SOCIO-ECONOMIC CHARACTERISTICS IN THE ADOPTION OF CASSAVA TECHNOLOGY BY SMALL FARMERS OF KANYAKUMARI AND TRIVANDRUM DISTRICTS OF SOUTHERN INDIA

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ABSTRACT

Seventy-five small cassava farmers were interviewed to determine their cassava technology adoption level and its relationship with their socio-economic characteristics. Majority of the farmers had low to medium adoption level. Knowledge on cassava technology had the most direct effect on adoption followed by scientific orientation and extension agency contact. On the other hand; age, mass media exposure and farm size had indirect effects through knowledge while education, area under cassava cultivation and risk preference did not influence adoption.

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INTRODUCTION

Cassava is an important root crop widely cultivated in tropical countries as a staple food. It can withstand near drought conditions hence, it is attractive to the poor farmers in India especially those in Kerala and parts of Tamil Nadu, where it is a secondary food crop. Besides, cassava is an important raw material of sago, glucose and animal feed. Results of a technology transfer program of the Central Tuber Crops Research Institute, Trivandrum, India reveal a great possibility of increasing the present cassava productivity of 17 t/ha. Cassava yield from farmers' field trials indicated an average yield of 30 t/ha from high yielding cassava varieties using scientific management practices.

Increase in cassava productivity is only possible when farmers adopt improved cassava technology. Although adoption of improved cassava technology increases yield, technology dissemination is not significant and uniform. This may be due to various factors and socio-economic characteristics of small cassava farmers appear to be the most important. If the factors affecting cassava technology adoption are ascertained, a rational action to improve the adoption behavior of cassava farmers could be programmed. Hence, an investigation was undertaken to determine the cassava technology adoption level of small farmers and the socio-economic characteristics affecting it.

METHODS

Data Collection. The study was conducted in Kanyakumari and Trivandrum districts of Tamil Nadu and Kerala States, respectively situated in southern India where cassava is widely cultivated for consumption. The respondents were the small cassava growers possessing total farm holdings up to 2 ha. From each district, one predominantly cassava growing revenue village with greater percentage of small farmers were selected. Thirty-five and 40 farmers were randomly selected from Kanyakumari and Trivandrum districts, respectively. A total of 75 sample farmers were interviewed. Data on adoption and socio-economic characteristics were collected using structured interview schedule. Percentage, simple correlation coefficient and path coefficient analyses were employed to analyze and interpret the data.

Variables and Measurement. The adoption behavior of cassava farmers was the dependent variable. It was measured by the Adoption Quotient (A.Q.) formula developed by Chattopadhyay (1963) modified to suit the farmer and crop type. The modified formula is:

$$A.Q. = \frac{\sum_{i=1}^{N} \left(\frac{e_i w_i}{p_i}\right)}{\sum_{i=1}^{N} w_i} \times 100$$

where e_i = extent of correct adoption of i^{th} practice

p_i = potential area for adoption of i^{th} practice

w_i = weightage given to i^{th} practice

N = number of improved practices under consideration

Nine improved cassava cultivation practices recommended by CTCRI were considered for the determination of individual farmer's adoption quotient. Many research findings (Thampi, 1981; Tyagi and Sohal, 1984; Singh and Ray, 1985) have shown that various socio-economic characteristics of farmers viz. age, education, knowledge, and farm size influenced the extent of adoption of innovations. For this study, nine independent variables, namely: age, formal education, farm size, area under cassava cultivation, mass media exposure, extension

agency contact, scientific orientation, risk preference and knowledge on cassava technology were selected based on various findings on adoption and previous experience with this group of farmers. The empirical measures adopted for each independent variable are shown in Table 1.

Table 1. Independent variables and their empirical measures.

Variable	Empirical Measure
Age	Actual age in years
Formal education	Quantification used for education in the socio-economic status scale (Trivedi, 1963)
Farm size	Actual area in cents[1]
Area under cassava	Actual area in cents[1]
Mass media exposure	Mass media exposure measurement (Knight, 1973)
Extension agency contact	Extension agency contact measurement (Knight, 1973)
Scientific orientation	Scientific orientation scale (Supe, 1969)
Risk preference	Risk preference scale (Supe, 1969)
Knowledge on cassava technology	Knowledge test developed for the study

[1]248 cents = 1 ha

RESULTS AND DISCUSSION

Adoption Level

The farmer-respondents were categorized into three adoption levels based on their individual adoption scores. Farmers with adoption scores of 0-33, 34-66 and 67-100 were considered to have low, medium and high adoption levels, respectively (Table 2). Data indicate that only 2.67 percent of

the respondents have high adoption level while 46.67 and 50.66 percent had low and medium adoption levels. Moreover, the mean score was only 31 and was way below the midpoint of the adoption quotient. This reveals that farmers' adoption of cassava technology was generally not encouraging.

Table 2. Small cassava farmers' technology adoption level.

Adoption Level	Frequency of Farmers	% of Farmers
Low (0-33)	35	46.67
Medium (34-66)	38	50.66
High (67-100)	2	2.67

Relationship of Independent Variables with Adoption

Results show that knowledge on cassava technology is positively and significantly correlated with adoption (Table 3). Knowledge is necessary to adoption and it follows that farmers with more knowledge on cassava technology apply it in their farms. This conforms with the findings of Singh and Ray (1985), Tyagi and Sohal (1984) and Samad and Nair (1981) who reported strong positive relationship between knowledge and technology adoption.

Besides knowledge; age, farm size, mass media exposure and scientific orientation also exhibited positive correlation with adoption. Cassava is a non-commercial crop in the area studied hence, minimal effort is exerted for the wide scale transfer of its production technology. Under this circumstance, long experience with the crop counts a lot for knowledge accumulation hence, the positive relationship with age. Thampi (1981) also observed positive relationship between age and adoption behavior of paddy farmers.

Farmers with larger farm holdings were economically better disposed to follow certain practices involving money, e.g. recommended method of land preparation for cassava and fertilizer application, which might ultimately contribute to higher adoption level. Findings of Sushama et al. (1981) and Reddy and Kivlin (1968) showed similar positive correlation between farm size and adoption of improved farm practices.

Farmers with more exposure to mass media get new information about various cultivation practices and this definitely influenced adoption of new practices. The positive correlation between mass media exposure and adoption was also observed in the studies by Wilson and Chatruvedi (1985) and Subramanyam and Chandrakandan

(1975). Furthermore, farmers with scientific orientation logically venture in adopting cassava technology in their farms. Hence, scientific orientation and adoption are positively related. This conforms with the findings of Veeraswamy and Bahadur (1979) that small rice farmers with greater scientific orientation were better adopters of rice technology.

Table 3. Correlation and path analysis of independent variables with adoption as dependent variable.

Variable	Correlation Coefficient (r)[1]	Direct Effect	Total Indirect Effect	Variable Channeling Substantial Indirect Effects[2] I	II
Age	0.294*	-0.242	0.536	0.271(9)	0.235(5)
Formal education	-0.008	-0.023	0.015	-0.112(5)	0.100(1)
Farm size	0.281*	-0.059	0.331	0.292(9)	0.971(4)
Area under cassava	0.225	0.081	0.147	0.228(9)	-0.069(1)
Mass media exposure	0.274*	-0.319	0.584	0.289(9)	0.184(1)
Extension agency contact	0.225	0.227	-0.002	0.037(9)	0.032(7)
Scientific orientation	0.267*	0.233	0.034	0.253(9)	-0.181(5)
Risk preference	0.001	-0.126	0.127	0.091(7)	-0.066(5)
Knowledge on cassava technology	0.771**	0.892	-0.121	0.100(5)	-0.074(1)

[1]*, ** - Significant at 5 and 1% levels, respectively.
[2]Figures in parenthesis indicate the variables channeling the substantial indirect effects.

Among the remaining four variables, the correlation coefficients of area under cassava cultivation and extension agency contact though not statistically significant indicated a trend of positive association with adoption. Since cassava is a poor man's crop in the area surveyed, farmers' contact

with extension agents or vice versa was generally low (two thirds of the farmers reportedly have low contact). This may be the reason for the absence of significant correlation. However, formal education and risk preference did not show any relationship with adoption. Formal education, although believed to be helpful in knowledge acquisition did not significantly affect adoption since knowledge gained by cassava farmers depends on factors like experience and various sources of information. This finding is in accordance with that of Thampi (1981). Moreover, the tendency of the farmers to adopt improved practices was not affected by their varied nature of risk orientation probably because cassava is a relatively risk free crop.

Path analysis

Correlation only shows the relationship between two variables and does not provide any clue on the degree of contribution and differential effects of various variables. Thus, path analysis was used to understand the influence pattern of selected variables on adoption of cassava technology and to identify the important variables. According to Li (1982), path coefficient is an absolute number without any physical unit but with direction. Path analysis also gives a clear picture of the direct and indirect effects of selected independent variables on the dependent variable. Variables which channeled substantial indirect effects were also determined. Variables with direct effect and magnitude exceeding 0.2 was subjectively considered to be substantial (Sethy et al., 1984). In this study, the two variables exhibiting higher indirect effect channeled through the variables were also considered.

The varying levels of direct and indirect effects of the selected variables on cassava technology adoption are presented in Table 3. The knowledge on cassava technology had the maximum direct effect (0.892) and it was greater than its correlation coefficient revealing its strong influence on cassava technology adoption. Moreover, it had the largest indirect effect channeled substantially through variables viz. age, farm size, area under cassava cultivation, mass media exposure and scientific orientation. These factors indicate that knowledge is an essential and major contributing variable to adoption. This conforms with the findings of Tyagi and Sohal (1984), and Sethy et al. (1984) that knowledge had a maximum direct effect on adoption of innovations. It therefore appears that knowledge on cassava is the major input to promote cassava technology adoption among small farmers.

Next in importance is scientific orientation which has substantial direct effect (0.233) on adoption and is close to its correlation coefficient (0.267) indicating its true association with adoption. Farmers oriented to science are more inclined to acquire scientific knowledge on cassava cultivation hence, they get substantial indirect effect through knowledge. Extension agency contact could be regarded to influence adoption because its direct

effect was substantial and same in magnitude as the correlation. Its relationship was more or less independent and no other variable had sizable indirect effect on adoption through extension agency contact. This suggests the necessity of developing extension agency contact with cassava farmers to obtain desirable change in the adoption pattern.

Though its correlation coefficient was significant (0.274), mass media exposure has negative direct effect (-0.319) and positive total indirect effect (0.584) on adoption. The indirect effect of knowledge and age on adoption through mass media exposure seemed to be the main cause for their relationship. The negative direct effect of mass media exposure on adoption may be due to very little importance given to cassava in the mass media compared to commercial crops which enjoy vast coverage in frequency and quantity. This encourages the farmers to concentrate more on these crops than on cassava.

Age had a negative direct effect indicating that its significant correlation was due to its indirect effect through knowledge and mass media exposure. This implies that age alone cannot influence adoption and it has to go with knowledge and mass media exposure.

The direct effect of farm size was negligible with greater indirect effect mainly through knowledge. This implies that age, mass media exposure and farm size could not contribute to adoption on their own but only in combination with other variables, mainly knowledge which had also shown significant correlation with these variables. Formal education, risk preference and area under cassava cultivation exhibited neither direct or indirect effect revealing that they are unnecessary in the adoption of improved cassava technology.

IMPLICATIONS

Results reveal that majority of the cassava farmers had low to medium adoption level primarily because of the existing extension gap. This is clearly reflected in the path analysis which shows more direct effect of knowledge and extension agency contact on adoption, and implies the need to improve knowledge level. Systematic extension strategies need to be programmed considering the economic and social background of cassava farmers. Organization of crop demonstration, peripatetic training and group discussion in the villages would prove fruitful in convincing cassava farmers and improving their knowledge owing to their limited mobility. Giving importance to cassava in extension programs would provide a need-based situation for extension agents to come into contact with cassava farmers. Involvement of more cassava growers as contact farmers in the reorganized extension project (training and visit system) would help in speedy cum multiplier knowledge transmission. In transferring technology through various extension platforms, scientific explanation of different recommended practices may also be given because it appears to affect technology adoption.

It is quite astonishing that mass media exposure had negative direct effect and this may be due to less cassava information in media like radio and newspaper. Mass media exposure would definitely contribute to adoption once it carries cassava information. The combination of aforesaid strategies would optimistically bring desired changes in the adoption of cassava technology.

LITERATURE CITED

CHANDRAKANDAN, K. and SUBRAMANYAN, V.S. 1975. Note on socio-personal factors of farmers in relation to adoption. Madras Agric. J. 62(10-12):355-357.

CHATTOPADHYAY, S.N. 1963. A study of some psychological correlates of adoption of innovations in farming. Unpublished Ph.D. Thesis. Indian Agricultural Research Institute, New Delhi.

KNIGHT, A.J. 1973. A study of relative effectiveness of three modes of presentation, listening and post listening behavior of farm broadcast listeners. Unpublished Ph.D. Thesis. Indian Agricultural Research Institute, New Delhi.

LI, C.C. 1982. Population Genetics. The University of Chicago Press. Chicago.

REDDY, S.K. and KIVLIN, J.E. 1968. Adoption of high yielding varieties. A study in three Indian villages. Behavioral Sciences and Community Development 2(2):121-142.

SAMAD, K.A. and NAIR, G.T. 1981. Relationship of selected factors with the adoption behavior of farmers of intensive paddy development, coconut package and pepper package area of Kerala. Agric'l. Res. J. Kerala. 19(2):62-65.

SETHY, B., SINHA, B.P. and BAHAL, R. 1984. Some entrepreneurial characteristics in adoption of an improved farm technology. India J. Extn. Educ. 20(1 & 2):29-37.

SINGH, A.K. and RAY, G.L. 1985. Variables contributing to the level of fertilizer use of the farmers. Indian J. Extn. Educ. 21(3 & 4):1-10.

SUPE, S.V. 1969. Factors related to different degrees of rationality in decision making among farmers. Unpublished Ph.D. Thesis. Indian Agricultural Research Institute, New Delhi.

SUSHAMA, N.P.K., MENON, A.G.G. and BHASKARAN, C. 1981. Adoption behavior of selected tribes of Kerala. Indian J. Extn. Educ. 17(1 & 2):71-76.

THAMPI, A.M. 1981. A study on the rate of adoption of improved agricultural practices by the national demonstrators of Trivandrum District. Agric. Res. J. Kerala 19(2):66-70.

TRIVEDI, G. 1963. Measurement analysis of socio-economic status of rural families. Unpublished Ph.D. Thesis. Indian Agricultural Research Institute, New Delhi.

TYAGI, K.C. and SOHAL, T.S. 1984. Factors associated with adoption of dairy innovations. Indian J. Extn. Educ. 20(3 & 4):1-8.

VEERASWAMY, S. and BAHADUR, T. 1979. Some correlates of adoption of improved rice technology by small farmers of South Arcot district. Indian J. Extn. Educ. 15(3 & 4):87-89.

WILSON, M.J. and CHATRUVEDI, J. 1985. Adoption of improved technology for flue cured Virginia (F.C.V.) tobacco in Andhra Pradesh. Indian J. Extn. Educ. 21(3 & 4):108-109.