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Research Article

AN ANALYSIS OF SHIFT IN AREA TO NATURAL RUBBER IN KASARGOD DISTRICT OF KERALA

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Abstract- Owing to the growing demand for natural rubber by various sectors in India, rubber cultivation assumes a great importance. The shift of area to rubber has been taken place due to several factors. Hence, this study was undertaken to analyse the reasons for shift in area between rubber and its competing crops in the Kasargod district of Kerala. The multinomial logistic regression model was used to analyse the reasons for shift in area towards rubber from competing crops. Multinomial logistic regression results revealed that probability of shift to rubber, partially or fully, from other crops is positively influenced by participation in rubber related extension activities and negatively by age. Thus, imparting training and extension education preferably to young farmers could be an effective strategy for promoting rubber production through area shift.

Keywords- Natural rubber, Kasargod, Multinomial logistic regression, Area shift.

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Introduction

Kerala is the highest producer of natural rubber in India, followed by Tripura and Karnataka. The agricultural scenario of Kerala since 1960 clearly showed that the cropping pattern in the state made a significant shift from the traditional food crops such as tapioca, paddy *etc.,* to rubber plantations and coconut gardens. The cropping pattern changes that had occurred were mainly based upon the farmers' decisions, which are influenced by labour availability, cost of cultivation, irrigation facilities, price levels, profitability *etc.* In Kerala during 1960-61, the area under rubber cultivation was 5.23 per cent of the total cropped area, which increased to 13.63 per cent in 1990-91 and 19.65 per cent during 2009-10 and in the process it replaced many crops such as tapioca, cashew *etc*[1-3].

Owing to the growing demand for natural rubber by various sectors in India, rubber cultivation assumes a great importance. It is observed that the rubber cultivation in the traditional rubber growing districts of Kerala namely Kottayam and Ernakulam reached the stagnation stage. However, in other parts of Kerala, the shift of area to rubber from its competing crops is still continuing especially in the districts of Kasargod and Wayanad due to the socio-economic factors and certain characteristic features of rubber plants. The shift of area to rubber has been taken place due to several factors. Hence, this study was undertaken to analyse the reasons for shift in area between rubber and its competing crops in the Kasargod district. The results of the study can be used for preparing new strategies to attract the potential farmers' towards rubber cultivation as the study reveals the reasons for area shift in the study area.

Methodology

For the study two taluks were selected from Kasargod district, based on the highest area under rubber during the five year period from 2009-10 to 2013-14. Thus, the taluks selected were Kasargod and Hosdurg from Kasargod district of Kerala. For the study of shift in rubber plantations, 50 farmers were selected randomly from each selected taluk of Kasargod district. This resulted in the selection of 100 farmers.

The multinomial logistic regression model was used to analyse the reasons for shift in area towards rubber from competing crops to rubber in the Kasargod district of Kerala. In general, multinomial logistic regression model is used for analysing unordered qualitative variables. It deals with truly nominal and mutually exclusive categories. Suppose a dependent variable 'y' has 'm' categories *i.e.* = 1, 2, 3....m with P_1, P_2, P_3 ....P_m as associated probabilities, such that $P_1+P_2+P_3+.....+P_m = 1$. The usual practice is to designate one category as the reference category. The probability of membership in other categories is then compared to the probability of membership in the reference category. Consequently, for a dependent variable with 'm' categories, requires the calculation of 'm-1' equations, one for each category relative to the reference category to describe the relationship between the dependent variable and the independent variables [4,5].

In the state of Kerala, the majorly exhibiting scenario was shift in area to rubber from its competing crops. Considering the same, a model was framed to find out the reasons for shift in area towards rubber. Since large amount of shift was occurring after 2005 and considering the capacity of the farmers to remember the details regarding variables used, year 2005 was taken as a base year to collect the information related to shift. Thus, the farmers who have shifted after 2005 were only considered for the study. If a farmer had not shifted from non-rubber crops to rubber during the period, his present status regarding the predictor variables were collected for the purpose of analysis.

The three possibilities of shift for a non- rubber farmer are as follows:

P_1= Probability that a non- rubber farmer shifts partially to rubber

P_2= Probability that a non- rubber farmer shifts completely to rubber

P_3= Probability that a non- rubber farmer remains with non- rubber crops

In the study, P_3 was considered as the reference category for the analysis and the two equations estimated were as follows:

$$Y_1 = \log\left(\frac{P_1}{P_3}\right)$$

$$Y_2 = \log\left(\frac{P_2}{P_3}\right)$$

A total of eight predictor variables were used in the present model and they are defined as follows:

1) Age: Age of the farmer at the time of shift decision taken was recorded for the study.
2) Number of years of schooling: The education of the farmer was measured in the number of years of schooling made by the farmer. Number of years of schooling he had undergone before shifting decision taken was considered for the analysis.
3) Family income: It means the average family income of the farmer during the last five years before shifting decision was taken. Here, the assumption made was that, a farmer may take decision of shift ifhis family income remains low for some years in the past. Family income of a particular year will have little impact on such long term decisions.
4) Net returns: Net returns mean the average net returns from the farm during the last five years before shifting decision was taken. It was considered as a categorical variable, which took the value 1 if average net returns from rubber were more than those from competing crops during a period of five years prior to making the decision regarding shift; and it takes the value 2 otherwise.
5) Household size: Household size means the average number of adult members in the family at the time of shifting decision taken. It is assumed that more adult household members a farmer possesses, the more household labour would be available to him for rubber production.
6) Size of landholdings: The agricultural landholdings a farmer had in his possession at the time of shift decision taken was considered as a predictor variable.
7) Participation in rubber related extension activities: The participation of farmers in the rubber related extension activities such as seminars, trainings, campaigns meetings, field demonstrations, exposure visits *etc*., before shifting decision taken by the farmers were considered. It was considered as a categorical variable, which took the value 1 if the farmer had participated in rubber related extension activities prior to making the decision regarding the shift; it takes the value 2 otherwise.

Results and Discussion

The -2 log likelihood estimate of -96.227 with chi-square value of 192.45 (p= 0.01) was found to be statistically significant. The pseudo R^2 (Nagelkerke) was 0.9799, indicating 97.99 per cent of the shift was jointly explained by the independent variables included in the model. The model was able to correctly predict 96.12 per cent of the cases into the three categories namely no shift from competing crops to rubber, partial shift from competing crops to rubber and complete shift. In the model, the category of no shift from competing crops was taken as a reference category. Since the probabilities of no shift, partial shift and complete shift add to one, only two equations were estimated. The model- 1 indicated the log of relative probability of partial area shift to rubber from the competing crops to the probability of no shift. Model- 2 estimated the log of relative probability of complete area shift to rubber from its competing crops to the probability of no shift. The results indicated that number of years of schooling, family income, net returns (this categorical variable takes the value 1 if average net returns from rubber were more than those from competing crops during a period of five years prior to making the decision regarding shift; and it takes the value 2 otherwise), household size, participation in rubber related extension activities (this categorical variable took the value 1 if the farmer had participated in rubber related extension activities prior to making the decision regarding the shift; it takes the value 2 otherwise).

Table-1 *Multinomial logistic regression analysis of factors responsible for shift in area to rubber in Kasargod district, Kerala*

Variables	Model- 1: Partial shift to rubber			Model- 2: Complete shift to rubber		
	b	Standard error	Exp (b)	b	Standard error	Exp (b)
Intercept	4.194**	0.003	66.02	4.502**	0.004	90.02
Age	-3.022**	0.001	0.05	-0.621**	0.002	0.54
No. of years of schooling	2.543**	0.003	12.72	1.793**	0.009	6.01
Family income	0.001*	0.005	1.00	0.006*	0.001	1.01
Net returns	0.131**	0.001	1.14	0.297**	0.000	1.35
Household size	1.112	0.001	3.04	0.244	0.008	1.28
Size of land holdings	2.511**	0.008	12.32	0.434**	0.006	1.54
Participation in rubber related extension activities	0.169*	0.006	1.18	1.381**	0.002	3.98
Experience in farming	1.748*	0.007	5.74	-1.983**	0.001	0.14

Residual Deviance : 3.14 Chi square : 192.45
AIC : 36.00 Percentage correctly predicted : 96.12%
Pseudo R^2 (Nagelkerke) : 0.9799 Sample size (n) : 100
-2 Log Likelihood: -96.227 ** Significant at 1 per cent, * Significant at 5 per cent

Size of landholdings was all found to be exerting positive impact on the probability of partial shift relative to the probability of no shift as well as the probability of complete shift relative to the probability of no shift.

However, the age of the farmer at the time of the shifting decision has to be made was found to be negatively influencing the relative probability of partial as well as complete shift in relation to the probability of no shift. The odds ratios {Exp (b)} are presented for both the models. The odds ratio of 12.72 for the variable number of years of schooling (model-1), for example, indicated that an increase of one year in the number of years of schooling would result in the probability of partial shift being 12.72 times the probability of no shift. Similarly, a unit increase in the household size (model-1) would result in the probability of partial shift to rubber being 3.04 times the probability of no shift. The odds ratios of model- 2 also have similar interpretations for all the explanatory variables.

Multinomial logistic regression results revealed that probability of shift to rubber, partially or fully, from other crops is positively influenced by participation in rubber related extension activities and negatively by age. Thus, imparting training and extension education preferably to young farmers could be an effective strategy for promoting rubber production through area shift.

Conclusion

The results for Kasargod district revealed that young people with higher family income, larger holdings and previous exposure to rubber related extension activities would be more probable to either partially shift or completely shift to rubber from competing crops. Multinomial logistic regression results revealed that probability of shift to rubber, partially or fully, from other crops is positively influenced by participation in rubber related extension activities and negatively by age. Thus, imparting training and extension education preferably to young farmers could be an effective strategy for promoting rubber production through area shift.

Application of research: An analysis of shift in area to natural rubber in Kasargod district of Kerala" was undertaken to analyse the reasons for shift in area between rubber and its competing crops in the Kasargod district. The results of the study can be used for preparing new strategies to attract the potential farmers' towards rubber cultivation as the study reveals the reasons for area shift in the study area

Research Category: Agribusiness Management, Agricultural Economics

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