Assessment of Influential Factors for Farmers towards Arecanut (*Areca catechu*) Cultivation in Tamil Nadu

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ABSTRACT

In India, one of the most important cash crops is Arecanut (Areca catechu), which is referred to as a traditional medicine in Indian Ayurveda texts. India ranks first in area and production of arecanut, accounting for 54.07 per cent of its world production. In Tamil Nadu arecanut is cultivated in 6,884 ha of area with 35% area is under Salem district with a sample size of 120 arecanut farmers was selected by proportionate random sampling technique. Kaiser Meyer Olkin Measures the sampling adequacy, for the present study, the value was 0.717, which signifies the sample is adequate and middling as used by most scientists. Bartlett's test of sphericity is 676.687, while the significance is 0.000,which implies the variables are adequate for the study. Five factors were extracted from the sixteen components with Eigen values and factor loadings witha total variance of 64.95 per cent. The functional factor had high variance of 18.32% with seven-factor loadings, cognizance factors with 15.30% variance with six-factor loadings followed by empirical factor with 15.12% variance for three-factor loadings, household factor having variance of 8.48% with two-factor loadings and decisive factor having variance of 7.71% with three-factor loadings. This study suggests promoting improved methods of cultivation at the farm level to increase household income and for expansion of arecanut areas.

Keywords: *Arecanut; Cognizance; Decisive; Functional; Household; Influential factor*

INTRODUCTION

In India, one of the most important cash crops is Arecanut (Areca catechu), which is referred to as a traditional medicine in an Indian Ayurveda text. Arecanut gained commercial and economic importance in India, China, and South East Asia and India ranks first in area and production of arecanut, accounting for 54.07 per cent of its world production (FAO, 2017). In Tamil Nadu arecanut is cultivated in 6,884 ha of area. The major arecanut growing districts are Salem, Coimbatore, Namakkal, Erode, Nilgiris, and Dharmapuri. Salem district accounts first in terms of area (2,421 hectares) under arecanut cultivation. Salem district accounts 35.00 per cent of the area under total arecanut cultivation in Tamil Nadu. In Salem district arecanut is majorly cultivated in Peddanackenpalayam, Valapady, Gengavalli, and Attur blocks. These four blocks account for 87.28 per cent of the total area under arecanut in this district. The farmers raised 3,000 hectares of area under arecanut cultivation with irrigation facilities from Puzhuthikuttai and Kariakovil dam, Vashita and Velar Rivers are also major irrigation facilities in this area. The farmers and traders in that area expressed that the quantity of nuts harvested from the trees dropped to 50 per cent due to drought in that area. The repeated failure of monsoon in this district causes 500 hectares of arecanut trees to wither. If the drought exists in upcoming years, the district will be bereft of arecanut groves. In these areas, arecanut is mostly cultivated by small-scale farmers who have an area of 2-5 acre. The harvest of nuts comes down due to the drought, which leads to unemployment for those who are depending on arecanut harvesting and processing.

The financial support alone is not enough to motivate farmers' participation (Moon, 2013), as a much wider range of factors must be considered (Blazy *et al*., 2011; Reimer *et al.,* 2014). In social science, several studies have analyzed the role of factors affecting farmers' choices in From the farm

factors, the farm size (F Size) has a positive effect on the Agro Eco Systems continuation at time t because both implementation and transaction costs have a lower impact on the overall farm income in larger farms (Bartolini *et al.,* 2013a, 2013b). The result of interplay of a mix of factors, among attitude, motivations and social factors plays an important role and complement the economic factors linked to policy support. Moreover, the effect of these factors evolves over time, adapting to the changing policy and social context where farmers values are "constantly modified and negotiated by social interactions" (Darragh and Emery, 2018; Gatto, P. *et al.,* 2019). The social-psychological factors and socio-economic factors influence farmer decision-making, very few studies combine these two-factor groups in a theoretically rigorous way (Baumgart Getz *et al.,* 2012; Daxini *et al.,* 2018; Lalani *et al.,* 2016). The households self-selected into the group of oil palm adopters, there may be unobserved factors (e.g., farmers' ability or motivation) that could influence the decision to adopt and the outcome variables simultaneously (Euler, *et al.,* 2017). The nature of farm work could have factored into farmers' cognitive assessment of life satisfaction through dynamics with financial-related psychological factors (Heo *et al.,* 2020). An overview of studies that found a significant relationship between cognitive factors and the adoption of sustainable farming practices (Dessart, F.J. *et al.,* 2019). The main aim of the study is to assess the influential factors for farmers toward arecanut cultivation, which helps the various stakeholders in addressing the needs of the farmers and helps them to influence and increase the area of arecanut cultivation. However, this study suggests that state department officials, policymakers, and various stakeholders in planning and program the necessary training and implementation of strategies that will helps the farmers to influence arecanut cultivation. With this background, the present study was entitled"Assessment of influential factors for farmers towards arecanut (Areca catechu) cultivation in Tamil Nadu".

MATERIAL AND METHODS

This study was undertaken in Tamil Nadu. The study was conducted in Salem district of Tamil Nadu. Salem district is selected for this study since it occupies the first position in the area and production of arecanut in Tamil Nadu. In Salem district arecanut is cultivated on 2421 hectares with an annual production of 3445 tones (Figure 1). The Salem district occupies 35.16 per cent of arecanut area in Tamil Nadu. Salem district consists of 20 blocks, *viz.,* Peddanackenpalayam, Valapady, Gengavalli, and Attur blocks were purposively selected for the study based on the major area under arecanut crop. These four blocks covering the area of 87.28 per cent of total area under arecanut in this district (Source: Deputy Director of Horticulture office, Salem). The total number of arecanut growers was collected from the concerned Assistant Director of Horticulture and respondents were selected from the four blocks by proportionate random sampling technique with a sample size of 120 arecanut farmers.

The data were collected with the help of a well-structured and pre-tested interview schedule. A set of sixteen independent variables selected for the study comprised social, psychological, and economic domains. To find out the influential factors of farmers toward arecanut cultivation, the statistical tool exploratory factor analysis was used. SPSS was used to run the exploratory factor analysis as presented in the results below. The entire sixteen variables related to the influential factors of farmers towards arecanut cultivation were selected for factors analysis by using principle component extraction with the help of Varimax rotation. Suitability of the data was checked by Bartlett's test of sphericity giving a significant chi-square value affirming that the data is sufficient for analysis. The sample adequacy was checked with Kaiser-Meyer-Olkin value.

RESULTS AND DISCUSSION

KMO Measures the sampling adequacy, for the present study the value was 0.717, which signifies the sample is adequate and middling as used by most scientists. Bartlett's test of sphericity is 676.687 (Approximate chi-square), while the significance is 0.000,which implies the variables are adequate for the study.

Principal component analysis of indicators

The principal component analysis was used and the results are furnished in table 1. The component with more than one Eigen value was selected and from the sixteen components, five factors were extracted with a total variance of 64.95 per cent. The functional factor had a high variance of 18.32% with seven-factor loadings, cognizance factors with 15.30% variance with six-factor loadings, followed by an empirical factor with 15.12% variance for three-factor loadings, household factor having variance of 8.48% with two-factor loadings and decisive factor having variance of 7.71% with three-factor loadings.

Rotated factor (Varimax)

The results of principle component analysis indicate the five factors explaining the maximum variation influential factors of farmers toward arecanut cultivation. Further, the findings on factor loading of each indicator under the five factors are given in table 2.

From the result obtained, the loading with a minimum of 0.30 coefficients was taken for the study. The factors explained up to more than 30.00 percent of the variation of the independent variables. Table 4 shows the rotated factor structure by the varimax rotation. The five factors were labeled to reflect major variables captured by each factor. Note that the variance explained by each factor in the rotated factor pattern is different from that in the unrotated factor pattern.

Factor –I: Functional factor:

Factor-I is the most important factor explaining 18.32% of the total variance (i.e., accounting for 64.95% of the variance explained by the five factors). This factor captures seven variables: the first three (Farm size, Annual income, and Educational status) have already been identified as the primary cluster of correlated variables in Table 4, and the remaining four variables (Information seeking behavior, Social participation, Innovativeness and Family type) has the smallest loading. This factor is a comprehensive indicator of 'Functional factor'. The factor had seven loadings attached to it as follows; Farm size and Annual income had high loading of 0.864 followed by Educational status 0.604, Innovativeness 0.499, Social participation 0.463, Information seeking behavior had a loading of 0.413, and family type had the least loading of 0.330 as observed in the results.

The farm size and annual income had high factor loadings, this is due to that 75.84 per cent of respondents had small to medium size of farm ranging from 1.26 to 5.00 hectares and 79.17 per cent of respondents falls under medium to high-income category with income level above two lakhs. This causes the factor with more variance and arecanut is a commercial crop. The average yield of arecanut per tree is 3 to 4 kgs with a price for processed nuts ranging from Rs.305 to Rs.370. The most adopted spacing in the study area is 7*7 feet comprises of more than 2,000 palms per hectare. The findings are in line with the findings of Bellary, SM. and Patil, VC. 2010. For these reasons the farm size and annual income are more influential factors for arecanut cultivation. The 75.83 per cent of respondents had middle level to collegiate level of education and this level of educational status influences the respondents to cultivate the arecanut crop.

Factor –II: Cognizance factor:

Factor II explains 15.30% of the total variance (i.e., accounting for 64.95% of the variance explained by the six factors). Six variables, including Educational status, Scientific orientation, Information seeking behavior, Market decision, Social participation, and Innovativeness form a comprehensive indicator of 'Cognizance factor'. The factor had six loadings, topped by three loadings viz., Scientific orientation 0.745 followed by Information seeking behavior 0.705 and Market decision had a loading of 0.635. The remaining three loadings had a value of Social participation with a loading of 0.545 followed by Innovativeness 0.537 and Educational status had the least loading of 0.363.

In the cognizance factor, Information seeking behavior and scientific orientation had high factor loadings followed by a Market decision. The 79.17 per cent of respondents had a medium to a high level of information seeking behavior, this is due to that most of the respondents had institutional sources for seeking information on new technologies pertaining to the arecanut cultivation. The 80.83 per cent of respondents had a medium to high level of scientific orientation, which is due to the medium to a high level of information-seeking behavior. Most of the respondents in the study area where innovative farmers with good social participation in village institutions, they are ready in adopting the scientific technologies and seek additional information from both institutional and media sources. This is the reason for the high factor loadings on the information of scientific technologies in arecanut cultivation. Thus, the cognizance factor is important in seeking the scientific technologies that influence the farmers toward arecanut cultivation.

Factor –III: Empirical factor:

Factor III explains 15.12% of the total variance (i.e., accounting for 64.95% of the variance explained by the five factors). It mainly captures the variables of Farming experience, Farming experience in arecanut cultivation, and Age, therefore it is labeled as an 'Empirical factor'. In the empirical factor, the three

loadings fall in this factor with a loading of Farming experience 0.886 followed by Farming experience in arecanut cultivation 0.848, and age had a loading of 0.820. Most of the respondents, 73.30 per cent, had over 10 years of farming experience, and the 70.80 per cent had over 10 years of farming experience in arecanut cultivation. Thus 89.00 per cent of respondents fall in the age group of middle age to old age category. In the empirical factor, experience plays an important role in influencing the arecanut cultivation and seeks scientific information from institutional sources, adopting to get the profit by adopting the improved cultivation practices in arecanut.

Factor –IV Household factor:

Factor IV explains 8.48% of total variance (i.e., accounting for 64.95% of the variance explained by the five factors). This factor captures the variables of occupational status and the family type and forms a comprehensive indicator of 'Household factor'. The family type and occupational status had a factor loading of 0.586 and 0.313 respectively. The 66.00 per cent of respondents are nuclear family type and 34.00 per cent are the joint family type, with 70.00 per cent of respondents had farming alone as their occupational status. Thus, the household factor influences the arecanut cultivation with high factor loadings of family type and occupational status.

Factor –V Decisive factor:

Factor V explains 7.71% of the total variance (i.e., accounting for 64.95% of the variance explained by the five factors). Three variables, including occupational status, Decision decision-making pattern and economic motivation, form a comprehensive indicator of 'Decisive factor'. The factor V had three-factor loadings of Decision-making pattern with a loading of 0.787 followed by Economic

motivation of 0.483 and Occupational status had a loading of 0.355. In the decision-making pattern variable, 50.00 per cent of respondents take joint decisions with family members, followed by 40.00 per cent of respondents who take independent decisions in arecanut cultivation. The 77.50 per cent of respondents had medium to a high level of economic motivation, thus the decision-making pattern and economic motivation variables play an essential contribution in the decisive factor.
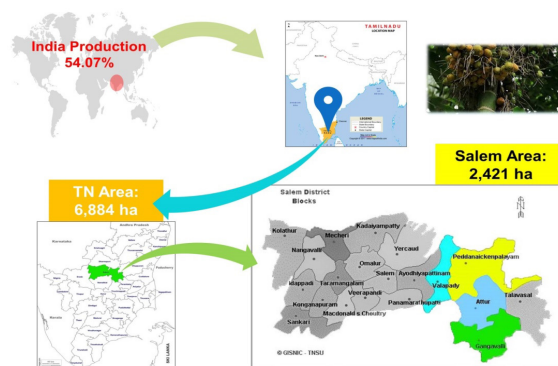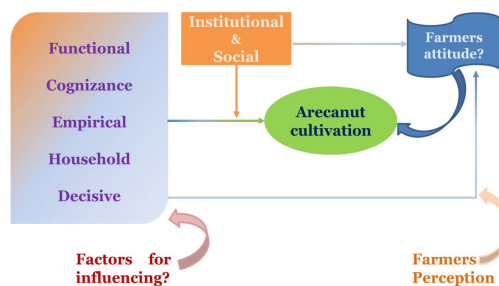

Figure 1. Map showing the study area

Figure 2. Theoretical model of the study

Table 1. Distribution of factors with variance

Sl.No.	Component number	Eigen values	Percentage of variance	Cumulative variation %
1.	Functional factor (Factor-I)	2.932	18.324	18.324
2.	Cognizance factor (Factor-II)	2.449	15.309	33.633
3.	Empirical factor (Factor-III)	2.419	15.121	48.754
4.	Household factor (Factor-IV)	1.358	8.486	57.240
5.	Decisive factor (Factor-V)	1.235	7.718	64.958

Table 2. Distribution of variable wise Rotated Factor (Varimax)

Sl.No.	Variables	Factor					Communalities (Extraction)
		I	II	III	IV	V	
1.	Farm Size	0.864	0.060	0.160	0.105	-0.021	0.788
2.	Annual Income	0.864	0.111	0.078	0.010	0.027	0.766
3.	Educational Status	0.604	0.363	-0.269	-0.254	-0.015	0.633
4.	Scientific Orientation	-0.216	0.745	-0.027	-0.050	0.095	0.613
5.	Information Seeking Behavior	0.413	0.705	-0.101	0.227	-0.146	0.751
6.	Market Decision	0.268	0.635	-0.125	-0.117	0.261	0.572
7.	Social Participation	0.463	0.545	-0.019	0.094	0.125	0.536
8.	Innovativeness	0.499	0.537	0.149	-0.064	-0.156	0.588
9.	Occupational Status	-0.245	-0.423	-0.075	0.313	0.355	0.468
10.	Farming Experience	0.053	-0.095	0.886	0.171	-0.050	0.828
11.	Farming Experience in Areca-nut Cultivation	0.035	0.079	0.848	-0.102	0.021	0.737
12.	Age	0.034	-0.094	0.820	0.156	0.096	0.717
13.	Attitude towards Arecanut Cultivation	0.078	0.007	-0.053	-0.772	0.146	0.626
14.	Family Type	0.330	0.026	0.241	0.586	0.287	0.594
15.	Decision Making Pattern	0.143	0.220	0.002	-0.174	0.787	0.719
16.	Economic Motivation	-0.347	-0.100	0.152	0.262	0.483	0.456

CONCLUSION

This study concludes that five factors influence the farmers toward arecanut cultivation. They are a functional factor, cognizance factor, empirical factor, household factor, and decisive factor. From this functional and cognizance factors had high variance with factor loadings. The farm size and annual income had high factor loadings and fall in the functional factor, this due to that 75.84 per cent of respondents had small to medium size of farm ranging from 1.26 to 5.00 hectares and 79.17 per cent of respondents falls under medium to high-income category with income level above 2 lakhs. In the cognizance factor, Information seeking behavior and scientific orientation had high factor loadings of 0.705 and 0.745. The 79.17 per cent of respondents had a medium to a high level of information seeking behavior, this is due to that most of the respondents had institutional sources for seeking information on improved technologies on arecanut. The 80.83 per cent of respondents had a medium to a high level of scientific orientation, which is due to the medium to a high level ofinformation-seeking behavior. Most of the respondents in the study area where innovative farmers with good social participation in village institutions, they are ready toadopt scientific technologies and seek additional information from both institutional and media sources. The empirical factor, household factor, and decisive factor also have a variance of 15.12, 8.48 and 7.71 with their factor loadings. This study concludes that identifying influential factors for farmers is pivotal in adopting improved technologies and expanding areas under arecanut cultivation. This study recommends increasing the extension services for farmers in facilitating the adoption of improved practices and increasing the utilization of development schemes in arecanut cultivation. Finally, this study suggests promoting improved methods of cultivation at the farm level to increase the household income and expand the arecanut cultivation area.

Ethics statement

This paper is the authors own original work, which has not been previously published elsewhere.

The paper reflects the authors own research and analysis in a truthful and complete manner.

Consent for publication

I have been assured that any future question, I may have will also be answered by a member of the research team.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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