

DIFFUSION AND ADOPTION OF AGRICULTURAL TECHNOLOGY AMONG THE FARMER HOUSEHOLDS: A STUDY OF FARMER HOUSEHOLDS IN KUTTANAD, KERALA

Abstract

In the modernization of the farm sector, mechanization and the use of technology matter a lot. But, the success of farm technology depends on its diffusion and adoption by the farmers. This article looks into the level of technology adoption by the farmers and examines the socio-economic factors that determine the categorization of farmers into different levels of technology adopters. The study reveals that technology gets diffused mainly through neighbours, relatives, and opinion leaders (Localite Channels). It also shows that variables like age, education, and size of landholding are significantly associated with the adoption of technology by the farmers. It also suggests that for technology adoption to be successful, farmers must be properly educated, and fragmentation of land should be discouraged.



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INTRODUCTION

Increasing agriculture production while causing minimum or no environmental disturbances assumes greater importance. It has been proved that technology adoption by the farmers has the potential to play a significant role in revitalizing agriculture in a sustainable way. Nevertheless, technology adoption by the farmers

is a herculean task as the farmers are generally averse to changes in the mode and method of production due to a number of factors. The present study intends to focus on the influence of socio-economic characteristics of farmers on the level of technology adoption.

CONCEPTUAL FRAMEWORK

Diffusion implies the spread of

new things and practices among the users or intended entities. Diffusion often happens through different communication channels. Communication channels involve interpersonal channels (where face-to-face interaction between one or two persons leads to the diffusion of technology at different levels), mass media, and social media channels (which also play a significant role in the diffusion of innovation among

the farmers at large), localite channels (which refer to those which exist within the social system in which the farmers live in like neighbours, relatives, and opinion leaders) and cosmopolite channels (which include people and institutions outside the social system like the extension workers of agricultural departments, sales personnel of companies selling the new machines).

Obviously, all farmers do not adopt technology at once. Therefore, it is important that agricultural extension workers identify those farmers who are likely to adopt it early and who lag behind. Picking up the 'early birds' in technology adoption is very crucial in farming as farmers are generally skeptical about embracing new technologies. Adoption always follows a special pattern where it grows at a slower pace in the beginning and gains momentum later on. Therefore, starting up the adoption is said to be critical in the adoption of farming technologies. Based on the readiness to adopt innovation, farmers could be classified as under:

- 1. Early Adopters** - Farmers who tend to adopt the technology much earlier than others, and therefore others look forward to this category with respect, and hence the early adopters are recognized as a 'respectable category'. It needs to be understood that normally early adopters are a few in number.
- 2. Early Majority Adopters** - Farmers who do not jump into adopting the technology as soon as it is introduced, but start adopting it after deliberation with their peer groups, and having observed the early adopters. Therefore, this category is often called 'deliberators'.
- 3. The late Majority** - The late majority adopts new ideas and technology at a later stage. They adopt it out of economic necessity and pressure. They always doubt the new idea and the technology, and hence they are often called 'Sceptical'.
- 4. Laggards** - Those who are the last to adopt new ideas or technology. They live with a traditional mind ('Traditional') and attempt to match everything with the past. When laggards take the decision to adopt something, it may have been superseded by a new idea.

LITERATURE SURVEY

Farmers especially in the high land areas are generally averse to adoption. In a study, *Fujisaka* narrates the possible six reasons for the poor adoption of technology by farmers of upland agriculture in Southeast Asia (*Fujisaka, 1994*). On the question as to what determines the level of adoption of technology by farmers, country-specific studies have found that market access, private participation, dissemination of information, membership in farmer groups and cooperatives, farmer training, and access to credit have positively influenced technology adoption (*Kumar,*

et al., 2020). Studies on digital farming have examined the problems involved in the kind of technologies to be adopted by the farmers rather than the farmer-centric factors that impede the adoption of farm technologies (*Shang, Heckelei, Gerullis, Börner, & Rasch, 2021*). Farmers having contact with the project technicians and extension officers of projects implementing farm technologies tend to adopt new technologies faster than others (*Chitere, 1998*). The farm and farmer household features like farm size, gender, and education have had a significantly higher influence on the level of technology adoption (*Ladebo, 1999; Franzel, Ndufa, J. K, Obonyo, C. O, Bekele, T, & Coe, R, 2000*). Government policy also appeared to have a significant influence on the technology adoption by farmers (*Sail, S, Norman, D, & Featherstone, A. M, 2000*). The inclusion of farmers in the technology development process has had a considerably higher influence on the technology adoption by farmers (*Sinclair, F. L, 2001*). Farmers' perceptions of the features of technology to be adopted also influence the adoption decisions (*Hays, H. M & Raheja, A. K, 1977*).

OBJECTIVE OF THE STUDY

The present study intends to identify the communication channels of diffusion of agricultural technology among the farmers and to examine the influence of socio-economic variables on the adoption of technology by farmers.

METHODOLOGY

Employing a semi-structured interview schedule, we interviewed 120 farmers chosen through random sampling from the Kuttanad Taluk of Alappuzha District. The Chi-Square test of independence was used to understand the association between different variables in the study.

ANALYSIS AND DISCUSSION

Table 1 provides a description of the socio-economic characteristics of farmer households under this study.

TABLE 1 SOCIO ECONOMIC CHARACTERISTICS OF SAMPLE FARMER HOUSEHOLDS

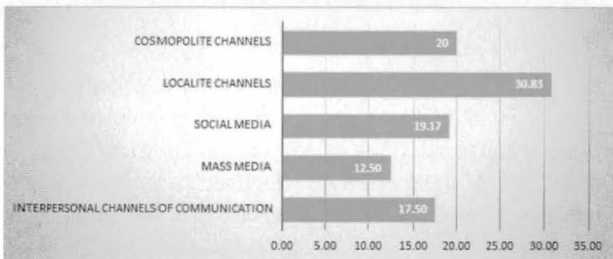
Socio Economic Variable	Category	Percentage of Households
Age	Between 25 and 45	60.00
	Between 46 and 55	44.00
	Above 55	16.00
Gender	Male	78.30
	Female	21.70
Education	Below SSLC	25.00
	SSLC	46.70
	Plus Two and Above	28.30

Caste	General	30.80
	OBC	32.50
	OEC	26.70
	SC/ST	10.00
Ownership of Land Holding	Own land	70.8
	Land on Lease	29.2
Size of Land Holding	Small	10.8
	Medium	50.8
	Large	38.3
Income from other Sources	Yes, do have	59.2
	No, don't have	40.8

SOURCES OF TECHNOLOGY DIFFUSION

The study shows that most of the farmers (30.83 per cent) consider localite channels like neighbours, relatives and opinion leaders as the main source of technology diffusion followed by cosmopolite channels (like extension works and officers), and social media (Figure No.1).

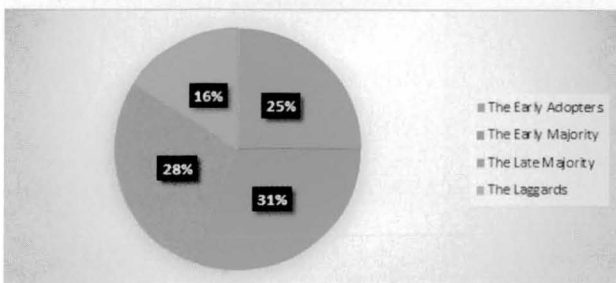
FIGURE 1 SOURCES OF TECHNOLOGY DIFFUSION AMONG FARMER HOUSEHOLDS



TECHNOLOGY ADOPTER CLASSIFICATION OF FARMERS

It is found that 25 per cent of the farmers are early adopters of technology whereas 16 per cent are laggards as they adopt technology at the last. It was further found that 31 per cent of farmers become accustomed to technological change after consultation with others, and they are called 'The Early majority' (Figure No2).

FIGURE 2 DIFFERENT TECHNOLOGY ADOPTER CATEGORIES OF FARMER HOUSEHOLDS



Looking into the influence of age in determining the adopter category of farmer households, it is observed that there is a significant association between age and adopter categories of farmer households. Among the younger, more are found to be adopting technology quicker than others, showing that age has a significant influence on the level of technology adoption (Table No.2). But, it is interesting to note in the case of gender-wise distribution that the P-value is .652, and hence, there is no significant association between gender and the adopter category of farmer households (Table No3).

TABLE 2 AGE WISE DISTRIBUTION OF ADOPTER CATEGORIES OF FARMER HOUSEHOLDS

Adopter Categories	Between 25-45	Between 46-55	Above 56
The Early Adopters	36.67	18.18	0.00
The Early Majority	41.67	25.00	6.25
The Late Majority	21.67	36.36	31.25
The Laggards	0.00	20.45	62.50
Total	100	100	100

P value is significant at .05 percent.

TABLE 3 GENDER WISE DISTRIBUTION OF TECHNOLOGY ADOPTER CATEGORY OF FARMER HOUSEHOLDS

Technology Adopter Categories	Gender		Total
	Male	Female	
The Early Adopters	26.60	19.23	25.00
The Early Majority	28.72	38.46	30.83
The Late Majority	29.79	23.08	28.33
The Laggards	14.89	19.23	15.83
Total	100.00	100.00	100.00

P value is .652

Education is another variable that plays an important role in determining the adopter category of farmers. It is observed that 60 per cent of farmers with Plus Two education are early adopters. The study has found a significant association between education and the level of technology adoption.

TABLE 4 EDUCATION WISE DISTRIBUTION OF TECHNOLOGY ADOPTER CATEGORY OF FARMER HOUSEHOLDS

Adopter Level Category of Households	Education		
	Below SSLC	SSLC	Plus Two
The Early Adopters	0.00	40.00	60.00
The Early Majority	13.51	56.76	29.73
The Late Majority	35.29	50.00	14.71
The Laggards	68.42	31.58	0.00
Total	25.00	46.67	28.33

P value is .00

It is surprising to note that ownership of land does not have any significant association with the adopter category of farmers (Table No5). On the other hand, the size of land held by farmers is significantly associated with the adopter category of farmers. It is observed that 50 per cent of farmers with large holdings are early adopters of technical change (Table No6).

TABLE 5 OWNERSHIP OF LAND AND DIFFERENT ADOPTER CATEGORIES OF FARMERS

Adopter Categories	Own	Lease
The Early Adopters	27.06	20.00
The Early Majority	35.29	20.00
The Late Majority	27.06	31.43
The Laggards	10.59	28.57
Total	100.00	100.00

P value is .055

TABLE 6 SIZE OF HOLDINGS AND DIFFERENT ADOPTER CATEGORY OF FARMER HOUSEHOLDS

Adopter Category	Small Holdings	Medium Holdings	Large Holdings
The Early Adopters	0	11.48	50.00
The Early Majority	7.69	29.51	39.13
The Late Majority	15.38	45.90	8.70
The Laggards	76.92	13.11	2.17
Total	100.00	100.00	100.00

P value is .000

Adoption always follows a special pattern where it grows at a slower pace in the beginning and gains momentum later on

CONCLUSION

The study has found that to bring about sustainable and productive change in the farm sector technology innovation is essential. But the level of technology adoption by the farmer depends on variables like their education level, size of farm holdings, ownership of land, and age. Since education and size of land holdings are significantly associated with the technology adoption by the farmers, it calls for making structural and fundamental changes among farmers through farms education and enhancing the size of land suitable to the application of farm technologies. **MA**

References

1. Chitere, O. P. (1998). *Diffusion and adoption of farm technologies among resource-limited farmers: Experiences from the ICIPE/UNECA Integrated Pest Management Project in Western Kenya. International Journal of Pest Management, 49-52.*
2. Franzel, S., Ndufa, J. K., Obonyo, C. O., Bekele, T., & Coe, R. (2000). *Farmer-Designed Agroforestry Tree Trials: Farmers' Experiences in Western Kenya. Nairobi: International Centre for Research on Agroforestry.*
3. Fujisaka, S. (1994). *Learning from six reasons why farmers do not adopt innovations intended to improve sustainability of upland agriculture. Agricultural Systems, 409-425.*
4. Hays, H. M., & Raheja, A. K. (1977). *Economics of sole crop cowpea production in Nigeria at the farmer's level using improved practices. Experimental Agriculture, 149-154.*
5. Jones, G. E. (1963). *The Diffusion of Agricultural Innovations. Journal of Agricultural Economics, 387-409.*
6. Kumar, A., Takeshima, H., Thapa, G., Adhikari, N., Saroj, S., Karkee, M., & Joshi, P. (2020). *Adoption and diffusion of improved technologies and production practices in agriculture: Insights from a donor-led intervention in Nepal. Land Use Policy. doi:https://doi.org/10.1016/j.landusepol.2020.104621*
7. Ladebo, O. (1999). *Determinants of adoption of new technologies among rice farmers in Ifo LGA of Ogun State of Nigeria. ActaUniv. agric. Et silvic. Mendel. Brun, 83-87.*
8. Sail, S, Norman, D, & Featherstone, A. M. (2000). *Quantitative assessment of improved rice variety adoption: the farmer's perspective. Agricultural Systems, 129-144.*
9. Shang, L., Heckeleei, T., Gerullis, M., Börner, J., & Rasch, S. (2021). *Adoption and diffusion of digital farming technologies - integrating farm-level evidence and system interaction. Agricultural Systems. doi:http://dx.doi.org/10.1016/j.agry.2021.103074*
10. Sinclair, F. L. (2001). *Process-based research in sustainable agricultural development: integrating social economic and ecological perspectives. Agricultural Systems, 1-3.*