



# Adoption Behavior of Farmers towards Improved Pineapple Production Practices in Uttar Dinajpur District of West Bengal, India

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## **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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## **ABSTRACT**

The study was conducted in the Uttar Dinajpur district of West Bengal with the objective of assessing the extent of adoption behavior among farmers towards improved pineapple production practices. A purposive sampling technique was employed, and a total of 120 respondents were selected from seven villages within the Chopra block. Data was collected using a pre-tested schedule and analyzed using appropriate statistical tools and techniques. The findings of the study revealed that the majority of respondents (65.00%) fell within the middle age range. In terms of adoption, about pineapple production technology, 50.83 percent of the respondents had a medium level of adoption, followed by 26.67 percent with low level of adoption and 22.50 percent with high level of adoption. The study also established positive and significant relationships between the

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independent variables, such as age, educational qualification, annual income, extension contact, mass media exposure, scientific orientation, and risk orientation, and the adoption behavior of farmers. Overall, the study provides valuable insights into the adoption behavior of farmers in the study area and highlights the importance of various factors in influencing their level of adoption of improved pineapple production practices.

*Keywords: Adoption; pineapple; production practices; socio-economic profile.*

## 1. INTRODUCTION

In India, an agrarian economy, agriculture holds a crucial position in the agenda of economic development. For rural inhabitants, agriculture has evolved into a way of life. This sector contributes approximately 50.00 percent to the national income and plays a vital role in the holistic progress of the nation. As the traditional form of agriculture gradually transitioned into a commercial enterprise during the British era, the farmers' perspective towards agriculture underwent a transformation [1,2]. Consequently, commercial crops emerged as significant players in the realm of agriculture, assuming a unique role in the sector.

Among tropical fruits, pineapple (*Ananas comosus*) is the second most important fruit in the world. The cultivation of pineapple originated in Brazil and gradually spread to other tropical regions of the world. In 1548 the Portuguese introduced its cultivation in India [3]. Currently, 85 countries around the world produce about 23.61 million tons of pineapple. In addition to being food, pineapple has always been a symbol and artistic theme for its natural sweetness throughout history. It is also used as a symbol of decoration, welcome and wealth. The rarity, reputation, and visual appeal of pineapples make it a quintessential exotic fruit. Pineapples are grown in areas where the climate is relatively uniform throughout the year and the yield is the best. Current production is still limited to the tropical regions of the world. The current total world production is 23 MMT, which is produced in about 80 countries around the world. Costa Rica is the world's largest producer of pineapples, accounting approximately 3.3MMT of the world's pineapple production followed by Philippines, Brazil and Indonesia. In 2013-14, India ranked seventh among the world's pineapple producing countries (Government of India, 2014).

Asia continues to dominate as the primary pineapple-producing region, accounting for 57.43 percent of global production [4,5]. The cultivation of pineapple was introduced in India only four to five decades ago and has since gained limited

significance in terms of land coverage, representing approximately 1 percent of the total fruit-growing area in the country. Pineapple cultivation thrives in states such as Assam, Meghalaya, Tripura, Mizoram, Manipur, Nagaland, West Bengal, Kerala, Karnataka, and Goa, where it is undertaken extensively. Additionally, there is notable pineapple cultivation in Gujarat, Maharashtra, Tamil Nadu, Andhra Pradesh, Orissa, Bihar and Uttar Pradesh on small scale [6,7].

West Bengal stands as one of the prominent states in India when it comes to pineapple production, contributing around 23.97 percent to the nation's total output. Interestingly, the state boasts approximately 12,000 hectares of land dedicated to pineapple cultivation, accounting for about 14.5 percent of the country's pineapple-growing area (Anon, 2008). Among the districts in North Bengal, namely Darjeeling, Jalpaiguri, and Uttar (North) Dinajpur, hold a significant share, approximately two-thirds, in both the pineapple-growing area and production within the state. While pineapple continues to dominate the global trade of tropical fruits, other fruits have also made strides in gaining market share. Statistics from 2000 reveal that pineapple accounted for 51 percent of the total 2.1 million tons of whole fruit market worldwide, with mangoes securing the second position at 21.7 percent. Due to its trade orientation towards developed nations like Japan, the USA, and Europe, pineapple has established itself as the most sought-after fruit [8]. Remarkably, despite adverse weather conditions and economic situations, the global pineapple production witnessed a steady growth rate of 1.9 percent per year during the 1990s. It is against this backdrop that we are intrigued to conduct an in-depth study on the expansion and progress of pineapple in the northern part of West Bengal, which has been officially designated as the Agri-expo Zone for Pineapple by the government since 2001.

Uttar Dinajpur is one of most backward district of West Bengal but in pineapple production it alone

produce one fourth(1/4) of the total production of the state (26.92%) and stand second ranks in production with 85.08 thousand tonnes in 2.95 thousand hectares of land.

## 2. METHODOLOGY

The study employed a descriptive research design, which is suitable for describing the characteristics of the subject under investigation. The research was conducted in the Uttar Dinajpur district of West Bengal. Among the nine blocks in the district, the Chopra block was purposively selected due to its high number of pineapple growers compared to other blocks. From the selected block, seven villages were randomly chosen. A total of 120 respondents were then selected using a proportionate sampling method, focusing on those who were engaged in the maximum quantity of pineapple cultivation.

### 2.1 Objectives

1. To assess the socio-economic profile of respondents.
2. To determine the extent of adoption of the recommended pineapple production practices by the respondents.

## 3. RESULTS AND DISCUSSION

The results collected from the respondents regarding the socio-economic are presented in the following Table 1.

From Table 1 it can be seen as follows Through the study it was observed that majority of the respondents (65.00%) belongs to the middle age group. It was revealed that maximum number of respondents (85.00%) were literate. The study proved that (87.50%) of respondents belonged from the nuclear family. It was revealed by the study maximum of the respondents (60.00%) lives in semi cemented house. The study shows that majority of respondents' (59.16%) major source of income is pineapple cultivation along with business. The study revealed that a substantial portion of respondents (46.67%) had a medium level of land holding. It was evident that majority of the respondents (52.50%) have medium level of extension contact. It was evident that maximum of the respondents (50.83%) earn medium level of annual income. The study proves that majority of the respondents (50.83%) have medium level of mass media exposure. A significant proportion of respondents from the survey (68.33%) have

medium level of risk orientation. It was evident that most of the respondents (39.17%) belonged to the medium level of scientific orientation. Majority of the respondents of the survey (45.84%) have medium level of economic motivation. Most of the respondents from the survey (44.17%) have high level of progressiveness.

From Table 2 it has been observed as follows. Majority (74.17%) of the respondents were found to adopt fully correct soil type for pineapple cultivation that is sandy loam, loamy and sandy soil. Most of the respondents (88.34%) adopted cultivation in trenches. A significant proportion (85.00%) of the respondents found to fully adopt correct type of planting. Majority of the cultivators (94.16%) accept recommended varieties. A large proportion(92.50%) of farmers adopted suckers as the planting material. 57.50% adopted correct seed treatment. Majority of the respondents (88.34%) found to adopt suitable timeplantation between the month of December to March. Most of the cultivators (80.83%) found to adopt recommend spacing for planting. 58.33% of the cultivators adopted recommended no. of plants in per hectare area. 87.50% of the respondents found to adopt correct depth of trench for cultivation i.e. 15-45cm. 41.67% did not adopted crop rotation. 98.34% of the respondents found to adopt fully correct intervals of manual weeding and hoeing. Majority (79.16%) of the respondents found to adopt correct chemical weeding practices. Most of the respondents (89.16%) found to adopt appropriate optimum dosages of fertilizer uses. Every respondents uses 25tonnes of FYM in per hectare of land for pineapple cultivation. 68.34% of cultivators found to have proper irrigation techniques. Every farmer is aware about pests and nematodes. Most of the respondents (66.67%) found to use appropriate chemical treatments for pest control. Majority of the cultivators (53.33%) uses appropriate fungicide dosages for soft rot and black rot disease control. Also 53.33% farmers found to adopt appropriate dosages of fungicide for the treatment of heart rot and leaf spot. Most of the farmers (59.17%) found to use appropriate treatment for fusariosis control. It can be said that majority of the farmers found to have medium level of adoption extent i.e. 50.83%, followed by 26.67% and 22.50% of low and high level of adoption extent respectively. These results align with the findings reported by Daudu [9] suggesting a similar distribution of adoption levels among farmers in soil conservation practices in their study.

**Table 1. Socio-economic profile of the respondents (n=120)**

S. No	Characteristics	Category	Frequency	Percentage
1	Age	Young (Below 35 years)	20	16.67
		Middle (35-50 years)	78	65.00
		Old (above 50 years)	22	18.33
2	Education	Illiterate,	18	15.00
		Primary, High school and intermediate	85	70.83
		U.G. and P.G.	17	14.17
3	Family type	Neuclear	105	87.50
		Joint	15	12.50
		Others	0	0.00
4	Type of House	Hut(Kuchha)	26	21.67
		Semi-cemented	72	60.00
		Cemented	30	18.33
5	Source of Income	Pineapple Cultivation Only	39	32.50
		Pineapple Cultivation with Business	71	59.16
		Pineapple Cultivation with Service	10	8.34
6	Land holding	Marginal and Small Farmer(1ha-2.49ha)	45	37.50
		Medium Farmer (2.5ha-4.0 ha)	56	46.67
		Large Farmer (Above 4ha)	19	15.83
7	Extension Contacts	Low level (6-8)	45	37.50
		Medium level (9-10)	63	52.50
		High level (11-12)	12	10.00
8	Annual Income	Low (Below Rs. 1,50000)	42	35.00
		Medium (Rs.1,50000-2,50000)	61	50.83
		High (Above Rs.2,50000)	17	14.17
9	Mass Media Exposure	Low level (21-25)	51	42.50
		Medium level (26-29)	61	50.83
		High level (30-33)	8	6.67
10	Risk orientation	Low level ((8-11)	29	24.17
		Medim level (12-14)	82	68.33
		High level(15-17)	9	7.50
11	Scientific Orientation	Low level(12-14)	38	31.66
		Medium level(15-16)	47	39.17
		High level (17-18)	35	29.17
12	Economic Motivation	Low level(11-13)	19	15.83
		Medium level(14-15)	55	45.84
		High level(16-17)	46	38.33
13	Progressiveness	Low level (9-11)	19	15.83
		Medium level (12-13)	48	45.84
		High level(14-15)	53	44.17

**Table 2. Adoption Extent of the respondents about improved pineapple production practices:**

Sl. No.	Statements	Evaluation		
		FA F (%)	PA F (%)	NA F (%)
1.	Suitable soil for pineapple cultivation a)Sandy loam b)Sandy c)Loamy	89 (74.17%)	25 (18.33%)	6 (5%)
2.	Land is prepared for pineapple cultivation in trenches	106 (88.34%)	7 (5.83%)	7 (5.83%)
3.	Knowledge about of different types of planting a)Single row b)Paired row c)Wider spacing	102 (85%)	15 (12.5%)	3 (2.5%)
4.	Knowledge about recommended variety a)Kew b)Giant kew c)Queen	113 (94.16%)	5 (4.17%)	2 (1.67%)
5.	Knowledge about of different types of planting materials used for cultivation a)Sucker b)Slip c)Crown	111 (92.50%)	6 (5.00%)	3 (2.50%)
6.	Knowledge about length of suckers used for planting a) 25-30 cm b) 45-50 cm c) 55-60 cm d)65-70 cm	105 (87.50%)	13 (10.84%)	2 (1.66%)
7.	Knowledge about length of slips used for planting a) 25-30 cm b) 45-50 cm c) 55-60 cm	40 (33.33%)	11 (9.17%)	69 (57.5%)
8.	Knowledge about length of crown used for planting a) 10-15 cm b) 15-20 cm c) 25-30 cm	4 (3.33%)	1 (0.84%)	115 (95.83%)
9.	Knowledge about seed treatment application a)Difoltan (0.4%) b) Ekatox (0.05%) c) Dithane Z78 (0.3%)	69 (57.50%)	26 (21.66%)	25 (20.84%)
10.	Most suitable months for planting pineapple a) December b) January c) February d) March	106 (88.34%)	12 (10%)	2 (1.66%)
11.	Knowledge about recommended spacing for pineapple a) 30 x 60 x120 cm b) 25 x 60 x 90 cm c) 25 x 90 x 91.5 cm	97 (80.83%)	16 (13.34%)	7 (5.84%)
12.	Knowledge about required number of plants per hectare. a)35,000 b)53,300 c)65,900	70 (58.33%)	35 (29.17%)	15 (12.50%)
13.	Knowledge about required depth of trench for planting pineapple a)15 cm b) 30 cm c) 45 cm	105 (87.50%)	10 (8.33%)	5 (4.17%)
14.	Knowledge about the most desirable intercrops in pineapple cultivation a) Turmeric b) Ginger c) Cowpea d) Coleus	64 (55.34%)	49 (40.83%)	7 (5.83%)
15.	Knowledge about the most desirable crops to rotate with pineapple cultivation a)Cereals b)Vegetables c)Legumes	46 (38.33%)	24 (20%)	50 (41.67%)
16.	Knowledge about manual weeding / Hoeing a)Whenever needed b) Monthly c) Quarterly	118 (98.34%)	2 (1.66%)	0 (0.00%)
17.	Knowledge about Chemical weeding a) Bromacil 3 kg/ha b) Diuron 3kg/ha c) Quizalofop 0.448 kg/ha	95 (79.16%)	22 (18.34%)	3 (2.50%)

18.	Knowledge about is the optimum dose of fertilizers to be application a) 600:400:600 kg/ha b) 320:160:320 kg/ha c) 450:300:450 kg/ha	107 (89.16%)	9 (7.50%)	4 (3.34%)
19.	Knowledge about FYM application of 25 tonnes/ha	120 (100%)	0 (0.00%)	0 (0.00%)
20.	Knowledge about the ideal interval of months for fertilizer application a) 3, 6, 9 and 12 months after planting b)2, 5, 8 and 11 months after planting c)1, 4, 7 and 10 months after planting	109 (90.84%)	7 (5.83%)	4 (3.33%)
21.	Knowledge about interval of irrigation applied for pineapple crop. a) 10 days 3 lit/pit b) 20 days 3 lit/pit c) 45 days 3 lit/pit	106 (88.34%)	7 (5.83%)	7 (5.83%)
22.	Knowledge about the different types of irrigation a) Trench b) Rain c) Sprinkler	82 (68.34%)	35 (29.16%)	3 (2.50%)
23.	Knowledge about the important pests in pineapple crop a) Mealy bug b) Ants c) Nematode	120 (100%)	0 (0%)	0 (0%)
24.	Knowledge about the name of the chemicals used for these pests a) 17.5 kg phorate/ha mealy bug b) 0.1% diazinon/lit/ha ants c)Soil fumigation with 1,3dichloropropane @ 157 l/ha	80 (66.67%)	26 (21.66%)	14 (11.67%)
25.	Knowledge about the important disease in pineapple crop and suggest remedial measures			
a.	Soft rot/black rot      Systemic fungicides used during p/kg smear the cut end with 20% solution of benzoic acid in 1 lt/alcohol	64 (53.33%)	24 (20.00%)	32 (26.67%)
b.	Heart rot and leaf spot      Bordeaux mixture (1%) or Difoltan (0.4%) is used during planting	64 (53.33%)	12 (10.00%)	44 (36.67%)
c.	Fusariosis      Pathogen free plant material should be obtained by sectioning the stump plants after harvesting To force plants to flower in month with low rainfall To protect the inflorescences of the forced plants with benomyl (0.05%) To protect inflorescence with paper	71 (59.17%)	12 (10%)	37 (30.83%)

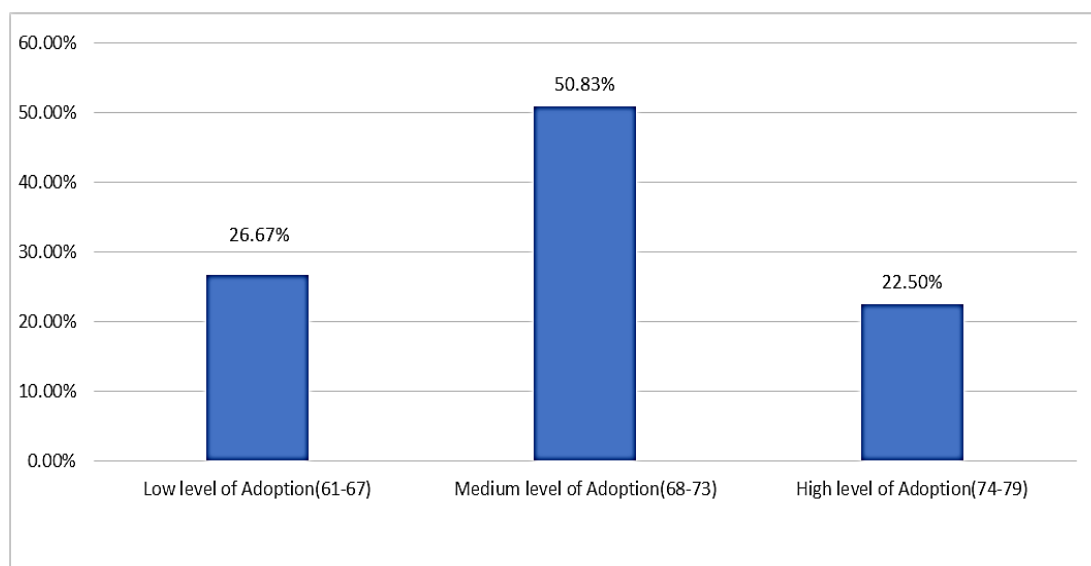
**Table 3. Distribution of Adoption level of the respondents about improved pineapple production practices**

Sl no.	Category	Frequency	Percentage
1	Low (score 61-67)	32	26.67
2	Medium (score 68-73)	61	50.83
3	High (score 74-79)	27	22.50
<b>Total</b>		120	100.00

**Table 4. Correlation coefficient (r) between different independent variables and Adoption in improved pineapple production practices:**

Sl. No.	Independent Variable	Correlation coefficient
1.	Age	0.998*
2.	Educational Qualification	0.992*
3.	Types of family	-0.251**
4.	Types of houses	0.997*
5.	Source of income	0.972*
6.	Land holding	0.865*
7.	Extension Contact	0.849*
8.	Annual income	0.893*
9.	Mass Media Exposure	0.743*
10.	Risk Orientation	0.991*
11.	Scientific Orientation	0.989*
12.	Economic motivation	0.588**
13.	Progressiveness	0.247**

\*= Correlation is significant at the 0.01% level of probability; \*\*= Correlation is significant at the 0.05% level of probability



**Fig. 1. Distribution of the respondents on the basis of adoption level about improved pineapple production practices**

Based on the data presented in Table 3, the findings of the study indicate that 50.83% of the respondents exhibited a medium level of adoption towards improved pineapple production practices. Additionally, a significant proportion of pineapple farmers, approximately 26.67%, displayed a low level of adoption, while 22.50% of the respondents showed a high level of adoption in improved pineapple production

practices. These results align with the findings reported by Daudu [9] suggesting a similar distribution of adoption levels among farmers in soil conservation practices in their study.

From this Table 4 concluded that the independent variables i.e. age, educational qualification, types of house, source of income, extension contact, annual income, extension

contact, mass media exposure, risk orientation and scientific orientation were positively and significantly correlated with level of adoption of farmers toward improved pineapple production practices measures at 0.01 percent of probability, As a result, the null hypothesis was rejected for these variables. On the other hand type of family shows negative and significant correlation with the adoption of the respondents at a probability level of 0.05 percent. However educational economic motivation, progressiveness shown positive and significant correlation with adoption at the 0.05% level of probability. Similar finding was also reported by Poonam and Sarkar [10].

#### 4. CONCLUSION

Based on the findings of the study, it can be concluded that the majority of respondents were middle aged group, possessed a higher level of literacy, belonged to nuclear families, resided in semi-cemented houses, significant source of income was pineapple cultivation along with business, possessed a higher level of literacy and had medium level of annual income. The majority of respondents showed a medium level of knowledge and adoption of improved pineapple production practices. Variables such as age, education, housing type, income, extension contact, mass media exposure, risk orientation, and scientific orientation had a positive and significant impact on respondents' adoption levels.

#### CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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