



Identification of Variables Contributing Banana Production: A Factor Analytic Approach

KEYWORDS

Socio, economic, productivity, cropping intensity, intercropping

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ABSTRACT *Banana, an antique fruit crop of the world is known as 'Apple of the Paradise' and botanically named as Musa paradisiaca. Banana is nature's wonder fruit. It is the most nutritious of all fruits. Banana is an integral part of our culture in India and an important part of happy and healthy life. Since the banana cultivation is dominated in our country and it provides employment opportunity and various kinds of value added products have market potential. The researcher has chosen Madurai as the study area, because Madurai district ranked first in the production of banana among the fruits and the place is having market facility for the produce. The objective of the study is to identify the Socio-Economic factors contributing to the production of Banana. Factor analysis is a multi-variate statistical technique that addresses the inter-relationships among the total set of observed variables.*

Agriculture is one of the most important sectors in Tamil Nadu. Within the State, Madurai district is one where there has been significant agricultural development especially during the last two decades. Increasing irrigational facilities, soil type, development of transport, availability of inputs like seeds, fertilizer and finance bring about a remarkable increase in the gross area cropped, gross area irrigated as well as increase in agricultural production of the district. Though there are many factors influencing agricultural development of the district, improvement in irrigation, and widespread usage of technical inputs are some of the important contributory factors.

Madurai district is selected for the present study because in this district after 1965 considerable changes have taken place in the area under crops and in the selection of inputs due to technological changes in agriculture. Madurai district is one of the largest districts in Tamil Nadu and is very popular in the use of cultivation. The Madurai district which ranks 15th in area under banana cultivation.

Objective of the study

The objective of the paper is to identify the Socio-Economic factors contributing to the production of Banana in Madurai District.

Primary Data

The primary data required for this study were collected from the selected sample farmers through personal interview method. For this purpose a schedule was prepared and pre-tested before starting the interview. The questions were administered by the

researcher to the farmers orally and their responses were recorded in the schedule. The data collected are reliable subject to the memory of the farmers as most of the farmers do not have the habit of maintaining records.

Period of study

The data has been collected from the respondents about banana production during the period of 6 months from June to December 2014.

Sample size and research design

Depending on the area of banana in each taluk 10 farmers

from 30 villages have been selected at random. The total size of the sample is 300 and factor analysis is used as a tool.

Multi Factor Technique

Factor analysis is a multi-variate statistical technique that addresses the inter-relationships among the total set of observed variables. None of these variables is treated differently than others. Unlike the case in multiple regression in which one variable is explicitly considered the criterion (dependent) variable and all others the predictor (independent) variables. However factor analysis is a way of grouping of variables based on the criterion of common characteristics which would serve as a common denominator for such classification. It is an analytical tool which can aid in preliminary investigation and the interpretation of the relationship among a large number of interrelated and interdependent variables.

The primary purpose of factor analysis is the resolution of a set of observed variables in terms of new categories called factors. Such factors then can prove to be useful for any of the four functions as detailed below.

The factor analysis model in Matrix notation is given by

$$x = Af + e$$

where $x = (x_1, x_2, x_3, \dots, x_p)$
 $f = (f_1, f_2, f_3, \dots, f_m)$
 $e = (e_1, e_2, e_3, \dots, e_p)$
 $m =$ Number of factors
 $P =$ Number of Variables

and the matrix

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2m} \\ \dots & \dots & \dots & \dots \\ a_{p1} & a_{p2} & \dots & a_{pm} \end{pmatrix}$$

Where a_{ij} = factor loadings which gives net correlation between the variable x_i and the factor f_j . It is assumed that the error variables (e) are distributed independently of f and p and e have multivariate normal distribution.

The district economy is based on agriculture. The performance of the district agriculture is quite impressive. But still even in areas where agriculture is predominant, inten-

sity of cropping and productivity are found to be rather low. This indicates that the agricultural potential has not been fully exploited. In view of high rate of population growth and high income elasticity of demand for food items, increasing agricultural productivity is recommended. The agricultural development could be boosted up only through increasing agricultural productivity because bringing additional area under plough is not possible. The cultivable area in the district is almost used up. The only alternative to achieve growth in agriculture is through increasing banana productivity. Therefore, it is necessary to study the factors affecting banana productivity.

The district's banana development is characterized by regional diversity and its complex interconnection of social, technical, ecological, administrative and infrastructural elements, besides the traditional inputs like human labour. It is suggested to identify a group of variables which are likely to have a combined favorable impact on banana productivity with a view to take the economy on the path of continued growth. Regarding the appropriateness of the tool for this type of study, it may be noted that the problems of multi-co linearity which is quite common using various socio-economic factors in Indian farm setting would make it difficult to apply commonly used regression analysis and it is decided to adopt the technique of factor analysis in this study.

Madurai is an urban district in Tamil Nadu. It also occupies an important place in the industrial map of the state. There are three agro-climatic regions on the basis of area of banana are considered in this study. The following table gives the list of 21 variables selected in this study along with their means and standard deviations.

Table-1
MEAN AND STANDARD DEVIATION OF THE VARIABLES

Sl. No.	Name	Mean	Standard Deviation
1.	Productivity of banana per acre (Rs.)	116313.33	12966.87
2.	Age of the Farmer (years)	51.82	8.92
3.	Education of the Farmer (years)	9.71	4.15
4.	Family Literacy (%)	372.00	103.53
5.	Consumption Units	3.52	0.94
6.	Health of the Farmer (Rs.)	267.98	144.25
7.	Extension contact (score)	1.93	0.77
8.	Experience in banana (years)	7.73	6.32
9.	Cultivated holdings (acres)	6.89	4.51
10.	Owned holding (acres)	6.32	4.98
11.	Area of banana (acres)	2.43	1.69
12.	Own Fund (Rs.)	16868.33	8125.90
13.	Fertilizer (Rs.)	15022.30	569.58
14.	Plant Protection (Rs.)	2241.38	3089.60
15.	Wage Bill (Rs.)	17059.83	4965.49
16.	Irrigation intensity (%)	118.19	24.94
17.	Credit (Rs.)	5450.14	3587.23
18.	Index of Assets (Rs.)	127844.60	88028.98
19.	Subsidiary Occupation (Score)	2.04	1.38
20.	Cropping intensity (%)	140.21	24.42
21.	Intercropping (Rs.)	5749.33	7650.32

Source: Computed from Primary data.

The key variable is banana production per acre which is No.1 variable. It is quite interesting to study how this prime variable banana production along with other variables contributes as clusters in the process of agricultural development. It is found by the researcher that all the 21

variables do not contribute for the process of agricultural development. The significant variables are discussed region wise in the succeeding paragraphs.

Variables 9, 10,11,12,18 are economic variables namely cultivated holding, owned holding, area of banana, own funds and index of assets. Variables 13, 14,15,16,17 are input variables viz., fertilizer, and plant protection, wage bill for human labour, irrigation and credit. Variables 20, 21 are cropping practices viz., cropping intensity and intercropping. Variables 2, 4, 5 are demographic variables namely consumption units, family literacy and age of the farmer. Variables 3, 6,7,19 are social variables which include educational level of the farmer, health of the farmer, subsidiary occupation and extension contact. As evident from several studies in India these variables influence the banana productivity.

On the whole in this study, banana productivity and the other 20 variables are arranged into 7 factor dimensions. Variables are assigned to a factor on the basis of their highest factor loading. The correlation co-efficient between a variable and the underlying factor is known as the factor loading. The communality (h^2) for each variable is the sum of squared factor loadings. To interpret the factor matrix it is essential to examine the factor loadings of the individual variables and then to give meaning to those variables which have a high loading on an individual factor.

Findings in Madurai District

F_1 explains 18.1 per cent of variation and is dominated by cultivated holdings and owned holdings which have positive relation with F_1 . It could be explained that size of owned holdings increases the size of cultivated holdings also increases. Cultivated holdings and owned holdings are directly related with banana productivity and have a positive impact on productivity.

F_2 is dominated by a set of three variables viz., family literacy, consumption units and health. First two variables are positively loaded and health is negatively loaded in F_2 . But at the same time these three variables are moving on the same direction and directly correlated to the banana productivity. The variance is 12.1 per cent.

In F_3 the variance is 8.4 per cent. It is dominated by consumption units which are positively loaded. It is argued that consumption units are directly associated with productivity of banana.

F_4 is dominated by only factor like education which is positively and significantly loaded. The educated farmers can achieve maximum profit. It is observed that education and banana productivity are move on same direction.

Table-2
ROTATED FACTOR MATRIX FOR SELECTED VARIABLES IN MADURAI DISTRICT

Variable	F ₁	F ₂	F ₃	F ₄	F ₅	F ₆	F ₇	h ²
Production of Banana	0.22165	0.07810	0.67373	0.06073	0.07338	-0.13606	0.05472	0.53971
Education	0.14017	-0.05048	-0.05780	0.81085	-0.07388	0.02117	-0.14655	0.71040
Family Literacy	0.06784	0.89773	0.05669	-0.02579	0.07889	0.01535	0.01203	0.82100
Consumption Units	0.09778	0.87317	0.18592	-0.18926	0.09454	0.07642	-0.01632	0.85743
Health	-0.08281	-0.74815	0.02023	-0.11894	0.10772	0.19751	0.02162	0.63223
Cultivated holdings	0.92443	0.03230	0.01887	-0.08124	0.07651	0.03934	-0.03486	0.87118
Owned holdings	0.91379	0.07254	0.02286	-0.13038	0.07260	0.00240	-0.02131	0.86353
Fertilizer	-0.05063	0.09513	-0.13641	-0.05782	0.11546	0.79961	0.06500	0.72358
Credit	-0.75337	-0.07822	0.11256	0.04420	-0.14221	-0.05205	0.04967	0.61370
Inter-cropping	-0.00705	-0.06208	0.14718	0.00809	-0.12349	4.11961	0.78071	0.69940
Variance Explained (%)	18.1	12.1	8.4	6.8	5.7	5.4	4.8	
Cumulative Variance (%)	18.1	30.2	38.6	45.3	51.1	56.5	61.3	

Source: Computed from Primary data.

F₅ explains 5.7 per cent variance and it is dominated by credit which is negatively loaded. But it could be interpreted that credit and banana productivity are directly correlated with each other. Government cooperatives and banks provide credit facility to the banana growers; it is very helpful to them.

F₆ is dominated by fertilizer which is positively loaded. It is observed that application of correct doses of fertilizer viz., ammonium nitrate, calcium nitrate, urea, phosphoric acid, potassium chloride, potassium nitrate and potassium sulphate at right time is suitable for maximum yield of banana. So the fertilizer application and productivity of banana are directly related with each other. The variance is 5.4 per cent.

The variance of F₇ is 4.8 per cent. It is dominated by intercropping which is positively and significantly loaded. It is observed that growing of intercrops during the early stages of growth of the banana plants fetches additional income to the farmers and also drastically reduces weed growth. The crops suitable to be grown as intercrop in banana plantations include leguminous vegetables, cow pea, onion, soya bean, green gram, black gram, marigold, sun hemp, yams, beetroot, carrot, maize etc.

Conclusion

In Madurai district, the factor analysis revealed that cultivated holdings, family literacy, consumption units, education, intercropping, and credit and fertilizer influence banana productivity positively and significantly. These variables are considered as important factor and supported by government policies, so that the level of banana productivity could be improved further.

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