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ADOPTION OF IMPROVED CULTIVATION PRACTICES BY COFFEE GROWERS IN ZUNHEBOTO DISTRICT, NAGALAND, INDIA

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ABSTRACT

Botanically, coffee belongs to the genus *Coffea* of the family *Rubiaceae*. The two most important species of coffee grown in India are arabica (*Coffeaa rabica*) and Robusta (*Coffeacanephora*). An investigation was conducted in the year 2022 with the objective to measure the extent of adoption of improved cultivation practices of coffee by growers in Zunheboto district of Nagaland, India. Zunheboto district was purposively selected for the study because maximum number of coffee growers are present in this district. A sample of 120 respondents was selected from 8 selected villages in Zunheboto district using a proportionate random sampling method. The extent of adoption was measured by the procedure used by structure schedule. The findings of the study revealed that majority of the respondents (73.33%) belonged to middle aged category with high school level of formal education (55.00%). Majority of respondents (41.67%) belonged to Semi-medium (2-4 ha) size of operational land holdings category with (84.17%) had medium level of overall annual income (84.17%). A large number of the respondents (67.50%) were found to be engaged in agriculture in occupation with medium level of family size (51.67%). Majority of the respondents (74.17%) had 2 - 5 years of experience in coffee cultivation followed by 18.33 per cent respondents with less than 2 years of experience in coffee cultivation. Most of the respondents (67.57%) had medium level of exposure to mass media on coffee cultivation. Majority of the respondents (68.33%) had medium level of adoption on improved coffee cultivation, followed by 24.17 per cent of the respondents had low level of adoption on improved coffee cultivation and 7.50 per cent of the respondents had high level of adoption on improved coffee cultivation. The mean overall adoption level (7.50) indicated that on an average the respondents had medium level of adoption on improved coffee cultivation with standard deviation of 2.26.

(Key words: Adoption, coffee, cultivation, Nagaland, Zunheboto)

INTRODUCTION

Coffee is the world's second most traded commodity. In the modern urban life, coffee is a beverage and great socializer. Coffee belongs to the genus *Coffea* of the family Rubiaceae. There are over 70 commercially cultivated species under the genus *Coffea*, most of which are native to Africa including two species in India *viz*., *Coffea arabica* and *Coffea canephora*. Coffee is cultivated as a silvi-horti cropping system under a tree cover for better yield. Coffee is grown in the tropical belt of the world where there is good sunshine with heavy rains and rich organic soil. The major coffee-producing countries are Brazil, Vietnam, Colombia, Indonesia, Ethiopia, India, Mexico, Guatemala, Honduras and Peru. Out of these Brazil, Vietnam, Colombia and Indonesia account for about 59 per cent of the total world production. Indian coffee is known to be "The world's best shade-grown 'mild' coffees". India is the seventh largest producer of coffee in the world. More than

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60 per cent of Indian coffee production is being exported. Coffee in India is grown in three regions with Karnataka, Kerala and Tamil Nadu forming the traditional coffee growing region, followed by the new areas developed in the non-traditional areas of Andhra Pradesh and Orissa in the eastern coast of the country and with a third region comprising the states of Assam, Manipur, Meghalaya, Mizoram, Tripura, Nagaland and Arunachal Pradesh of Northeastern India, popularly known as "Seven Sister States of India"(Bharath, 2022).

Nagaland, located in the North Eastern region of India has a total area of 16,579 sq km. In Nagaland, coffee is mainly grown in five districts namely; Zunheboto, Mokokchung, Wokha, Mon and Kohima which offers especially high-altitude coffee, grown in the natural shade of the forest. Coffee cultivation in Nagaland began in the 1970s with the encouragement of the Coffee Board of India. The project was carried out in partnership with the Nagaland Plantation Crops Development Corporation (NPCDC). Apart from encouraging coffee cultivation in the state, one main reason was to discourage jhum practices, to help prevent soil degradation along the hill slopes and to improve socio economic conditions of the tribal people. Despite the region having appropriate climatic and soil conditions for growing coffee, the project wasn't of much success due to multiple reasons with lack of financial support being one of the main reasons. Hence, the coffee farmers abandoned the land given to them for both financial and economic reasons. Eventually, the coffee plantations were also abandoned in 1991 due to political unrest and lack of proper market linkage to sell the produce. Recently there has been an effort to revive coffee cultivation in the state under a Special Area Programme (SAP). Under this programme, the farmers are being given subsidies for converting their land into or expanding existing coffee cultivation wherein, seeds are also supplied and growers are trained in coffee cultivation practices. In 2014, the Coffee Board partnered with the Department of Land and Resources to revive the coffee plantations. In 2016, Department of Land resources distributed 13 lakh coffee seedlings to the farmers. (Anonymous, 2022).

Adoption is a decision to make full use of an innovation as the best course of the action available. Adoption process is the mental process through which an individual passes from hearing about an innovation to final adoption. Rate of adoption of a social system, usually measured as the number of members of the system that adopt the innovation in a given time period. It depends on the innovativeness of the individual that is the relative earliness-lateness with which an individual adopts an innovation or recommended coffee cultivation practices when compared with other members of his social system.(Bharath, 2022). The rate of acceptance depends on the socio-economic characteristics of the farmers. A scientific investigation may reveal as to what extent these and such other factors are responsible for the farmer-to-farmer variation in adoption of improved agricultural practices keeping these stated facts in view the present investigation was undertaken (Nandi *et al*., 2015).

MATERIALS AND METHODS

The study was undertaken in 2022 in the state of Nagaland. The state is located in the North Eastern region of India and has a total geographical area of 16, 579 sq. km. There are 16 districts in Nagaland, out of which Zunheboto district was selected purposively for the study. There are 8 sub-divisional blocks in Zunheboto District, for the present study 4 blocks namely Atoizu, Akuhaito, Pughoboto, Akuluto were selected purposively for the study as maximum numbers of farmers were engaged in coffee plantation these blocks.Two villages each was selected from the selected blocks namely Khrimtomi, Roto (Atoizu), Litta, Phiushimi (Akuluto), Yesheluto, Philimi (Akuhaito), Iphonumi, Tsaphimi (Pughoboto).A sample of 120 respondents was selected from 8 selected villages in Zunheboto district using a proportionate random sampling method. The primary information for the study were gathered through personal interviews utilizing a predefined research schedule.

Keeping in view the objectives of the study, 15 independent variables and 1 dependent variable were included in the study. The independent variable included in the study were age, sex, educational level, marital status, occupation, family size, land holdings size, sources of income, total annual income, source of information, mass media exposure, social participation, farming experience, training exposure and market accessibility. The dependent variable included in the study was adoption level of respondent on improved cultivation practices of coffee which was measured by the procedure used by structured schedule. Extensive literature was browsed for seeking additional information on the conceptual framework of the dependent variable.

The dependent variable included in the study was the adoption level of respondents on improved cultivation practices of coffee which was measured by using the procedure used by structured schedule. Rogers (1983) defined adoption as a decision to make full use of an innovation as the best course of action available. Extent of adoption of selected improved cultivation practices of coffee practices by the farmers has been conceived as the adoption of recommended coffee cultivation practices against three response categories, *viz*., full adoption, partial adoption and no adoption. If the farmer was found to use a given practice as per recommendation, it was considered as 'full adoption' which was assigned a score of 2. A deviation from the recommended practice was considered as 'partial adoption' practice which was assigned a score of 1. Farmers who did not follow the recommended practice at all was considered as 'no adoption' and assigned a score of 0. Package of practices were recommended by the state Land Resource Department, Nagaland and Coffee Board of India covering various aspects.

The total score obtained by a respondent was calculated by adding the adoption scores for all the practices followed by that respondent.

$$\text{Adoption Index} = \frac{\text{Obtained adoption sore}}{\text{Maximum obtainable adoption score}} \times 100$$

On the basis of the mean ($\overline{X}$) and standard deviations (S.D.) of obtained scores, respondents were classified into three categories as follows:

Categories	Score range
Low extent of adoption	Below ($\overline{X}$ - 1.S.D.)
Middle extent of adoption	($\overline{X}$ - 1.S.D.) to ($\overline{X}$ + 1.S.D.)
High extent of adoption	Above ($\overline{X}$ + 1.S.D.)

RESULTS AND DISCUSSION

For the purpose of this study, a total of 15 personal, socio-economic, and psychological variables of the respondents were taken into consideration. These were-age, sex, educational level, marital status, occupation, family size, land holdings size, sources of income, total annual income, source of Information, mass media exposure, social participation, farming experience, training exposure and market accessibility.

Findings from Table 1 revealed that majority of the respondents (73.33%) were in the middle-aged group followed by 14.17 per cent of respondents in old group and 12.50 per cent of the respondents in young group.A similar type of observation was also reported by Thakuria *et al*. (2024) and Laldampuii *et al*. (2023) where 43.74 per cent and 51.00 per cent of the respondents were in the middle-aged group respectively. Majority of the respondents (97.50%) were male and only 2.50 per cent were female in coffee cultivation. A similar type of observation was also reported by Seby *et al*. (2018) and Ngadong (2024) where 96.7 per cent and 60.91 of the respondents were male respectively. Most of the respondents (55.00%) had high school level of education followed by 40.83 per cent respondents with illiterate level of education and only 4.17 per cent of the respondents had higher secondary level of education. Majority of the respondents (90.00%) were married while the remaining 8.33 per cent and 1.67 per cent were unmarried and divorced respectively. This finding is in accordance with that of Manida (2020). Majority of the respondents (67.50%) belonged to the agriculture category followed by 20.00 per cent of the respondents in business category and only 12.50 per cent of the respondents belonged to government service based on occupation. This finding is in line with the finding of Ananthnag (2014). Majority of the respondents (51.67%) belonged to medium family size followed by 26.67 per cent of the respondents with small family size and only 21.67 per of the respondents belonged to large family size. Majority of the respondents (41.67%) belonged to the semi-medium land holding category followed by 30.83 per cent in small farmer category and 22.51 per cent of the respondents in medium land holding category. Only 5.00 per cent of the respondents belonged to the marginal land holding category, most of the respondents (84.17%) had medium annual net farm income ranging from Rs 43,455-Rs 1, 47,247 followed by 12.50 per cent respondents with high annual net farm income above Rs.1, 47,247. In case of sources of information, majority of the respondents (74.17%) had medium level of exposure to informal sources of information followed by 14.17 per cent respondents with low level of exposure to informal sources of information. Most of the respondents (90.83%) had medium level of exposure to formal sources of information followed by 3.33 per cent respondents with low level of exposure to formal sources of information. Majority of the respondents (67.57%) had medium level of exposure to mass media on coffee cultivation followed by 22.51 per cent respondents with low level of exposure to mass media on coffee cultivation. In case of social participation, majority of the respondents (61.77%) were found to be involved in social participation followed by 38.33 per cent of the respondents were not involved in any social participation. Majority of the respondents (74.17%) had 2–5 years experience in coffee cultivation followed by 18.33 per cent respondents with less than 2 years of experience in coffee cultivation. Majority of the respondents (65.83%) had not undergone or participated in any training related to coffee cultivation whereas 34.17 per cent of the respondents had undergone or participated in training related to coffee cultivation. Almost half of the respondents (43.33%) sold their produce to middleman and 38.33 per cent of the respondents sold their produce to Land Resource Department of Nagaland while the remaining 13.33 per cent and only 5.00 per cent of the respondents sold their produce to wholesaler and retailer based on market accessibility.

Table 2 revealed that majority of the respondents (68.33%) had medium level of adoption on improved cultivation practices of coffee, followed by 24.17 per cent of the respondents had low level of adoption on improved cultivation practices of coffee and only7.50 per cent of the respondents had high level of adoption on improved cultivation practices of coffee. The mean overall adoption level (7.50) indicated that on an average the respondents had medium level of adoption on improved cultivation practices of coffee with standard deviation of 2.26. This finding was in agreement with the findings of those of Prajapati *et al.* (2002), Venkataramalu (2003), Meena *et al*. (2005), Jakkawad *et al*. (2017), Priyanka *et al*. (2018) and Thakuria (2023) who also found medium level of adoption among farmers.

The study revealed prevalence of diverse profile characteristics among the respondents of Zunheboto District of Nagaland, emphasizing several key insights. The majority of the respondents belonged to middle age group, mostly male and more than two-third of the respondents were married and had medium size family. More than half of the respondents had received high school level of education. Majority of the respondents (41.67%) belonged to the semi-medium land holding category followed by 30.83 per cent in

small farmer category with more than two-third of the respondent had medium level (2-5 years) on coffee farming experience. That shows that most of the farmers in the study area practices coffee cultivation in a small and medium scale. Therefore, initiative may be taken to motivate the farmers to start large scale of coffee cultivation. The most of the respondents (84.17%) had medium annual net farm income ranging from Rs. 43,455-Rs. 1, 47,247 with agriculture as occupation. More than half of the respondents had low level of information with regard to coffee cultivation from mass media, formal sources and informal sources. So, more extension contact is necessary to reduce the gap between the farming community and extension agents in order to enhance the dissemination of information on recommended scientific practices of coffee. Majority respondents (65.83%) had not undergone or participated in any training related to coffee cultivation. The concerned department should initiate action to conduct more numbers of massive training or capacity building programs for respondents so that they are motivated to adopt the recommended scientific practices of coffee. Findings revealed that majority of the respondents (68.33%) had medium level of adoption on improved cultivation practices of coffee, followed by 24.17 per cent of the respondents had low level of adoption on improved cultivation practices of coffee.

The study shows that despite the adoption level of the respondents on improved cultivation practices of coffee falls under medium level they were not well aware of the recommended practice on disease and pest management, manure and fertilizer application, bush management and storage practices. It implies that with proper extension strategies, training programs and required demonstrations the production of coffee can be enhanced. The concerned state department and agencies should motivate the respondents by providing appropriate guidance and necessary essential in proper time. In future directions, the same could be administered to any other coffee growers in other districts of Nagaland for measuring the Adoption level of the coffee growers.

The limitation of the study is that considering the restraint of time and resources of the investigator, only one district is covered in the state of Nagaland were brought under the purview of the study. In future a similar study may be undertaken to cover more numbers of districts of Nagaland with a larger sample size.

Table 1. Socio-economic profile of the respondents

Sl. No.	Variables	Categories	Score range	Frequency	Percentage
1.	Age	Young	Upto 44 years	15	12.50
		Middle	44-63 years	88	73.33
		Old	63 years and above	17	14.17
2	Sex	Male	1	117	97.50
		Female	2	3	2.50
3.	Education level	Illiterate	1	49	40.83
		High school	2	66	55.00
		Higher secondary and above	3	5	4.17
4.	Marital Status	Married	1	108	90.00
		Unmarried	2	10	8.33
		Divorced	3	9	1.67
5.	Occupation	Farmer	1	81	67.50
		Business	2	24	20.00
		Government service	3	15	12.50
6.	Family size	Small	Upto 4 members	32	26.67
		Medium	5-7 members	62	51.67
		Large	7 members and above	26	21.66
7.	Land holdings size	Marginal	Upto 1ha	6	5.00
		Small	1-2 ha	37	30.83
		Semi-medium	2-4 ha	50	41.67
		Medium	4-10 ha	27	22.5
8.	Sources of income	Agriculture	₹ 40,230.83	102	85.00
		Coffee	₹ 41,862	120	100
		Others	₹ 94,739.13	22	18.33

Continued....

9.	Total Annual income	Low	UptoRs. 43,455	4	3.33
		Medium	Rs 43,455-Rs 1,47,247	101	84.17
		High	Rs1,47,247	15	12.50
10.	Informal source of Information	Low	Upto 5	17	14.17
		Medium	5- 8	116	74.17
		High	8 and above	14	11.67
11.	Formal source of Information	Low	Upto 3	10	3.33
		Medium	3-5	109	90.83
		High	5 and above	1	0.83
12.	Exposure to mass media on coffee cultivation	Low	Upto 1	27	22.50
		Medium	1-3	81	67.50
		High	3 and above	12	5.45
13.	Social participation	Involved	1	80	66.67
		Not-involved	0	40	33.33
14.	Coffee farming experience	Low	Upto 2years	22	18.33
		Medium	2-5years	89	74.17
		High	5years and above	9	7.50
15.	Training exposure	Undergone training	1	58	34.17
		Not undergone training	0	79	65.83
16	Market accessibility	Middleman	1	52	43.33
		Wholesaler	2	15	13.33
		Retailer	3	6	5.00
		LRD department	4	46	38.33

Table 2. Distribution of respondents according to adoption level on improved cultivation practices of coffee

Category	Score Range	Frequency	Percentage	Mean	S.D.
Low adoption level	Up to 6.273	29	24.17	7.50	2.26
Medium adoption level	6.274-10.727	82	68.33		
High adoption level	Above 10.727	09	7.50		
Total		120	100		

Table 3. Distribution of respondents based on their adoption level on improved cultivation practices of coffee

Sl.No.	Practices	Extent of adoption					
		Full adoption		Partial adoption		No adoption	
		F	%	F	%	F	%
1	Land preparation method						
	Spacing- 1.5 m-1.5 m	79	65.83	41	34.17	0	0
	Pit size- 45 cm x45cm x 45 cm	37	30.83	9	7.50	74	61.67
2	Nursery(i) Raised beds 15 cm	30	45.00	90	75.00	0	0
	(ii) Bag nursery- Polyethene bags with adequate hole containing mixture of black soil, FYM and sand in proportion 6:2:1	0	0	45	37.50	75	62.50
3	Manure and fertilizer application						
	FYM/Compost @ 5 tones ha^{-1}	0	0	20	0	100	83.30
4	Insect and pest management	0	0	0	0	120	100

Continued.....

5	Disease control Coffee leaf rust- Spray 0.5% Bordeaux mixture during Pre-monsoon (May-June) and Bayleton 25 WPN@ 0.02 a.i. (160 g barrel^{-1}) during post monsoon	0	0	0	0	120	100
6	Weed Management						
	(i) Hand hoeing and hand weeding	34	28.33	86	71.67	0	0
	(ii) Chemical weed control-GramaxoneGlycel	0	0	0	0	120	100
7	Irrigation-						
	Drip – irrigation	0	0	0	0	120	100
8	Shade management	30	25.00	75	62.50	15	12.50
9	Bush management	0	0	22	18.33	98	81.67
	(i) Light pruning after harvesting						
	(ii) Handling, centering andde-suckering	0	0	14	11.67	106	88.33
10	Harvesting						
	(i) Time (Nov-March)	73	60.83	20	16.67	27	22.5
	(ii)Techniques - Selective picking	93	77.5	0	0	27	22.5
11	Following recommended storage practices	0	0	35	29.17	85	70.83

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