analyse the profile characteristics of farmers and their relationship in adoption of eco-friendly technologies.

Rogers's (1983) defined adoption as a decision to use and implement a new idea. A total of eight eco-friendly technologies in rice disseminated through FFS (Farmers Field School) were identified. The responses elicited from the 100 respondents of FFS promoted by KVK, Palakkad district, were categorised as adoption and non-adoption of the recommended practices. A score of one for adoption, and zero for non-adoption was given. The maximum score that one respondent could secure was 8 and minimum was zero. Depending upon the total score obtained by each of the respondent, they were grouped into three categories 'low', 'medium' and 'high' adopter category by using mean and standard deviation (SD) as a measure of check and expressed as a below, and the frequency for adoption of each technology calculated and expressed in percentage.

RESULTS AND DISCUSSION

The adoption level of the eco-friendly farm technologies in rice cultivation by the FFS participants were gathered using standard data collection and presented in Table 1 for discussion.

Application of pseudomonas : It is noticed from the Table 1 that majority of the respondents (82.00%) had adopted the application of *Pseudomonas fluorescens*. Higher rate of adoption might be associated with attributes like compatibility and trialability of the technology and also possession of high knowledge of the farmers on the application of *Pseudomonas.*

Application of trichoderma and use of Trichogramma cards : 76 per cent of them had adopted *Trichoderma* and *Trichogramma* cards, whereas only 24 per cent were non adopters. The attributes of the technology viz; relative advantage (62.00%) and compatibility (58.00%) and higher knowledge level of the respondents (67.50%) (*Naveenkumar et al 2017)* might have promoted adoption of these two technologies.

Use of neem pesticides and bio-pesticides : In case of bio pesticides usage, 72 per cent of the respondents were found to be adopters, and the rest belongs to non-adopters category .It is obvious to note that the bio-control techniques are the innovative practices and require proper scientific knowledge about their use. The resulted demographic features of respondents, medium to high level of innovativeness, high extension participation, mass media utilization and knowledge level (64.33%) and the attributes of technology viz; relative advantage (82%), compatibility (86%) and observability (83%) might have encouraged the adoption process.

Use of pheromone traps and light traps : Differential rate of adoption was found in the use of pheromone traps (72%) and light traps (49%). Relatively the non adopter category was seen more in the case of light trap usage (51%). The lessons learnt by the FFS participants through agro ecosystem analysis (AESA) might have helped them to know the importance of natural enemies and economic thresh hold levels (ETL) of different pests based on which they had preferred to go for need based spraying.

Application of PGPR : 72 per cent of the respondents were not adopted PGPR and only less than one-third (28%) were adopted. Lack of adequate knowledge, non-availability and high cost of PGPR associated with complexity nature and low compatibility of the technology were contributed for the non adoption.

Table 1. Distribution of respondents on the basis of adoption of individual eco-friendly technologies (N =100)

Eco-friendly technologies	Adopters (%)	Non-adopters (%)	Knowledge Mean Index	Attributes (%)
Application of *Pseudomonas*	82.00	18.00	70.83	Compatibility (75.00)Trialability (80.00)
Application of *Trichoderma*	76.00	24.00	67.50	Relative advantage (62.0) Compatibility (58.0)
Use of *Trichogramma* cards	76.00	24.00	64.33	Relative advantage (63.00)Trialability (74.00) Observability (75.00)
Use of pheromone traps	72.00	28.00	62.50	Observability (66.00)
Use on neem based pesticides and bio pesticides	72.00	28.00	61.75	Relative advantage (82.0), Compatibility(86.0), Observability (83.00)
Use of light traps	49.00	51.00	59.5	Complexity (80.00)
Application of *Beauveria*	31.00	69.00	30.00	Complexity (80.00)
Application of PGPR	29.00	71.00	29.00	Complexity (84.00)

Application of beauveria: In the case of application of *Beauveria*, 31 per cent had fully adopted the technology, while about 69 per cent had not adopted it. The lower adoption might be due to lack of technical skill in handling and usage of *beauveria*, besides its complexity and low compatibility. Moreover, the farmers might have not convinced about this technology, probably due to its slow action on controlling of pests and intangible nature.

Overall adoption level of the respondents about eco-friendly farm technologies : The data presented in Table 2 reveals that nearly 70 per cent of the respondents belonged to medium adoption category, whereas 26 per cent and 4 per cent of FFS respondents belonged to high and low adoption categories respectively.

Table 2. Overall adoption level of the respondents about eco-friendly farm technologies (N=100)

Category	%
Low (Less than 3.00)	4.00
Medium (4.00-6.00)	70.00
High (Greater than 6.00)	26.00
Mean = 4.62	SD=0.73

Probable reason for the respondents to be in medium adoption category might be due to the medium to high knowledge possessed by majority (84%) of the respondents. Since knowledge limits the action of individuals, as it is basic pre-requisite for any individuals to think of the pros and cons in making a decision, to either adopt or reject a practice. Other possible reason might be that, majority of the respondents had participated in extension activities like, demonstrations, trainings, group discussions and field days. The results are in line with the findings of *Shashidhara (2006).*

Relationship between profile characteristics of rice farmers in FFS with adoption of eco-friendly technologies: The correlation co-efficient were computed for the examination of the relationship between the independent variables and the adoption of eco-friendly technologies. The results presented in Table 3.

Education and adoption : Significant relationship (0.258**) existed between education and adoption. This inferred that, respondents with higher level of education adopted more of eco-friendly technologies. As farmers with high education are more receptive to new ideas and they always tend to change and attracted towards modern practices. The probable reason for this might be that majority of the respondents had good educational level coupled with extension contact.

Table 3. Correlation between characteristics of the FFS respondents and their adoption of eco-friendly farm technologies (N=100)

Variables	r value
Age (X_1)	-0.053
Education (X_2)	0.258**
Land holding (X_3)	0.062
Farming experience(X_4)	-0.119
Annual income(X_5)	0.093
Innovativeness(X_6)	0.441**
Risk orientation (X_7)	0.262**
Scientific orientation(X_8)	0.339**
Extension participation(X_9)	0.404**
Mass media utilisation (X_{10})	0.229*
Trainings attended (X_{11})	0.208*
Institutional support (X_{12})	0.288**
Group cohesiveness (X_{14})	0.129
Group interaction(X_{15})	0.303**
Knowledge on eco-friendly farm technologies(X_{16})	0.494**

**Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed).

Innovativeness and adoption : It was observed that innovativeness and adoption was significantly associated (0.441**) *Yadavet al. (2007)* revealed that correlation coefficients of nine variable. Innovativeness is associated with the individuals' earliness in the use of new practices. During any contingent situation farmers with high levels of innovativeness experiment the new ways of doing things to change the existing situation. Generally person with more innovativeness would be looking for new ideas. The major reasons for this might be majority of the framers had good educational level, institutional support and extension participation.

Risk orientation and adoption : It was evident that coefficient of correlation value (r= 0.262) between risk orientation and extent of adoption of eco-friendly farm technologies by the respondents was positively and significantly related. It was observed that many farmers were taking risks due to peer pressure or situational demands. Timely guidance by the change agents and other sources of information and the anticipation of high profits from adoption of eco-friendly farm technologies might have influenced them to take risks in adopting the eco-friendly farm technologies by rice farmers in FFS.

Scientific orientation and adoption : Farmers having more scientific orientation (0.339**) will always search for new and advanced production technologies and have keen observation power to find out the cause effect relationship in any constraint situation. Most of the innovations will be adopted by the persons with more scientific orientation, who prefer new technologies. The major reason for this might be majority of the farmers had medium to high level of scientific orientation, innovativeness and risk taking ability might have influenced them to adopt eco-friendly technologies. es.

Extension participation and adoption : Farmers with high level of extension participation were high adopters of eco-friendly farm technologies. There was significant association (0.404**) between extension participation and adoption of eco-friendly technologies.

Mass media utilization and adoption : The results showed that significant and positive correlation (0.229*) had existed between mass media exposure and extent of adoption of eco-friendly farm technologies by the respondents. The published and broadcasted farmer success stories of different mass media might have influenced the farmers to adopt eco-friendly technologies.

Trainings attended and adoption : Trainings attended had a significant relationship (0.208*) with adoption. Timeliness of training conducted by different organizations has led to increase in adoption of eco-friendly farm technologies and other improved crop management practices. Training might have inculcated technical competency, more exposure to the subject matter and convinced to adopt the eco-friendly technologies in the farms.

Institutional support and adoption : In the present study, the relationship between the institutional support and adoption of the respondents was significant (0.288**). The probable reason might be that the FFS participants might have come across new ideas relating to eco-friendly technologies, when they participated in the activities of institutions like Co-operative societies, gram panchayath, KVK, SAU, ATMA and *padasekhara samithis* which might have influenced them to adopt eco-friendly technologies.

Group interaction and adoption : Group interaction had a significant relationship (0.303**) with adoption. The major reason for this positive correlation might be the respondents in FFS had good access to information through various mechanisms, such as extension agents, trainings and mass media.

Knowledge and adoption : There existed a positive and significant relation (0.494**) between knowledge and adoption. Adequate knowledge of any improved practice is a pre-requisite for its adoption. Research studies have established that knowledge of an innovation would lead to its eventual adoption. The major reason for this might be that majority of the respondents had medium to high level of knowledge which might have influenced them to adopt eco-friendly technologies.

CONCLUSION

The results showed that, education, innovativeness, scientific orientation, risk orientation, extension participation, institutional support, mass media utilization, trainings attended, group interaction and knowledge exhibited positive and significant relationship with adoption of eco-friendly technologies in rice. Hence, there is an urgent need to consider these variables in order to promote eco-friendly method of cultivation, focusing more on imparting the principles of FFS during the training programmes and demonstrations, skill development among rural youth and farmers.

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