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DETERMINANTS OF HOUSEHOLD TO TAKE UP DIFFERENT NON-FARM ACTIVITIES IN CAUVERY COMMAND: AN APPLICATION OF MULTIPLE DISCRIMINANT ANALYSIS

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Abstract- The study was conducted in the Vishweshwariah channel of Cauvery command area in Karnataka state of India. A total sample of 426 households were involved in diverse non-farm activities. Depending on the nature, the non-farm activities are classified into five different economic categories like agricultural services, trade and commerce, manufacturing and processing units, service and repairs and final category as traditional services. To determine the factors affecting households to take up different non-farm activities, multiple discriminant analysis was used in the study. From the data, six important variables like age of family head, education, number of working adults in the family, land holding, investment on non-farm activity and annual non-farm income have been chosen as predictors for discriminating the groups. For five groups and six variables, four linear discriminant functions are obtained. The study reveals that the first two discriminant functions explain a maximum variability of 85 per cent with an Eigen value of 0.197 and 0.061 respectively. From the standardized discriminant canonical coefficients of the four discriminant functions reveals that the variables such as age, education, land holding and the number of working adults in the family have more discriminating power to classify a household into five groups.

Keywords- Non-farm activity, Eigen value, Predictors, Multiple Discriminant Analysis

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Introduction

The rural non-farm sector comprises of all the activities other than crop and animal husbandry taken up by the farm households, which are carried out in the rural areas. The non-farm activities are mainly like manufacturing and processing sector, repair, construction, trade and commerce, transport and other supporting services in villages and rural towns undertaken by the farm households. Non-farm activity plays a significant role in the rural economy for income and employment generation, Pavithra and Kamal [1]. Development of various potential non-farm activities creates a profitable employment chances in rural areas. Household-based activities in the non-farm sector are mainly important for the rural poor, including women, Biradar [2].

Enormous numbers of studies have been made to examine many issues related to the structure and growth of non-farm employment, contribution of different rural non-farm economic activities in providing employment and income to the rural households, factors influencing and determining the structure of employment and its growth pattern in different non-farm activities [3-6]. Hence finding the determinants of different non-farm activities, provide necessary analytical insights about the character of socio-economic changes which might be induced by the adoption of employment oriented strategy to boost the rural economy. Also it helps in studying the nature of different non-farm activities and influencing variables such as age, education, farm size, income, etc., Zahonogo [7].

Materials and Methods

The data collected in the project entitled "Role and contribution of irrigation to rural non-farm activity – A case of Cauvery Command" during 2012, funded by Ministry Of Statistics and Programme Implementation (MOSPI), Government of India, is used for the study.

The data consists of 426 households, which are involved, in different non-farm activities. The data includes regarding age of the farmer, education level, family composition, land holding pattern, type of non-farm activities: nature, investment made and income generated by them.

Depending on the nature, the non-farm activities are classified into five different categories as follows:

1. Agricultural services (AS)
2. Trade and commerce (T & C)
3. Manufacturing and processing units (M & P)
4. Service and repairs (S & R)
5. Traditional services (TS)

This classification of non-farm activities into five sectors was similar to the ones followed in Jayaram [4] and Mehta [8].

Agricultural services comprises of activities which mainly help the farmers in carrying out various agricultural activities, such as transportation (hiring of bullock carts, tractors, power tillers) ploughing and other agricultural activities (hiring of bullocks, tractors, power tillers), agricultural implements (hiring of sprayers, water lifting pumps, paddy thresher etc.). Trade and commerce comprises of activities related to business, which are retail and grocery shops, agricultural input shops, small refreshment shops like hotel and tea shops, hardware shops, medical stores, jaggery business, coconut and tender coconut business, milk business, vegetable business, money lending and brokerage. Manufacturing and processing units includes activities like agricultural processing and other allied activities, such as jaggery making, rice mill, flour mill. The manufacturing activities are bullock cart

manufacturing, brick making and quarrying. Service and repairs are the activities which provide basic services in the villages. The services under this are workshops, tailoring, contractors, labour contractors, cable operators and gas agency. Traditional services are activities, which are traditionally practised by the rural people, which is continued as family profession or which is handed down by ancestors. Laundry, blacksmith, carpentry, barber and traditional Ayurveda medicine come under this category.

The present study is to know the discrimination of groups by the variables, hence multiple discriminant functions is used in the study. Discriminant analysis is a multivariate statistical tool used to discriminate two or more groups by assigning some weights to the linear combination of selected variables called predictors/independent variables. For the purpose of making the groups differ as much as possible on the values of the discriminant function, the coefficients/weights are estimated .If there are k groups, and n variables, then maximum number of linear functions for discriminating is min (k-1, n). First few linear functions of the variables extract most of the variability. The discriminant function used in the study is mathematically represented as follows,

$$Z = L_0 + \sum_i L_i X_i$$

where, Z is the discriminant score, X_i stands for predictors or independent variables and L_i stands for discriminant coefficients or weights associated with predictors.

From the data collected six important variables have been chosen as predictors for discriminating the groups like

X_1 = Age of family head [in years]

X_2 = Education (i.e., Number of years of schooling) [in number]

X_3 = Number of Working Adults in the family (NWA) [in number]

X_4 = Land Holding (LH)[in hectare]

X_5 = Investment on non-farm activity collected in rupees [in Rupees]

X_6 = Annual non-farm Income (ANFI)[in Rupees]

The statistical significance and goodness of the fit of the discriminant model is examined using Eigen value and Wilks lambda criterion. Wilks lambda is also known as U Statistic. For each discriminant function, Wilks lambda is the ratio of within group sum of squares to total sum of squares. Its value ranges between 0 and 1. Larger values of Lambda (near to 1) indicate that the group means seems not to be different. Small value of Lambda (near to 0) indicates that group means seems to be different. And these Lambda values are transformed to chi-square values to test their significance.

The unstandardized canonical discriminant function is the multipliers of variables, when the variables are in the original units of measurement. To obtain the discriminant scores these products are summed and added to the constant term. Whereas the comparative importance of the variables can be judged by inspecting the magnitude of the standardized discriminant function coefficients. The standardized discriminant function coefficients are the discriminant function coefficients used as the multipliers when the variables have been standardized to a mean of 0 and variance of 1. The predictors with comparatively large standardized coefficients add more to the discriminating power of the function, as compared to smaller coefficients. An effort has been made in the present investigation to obtain both un-standardized and the standardized canonical discriminant coefficients for each variable and for each function.

The analysis was done through Statistical Package for Social Sciences (SPSS).

Results and Discussion

In the present case for five groups (k=5), and six variables (n=6), the number of linear functions for discriminating is minimum of (5-1, 6) which is 4. The linear discriminating functions thus obtained along with their Eigen values, percent variance explained and Canonical correlations are presented in [Table-1].

Canonical correlation is a measure of association between the single discriminant function and set of variables that define the group membership. The function with larger canonical correlation, explains the maximum variability of the groups. For each discriminant function, there will be one Eigen value. Eigen value is the ratio of between groups sum of square to within group sum of square. Larger Eigen value implies superior functions

Table-1 *Canonical correlation and Per cent of variance explained by each of the discriminant function*

Function	Eigen value	% of Variance explained by the function	Cumulative of variance (in %)	Canonical Correlation
1	0.197	64.9	64.9	0.405
2	0.061	20.0	84.9	0.239
3	0.036	12.0	97.0	0.188
4	0.009	3.0	100.0	0.095

From the [Table-1] we can conclude that the first function has an Eigen value of 0.197 and canonical correlation of 0.405 explaining the maximum variability of 64.9 percent. The second function explains the variability of 20 percent with an Eigen value of 0.061 and canonical correlation of about 0.239. Similarly, the third and fourth discriminant function explains a variability of 12 and 3 percent respectively.

The Wilks Lambda U-Statistics obtained for each discriminant function and their transformed chi-square values are given in [Table-2] and the results shows that the first three discriminant functions have a significant value for the test statistic, whereas for the fourth function it is not significant.

Table-2 *Wilks Lambda U-Statistics for the discriminant functions*

Test of Function	Wilks Lambda	Chi-square	DF	Sig.
1 through 4	0.753	118.812	24	.000
2 through 4	0.901	43.529	15	.000
3 through 4	0.956	18.841	8	.016
4	0.991	3.827	3	.281

The un-standardized canonical discriminant coefficients for each variable and for each function are given in the [Table-3]. The value of the coefficient for a particular predictor depends on the other predictors included in the discriminant function. The signs of the coefficient are arbitrary, but they indicate which variable values result in large and small function values and associate them with particular groups.

Table-3 *Un-standardized Canonical Discriminant Function coefficients*

Predictors	Function			
	1	2	3	4
Age	0.033	-0.014	0.082	0.037
Education	0.161	0.182	0.104	-0.075
LH	0.131	-0.228	-0.017	-0.182
NWA	0.068	-0.054	-0.112	0.019
ANFI	0.000	0.000	0.000	0.000
Investment	0.000	0.000	0.000	0.000
(Constant)	-3.298	-0.064	-3.320	-0.957

The relative importance of the variables can be judged by examining the magnitude of the standardized discriminant function coefficients as given in the [Table-4]. The ranking of the variables is given in [Table-4] based on the magnitude of the coefficients of predictors to know the importance of predictors.

The number in the parenthesis is the rank of the predictor variable based on their discriminating power. The sign of the standardized canonical discriminant co-efficient indicates the direction. Higher the value of the positively signed variables, greater is the probability of the household to be in that group. On the contrary, larger the value of the negatively signed variables, lesser is the probability of households to be in that group.

Table-4 *Standardized Canonical Discriminant Function Coefficients*

Predictors	Function			
	1	2	3	4
Age	0.359 (3)	-0.150 (5)	0.905 (1)	0.406 (3)
Education	0.633 (1)	0.715 (1)	0.410 (2)	-0.293 (5)
LH	0.366 (2)	-0.635 (2)	-0.048 (6)	-0.509 (2)
NWA	0.134 (6)	-0.106 (6)	-0.218 (5)	0.037 (6)
ANFI	0.147 (5)	0.581 (3)	-0.390 (3)	0.682 (1)
Investment	0.161 (4)	-0.351 (4)	-0.321 (4)	0.350 (4)

Figures in the parenthesis indicates the rank of the predictors in the respective functions

In the first discriminant function the three top-ranked variables are education, land holding and age. In the second function the first two ranks are for the same variables *viz*, education and land holding and third important variable is annual farm income. Age and education are the first two important variables followed by annual farm income in the third discriminant function. Fourth discriminant function has greater importance for annual farm income, land holding and age in that order. It is seen from the above four functions that age, education, land holding and annual farm income play a major role in discriminating the five groups.

Conclusion

To determine the factors affecting the households to take up different non-farm activities, multiple discriminant analysis is used. Depending on the nature of activity, the non-farm activities are classified into five different economic categories. From the data six important variables have been chosen as predictors for discriminating the groups. For five groups four linear discriminant functions are obtained. The results of the multiple discriminant analysis reveals that the first three discriminant functions means are significantly different with smaller Wilks Lambda value, but the fourth function is not significant with larger Lambda value. The first function discriminate the five groups better than the remaining discriminant function by explaining maximum variability of 65 per cent. The first two discriminant functions explain a maximum variability of 85 per cent with an Eigen value of 0.197 and 0.061 respectively. The third and fourth discriminant function explains the variability of 12 and 3 percent respectively. From the standardized discriminant canonical coefficients of the four discriminant functions reveals that the variables such as age, education, land holding and the number of working adults in the family have more discriminating power to classify a household into five groups. The results may stand in help for the policy makers of the Cauvery Command region.

Conflict of Interest: None declared

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