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Extent of adoption and determinants of coffee production technologies among FPO and non-FPO farmers in Visakhapatnam district of Andhra Pradesh

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Abstract

The present study assessed the extent of adoption of recommended coffee production technologies and factors influencing adoption by FPO and non-FPO tribal farmers in Visakhapatnam district of Andhra Pradesh. A multistage purposive cum random sampling technique was used to select sample farmers and the extent of adoption of technologies was measured using Composite Technology Adoption Index (CTAI), while the determinants were analysed using Tobit regression model. The results revealed that adoption of recommended technologies were found to be higher in FPO farmers compared to non-FPO farmers. Composite index showed that majority of FPO farmers were high adopters (77%) whereas, non-FPO farmers were medium adopters (45%). The results of Tobit analysis indicated that, FPO membership (0.142) and extension services (0.577) were most significant factors influencing adoption, highlighting the role of organizational support and extensions services.

Keywords: Coffee, Composite Technology Adoption Index (CTAI), FPO, technology adoption, Tobit model

Introduction

Coffee cultivation in India is mainly concentrated in the hilly regions of the southern states, where the unique agro-climatic conditions favour high-quality production. Indian coffee is widely acclaimed as one of the finest in the world largely because it is shade-grown under natural forest canopies rather than exposed to direct sunlight. Among the major producing states, Karnataka accounts for about 70 per cent of India's total coffee production, followed by Kerala (20%) and Tamil Nadu (7%). In recent decades, coffee cultivation has also expanded eastward into the non-traditional coffee growing areas of Andhra Pradesh and Odisha, thereby extending the country's traditional coffee belt (Suresh, 2023) [14].

In Andhra Pradesh, coffee contributes 12 per cent of the nation's Arabica output with cultivation concentrated in the Visakhapatnam district (Coffee Board, Government of India, 2023) [4]. The district has 218,393 growers cultivating 90,809 hectares, yielding 71,258 metric tonnes (Girijan Cooperative Corporation Ltd, A.P, 2022-23) [5]. From 2015 to 2020, coffee yields in Andhra Pradesh fluctuated between 234.85 and 543.49 MT, showing significant variability in local productivity (Ramalakshmana and Padal, 2022) [13]. The average productivity of Arabica coffee in non-traditional areas was 108kg/ha which was notably lower than the national average of 592 kg/ha (Prabha *et al*., 2021) [12]. Coffee productivity largely depends on the type of production technologies adopted by the farmers and the extent of their adoption. Hence, an attempt was made to identify the major coffee production technologies adopted by farmers in the study area and to analyse the factors influencing their adoption. The study also aims to examine the role of Farmer Producer Organizations (FPOs) in promoting technology and to compare the adoption patterns between FPOs and non-FPO farmers. Accordingly, the research was undertaken with following objectives:

Objectives of the study

1. To assess the adoption of recommended coffee production technologies among FPO and non-FPO farmers.
2. To identify the factors influencing the adoption of

coffee production technologies among farmers.

Hypothesis

1. There is no significant difference in the adoption of recommended coffee production technologies between FPO and non-FPO farmers.
2. Socio-economic and institutional factors do not significantly influence the adoption of production technologies among farmers.

Materials and Methods

The study was carried out in Visakhapatnam district of Andhra Pradesh. A multistage purposive cum random sampling technique was used to select the sample. Three mandals, *viz*., Araku Valley, Dumbriguda and Paderu were randomly selected. From each mandal, one FPO dealing with coffee was purposively selected. The FPOs chosen for the study were, Nandidevara Farmer Producer Company Limited (Araku Valley), Manavanam Farmer Producer Company Limited (Drumbriguda) and Vaishaki Siridhaanyalu Producer Company Limited (Paderu). Subsequently, two villages were randomly chosen from each manadal and from each village, 10 FPO and 10 non-FPO farmers were selected randomly, resulting in a total sample of 120 farmers (60 FPO and 60 non-FPO). The primary data for the agricultural year 2022-2023 were collected through structured interview schedules.

Composite Technology Adoption Index (CTAI)

CTAI was used to measure the extent of technology adoption among FPO and non-FPO farmers. The CTAI was calculated using the following formula:

$$CTAI_i = \sum w_{ij} x_{ij}$$

Where, x_{ij} is the adoption of recommended technologies. The technology for which the farmer was following the recommended package of practice is given a score of '1' and '0' otherwise. The w_{ij} is the weight assigned to each technology, which was calculated through principal component analysis (PCA). The PCA was done in IBM SPSS software. The recommended package of practices considered in this study was based on the guidelines provided by the Department of Horticulture, Andhra Pradesh. In the study area, coffee plantation farmers did not use farm yard manure (FYM), fertilizer and plant protection chemical as they largely adhered to traditional and natural farming practices. Likewise, seed treatment was also not performed, since most farmers procured planting material. Hence, these variables were excluded from the computation of CTAI.

Tobit Model

Tobit model was used to identify the determinants influencing farmers decision to adopt technologies. In this analysis the composite index constructed through principle component analysis (PCA) was used as dependent variable. The Tobit model can be described in terms of the latent variable $CTAI_i$*. Suppose $CTAI_i$ * is observed when $CTAI_i$ * >T and is not observed when $CTAI_i$* <= T (Adesina and Zinnah, 1993 and Maddala, 1992) [1, 9]. The analysis was conducted in STATA software. The observed $CTAI_i$ model is

$CTAI_i = X_i\beta$ if $CTAI^* = X_ib + u_i > T$
$= 0$ if $CTAI^* = X_ib + u_i \leq T$

Where,
$CTAI^*$ = Adoption index of i^{th} farmer
X_i =Vector of factors affecting adoption
β =Vector parameters to be estimated
u_i = Error term

The factors hypothesized to influence the adoption of recommended technologies include age (years), education (no of years of schooling), experience in farming (years), production area (ha), FPO membership (dummy: 0 or 1) and access to extension services (dummy: 0 or 1).

Results and Discussion

The recommended technologies in coffee plantations adopted by FPO and non-FPO farmers in Visakhapatnam district are shown in Table 1. FPO farmers displayed higher adoption rates for nearly all practices. The most widely adopted practices included pruning or bush management, with 92 per cent of FPO farmers and 77 per cent of non-FPO farmers implementing it, while 88 per cent of FPO farmers and 73 per cent of non-FPO farmers adhered to timely harvest. Similarly, the adoption of improved coffee varieties was reported by 83 per cent of FPO farmers and 58 per cent of non-FPO farmers and timely sowing was adopted by 87 per cent of FPO and 67 per cent of non-FPO farmers. The recommended seed rate was adopted by 78 per cent of FPO and 65 per cent of non-FPO farmers. Consistently higher adoption levels among FPO members reflect the positive impact of collective organizational support on adoption.

Other practices such as inter-cultivation and spacing followed similar pattern, 78 per cent and 68 per cent adoption among FPO farmers and 72 per cent and 60 per cent among non-FPO farmers respectively. In contrast to this, Alela *et al*. (2024) [2] reported that higher adoption rate of regular weeding practices (97.52%) by coffee producers in mid-Northern Uganda. Intercropping in coffee plantation was important for diversification and income stabilization which was adopted by 65 per cent of FPO farmers compared to 57 per cent of non-FPO farmers. Similar results were found in Khanal *et al*. (2025) [7] 71 per cent of coffee farmers adopted intercropping in Arghakhanchi district of Nepal. This difference in adoption of technologies among FPO and non-FPO farmers can be attributed to the active involvement of FPOs in promoting improved production practices.

The extent of adoption of coffee technologies was presented in Table 2. The results of CTAI indicated that 77 per cent of FPO farmers were classified as high adopters, while only 20 per cent of non-FPO farmers fell under this category. Most of the non-FPO farmers (45%) were classified as medium adopter, while only 10 per cent of FPO farmers comes under same category. Similarly, 13 per cent FPO farmers and 35 per cent of non-FPO farmers were categorised as low adopters, further indicating the greater overall adoption capacity among FPO farmers.

Table 1: Adoption of coffee production technologies by FPO and non-FPO farmers

S. No.	Coffee production technologies	FPO farmers		Non-FPO farmers	
		Frequency	Percentage	Frequency	Percentage
1	Improved varieties	50	83	35	58
2	Seed rate	47	78	39	65
3	Spacing	41	68	36	60
4	Time of sowing	52	87	40	67
5	Inter-cultivation	47	78	43	72
6	Pruning/bush management	55	92	46	77
7	Timely harvest	53	88	44	73
8	Intercropping	39	65	34	57

Table 2: Level of adoption of coffee technologies according to CTAI

Category	CTAI range	FPO Farmers		Non-FPO Farmers	
		Frequency	Percentage	Frequency	percentage
Low adopters	<0.44	8	13	21	35
Medium adopters	0.44-0.77	6	10	27	45
High adopters	>0.77	46	77	12	20
Total		60	100	60	100

The higher proportion FPO farmers in the high adopters category clearly reflects the active role of FPOs in promoting, facilitating and supporting the adoption of improved technologies. These findings were in line with those of Brunda *et al*. (2019) [3], who reported based on composite index, 26 per cent high, 42 per cent medium and 32 per cent low adopters of bengal gram technologies developed by UASR in NEK Region.

Determinants of Adoption

The results of Tobit regression model were presented in Table 3. The results revealed that, FPO membership and extension services were major determinants of technology adoption among coffee farmers. The variable FPO membership was significant at one per cent level, indicating that being FPO member alone increased the adoption score by 0.142 points. This implied that the FPO members had greater exposure to agricultural information, training and collective learning, which enhanced their awareness and adoption of recommended production technologies. Similar findings were reported by Million *et al*. (2020) [10], who observed that farmers associated with cooperative exhibited higher adoption rates than non-members.

Likewise, access to extension services was also significant at one per cent level, implying that greater access to extension services increased the adoption score by 0.577 points. This indicates the importance of effective knowledge dissemination and technical guidance in improving adoption behaviour. Luzinda *et al*. (2018) [8] found that access to extension services had a positive and significant effect on adoption of improved coffee production technologies, whereby a one per cent increase in extension access led to a proportional increase in adoption level.

The results further indicated that the age of the farmers (-0.004) was not significant, but it negatively influenced farmers to adopt technologies, this suggested that older farmers tend to stick to the traditional farming practices and were less inclined to adopt new technologies. Similar findings were reported by Kebedom and Ayalew (2012) [6], who observed that age negatively affected technology adoption among coffee farmers.

Table 3: Determinants of adoption of Coffee production technologies in Visakhapatnam district

Variables	Coefficient (β)	Standard Error	p-value
Age	-0.004	0.004	0.331
Education	0.005	0.004	0.182
Experience	0.005	0.004	0.239
Production area	0.368	0.039	0.352
FPO membership	0.142***	0.030	0.000
Extension services	0.577***	0.041	0.000
Constant	0.769	0.951	0.420
Sigma (σ̂)	0.156	0.012	
Number of observations	120		

Note: ***=significant at 1% level, **=significant at 5% level, *=significant at 10% level

There was no significant difference between farmers education (0.005) and adoption of recommended coffee technologies. These findings were consistent with previous studies by Luzinda *et al*. (2018) [9] and Mohammed (2018) [12], who also reported that there was no significant relationship between education and adoption of agricultural technologies. The other variables like, experience (0.005) and production area (0.368) under coffee were not significant but positively influenced farmers in the adoption. The sigma ($\hat{\sigma}$ = 0.156) indicates adequate variation in the adoption level to justify the Tobit model.

Conclusion

FPO farmers exhibited higher adoption levels across most recommended practices such as pruning, timely harvesting and use of improved varieties. The Composite Technology Adoption Index (CTAI) further confirmed that a majority of FPO farmers were classified as high adopters, whereas non-FPO farmers mostly fell under the medium adoption category. The major determinants of adoption of technologies were FPO membership and extension services, which indicates importance of institutional support and knowledge dissemination. The study highlights that FPOs play a key role in enhancing technology adoption and productivity in coffee cultivation. Strengthening FPO-based extension services, capacity-building programs and access to technical knowledge can help to reduce the adoption gap

between FPO and non-FPO farmers, supporting sustainable and inclusive growth in tribal coffee farming systems.

References

1. Adesina AA, Zinnah MM. Technology characteristics, farmers' perceptions and adoption decisions: a Tobit model application in Sierra Leone. Agric Econ. 1993;9(4):297-311.
2. Alela B, Kule EK, Midamba DC, Mugonola B. Determinants of adoption of integrated soil fertility management practices among coffee producers in Mid-Northern Uganda. Cogent Soc Sci. 2024;10(1):1-17.
3. Brunda S, Hiremath GM, Reddy BS, Joshi AT, Goudappa SB. Extent of adoption of Bengalgram technologies developed by UASR in NEK region. Int J Curr Microbiol Appl Sci. 2019;9(Spl. Issue):18-27.
4. Coffee Board of India. Database. 2024 Apr 19. https://coffeeboard.gov.in/Database/DATABASE3_JULY2023.pdf
5. Girijan Cooperative Corporation Limited. Coffee marketing - Area and production under coffee in Visakhapatnam, Andhra Pradesh. 2024.
6. Kebedom A, Ayalew T. Analyzing adoption and intensity of use of coffee technology package in Yergacheffe district, Gedeo Zone, SNNP Regional State, Ethiopia. Int J Sci Res. 2012;3(10):1945-1951.
7. Khanal S, Shrestha A, Kafle N, Khanal S, Koirala P. Adoption status of improved coffee production technology in Arghakhanchi district, Nepal. Agric Sci Technol. 2023;17(1):110-122.
8. Luzinda H, Nelima M, Wabomba A, Musoli PC, Kakuru A. Factors influencing adoption of improved Robusta coffee technologies in Uganda. Uganda J Agric Sci. 2018;18(1):33-41.
9. Maddala GS. Introduction to econometrics. 2nd ed. New York: Macmillan Publishing Company; 1992.
10. Million M, Like M, Chalchisa T. Adoption status and factors determining coffee technology adoption in Jimma Zone, South West Ethiopia. Pelita Perkebunan. 2020;36(1):68-83.
11. Mohammed MK. Analysis of adoption of improved coffee technologies in major coffee growing areas of Southern Ethiopia. Innov Syst Des Eng. 2018;9(5):9-17.
12. Prabha SA, Sivakumar SD, Murugananthi D, John Joel A. Trend in area, production and yield of coffee in India. Asian J Agric Ext Econ Sociol. 2024;39(11):310-320.
13. Ramalakshmana J, Padal SB. Cultivation, yield, income, and tree diversity in a coffee field in the Eastern Ghats of Andhra Pradesh, India. Sch Acad J Biosci. 2022;10(9):205-212.
14. Suresh M. Agricultural communication in scheduled areas: a study on coffee cultivation in the Araku Valley, Andhra Pradesh, India. J Pharm Negative Results. 2023;14(3):2494-2504.