A STUDY ON ADOPTION OF ASSAM AGRICULTURAL UNIVERSITY'S MAJOR RICE VARIETIES IN DHUBRI DISTRICT OF ASSAM

ABSTRACT

. Rice is the staple food in India. The varieties of rice used for cultivation vary with land situation. A study was conducted to know the adoption of Assam Agricultural University (AAU)'s rice varieties by the farmers in Dhubri district of the state of Assam. To conduct the study, on adoption of the said improved rice varieties, a total of 120 numbers of farmers from three Agricultural Development Officer (ADO) circles were selected. The study was conducted from July, 2021 to February 2022. Multiple regression analysis was done to determine the factors responsible for the adoption of AAU rice varieties. The study revealed that the AAU developed varieties like Ranjit sub1, Bahadur Sub 1, Prafulla, Gitesh, Swarna Sub 1 were adopted by farmers for flood affected situation. For flood free situation, the AAU developed varieties like Ranjit, Bahadur, Mahsuri were adopted. Out of the different varieties, Ranjit and Ranjit sub 1 variety was adopted by the highest numbers of farmers. The factor availability of seeds is significant at 0.01 level and educational qualification of farmers and occurrence of flood was significant at 0.05 level.

KEY WORDS: Adoption, Flood, Multiple regression analysis, Rice Varieties, Significant

INTRODUCTION

Rice is considered as the staple food in most of the parts in Asia. During 2020, it occupies approximately 44 million hectares of area in India and this area remained relatively consistent for last three years[1]. During 2019-20, the area covered under rice was 2400 thousand hectare in Assam which accounts for 59.93 per cent of gross cropped area. In terms of production, the share of rice to the total food grains is 95.3 per cent[2]. Thus, rice has a significant role in the economy of Assam as well as in the GDP of the state. The per capita average monthly consumption of rice is about 13 kg also speaks volumes on the rice orientation of the state[3]. In Dhubri district of Assam the percentage share of total rice production to the state as a whole is accounted as 10.47 per cent[4]. It is very noteworthy that rice is grown in

Assam in three seasons viz. winter, summer and autumn season and the winter rice is considered as the major crop in the state. Due to more low lying areas in Dhubri district of Assam, both winter as well as the summer rice crops are equally important.

During the last three decades, the adoption of high yielding rice varieties has been increased and these high yielding rice varieties replace thousands of traditional varieties[5]. For the welfare of farmers, Assam Agricultural University has developed number of high yielding rice varieties of rice. It was reported that the productivity of rice in Assam is comparatively less than the national average[3]. There was a very large technological gap that was existed in case of adoption of improved technology by the farmers[6]. Some important varietal attributes like ease of threshing, cooking and swelling quality are significant determinants for adoption of a variety[7]. The adoption of a technology mainly depends on some factors like availability of labour, size of farm, availability of extension service facilities, market demand of the variety, credit facilities and gender orientation[8]. Keeping in view the importance, the study was conducted to identify the popular varieties of rice and to know the adoption of Assam Agricultural University (AAU)'s rice varieties by the farmers in Dhubri district.

METHODOLOGY

The study was carried out in Dhubri district of the state of Assam to know the AAU major rice varieties grown by the farmers during kharif and summer seasons 2021-22. The study district was selected purposively as it is located at the international boundary between India and Bangladesh. Three Agricultural Development Officer (ADO) circles from the district were selected purposively. Four villages from each circle were considered. Ten farm families from each village were taken into consideration and thus a total of 120 (one hundred twenty) numbers of farm families were covered. The data for the study were collected directly from the farmers through personnel interview method with the help of pre-tested structured schedule. The statistical techniques used are frequency, percentage, and mean.

Classification of farmers groups

As per agricultural census, the farmers were categorized based on operational holding as follows[9]

:

Chart 1 : Classification of farmers groups

Sl. No.	Category	Size-Class
1	Marginal	Below 1.00 hectare
2	Small	1.00 – 2.00 hectare
3	Semi Medium	2.00 – 4.00 hectare
4	Medium	4.00 – 10.00 hectare
5	Large	10.00 hectare and more

Factors determining the adoption of AAU rice varieties

The factors determining the adoption of AAU rice varieties were evaluated using multiple regression analysis. The model used was explicitly expressed as[10] ;

$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e_i$

Where:

Y_i = The adoption of AAU major rice varieties

β_0 = constant

β_i = estimated coefficients of the explanatory variables

X_i = explanatory variables

e_i = disturbance term

RESULTS AND DISCUSSION

The number of farm families according to different farmers groups is presented in Table 1. Out of three different ADO circles, Bilasipara and Raniganj ADO circles having the highest percentage of farm families in marginal group of farmers followed by small, semi medium and medium group of farmers. In case of Chapar ADO circle, the highest percentage of farmers was calculated for small group of farmers (42.50 per cent) followed by marginal (40.00 per cent), semi medium (12.50 per cent) and the lowest was calculated for medium group of farmers (5.00 per cent). No big farmer was found in the study area. The highest 55 number (45.83 per cent) of marginal farm families were calculated for all the three circles followed by 44 (36.67 per cent) small, 14 (11.67 per cent) and the lowest 7 (5.83 per cent) number of farm families were calculated for medium group of farmers.

Table 1: Distribution of farm families according to different groups of farmers

ADO circles	Number of farm families					Total
	Marginal	**Small**	**Semi medium**	**Medium**	**Large**	
Chapar	16 (40.00)	17 (42.50)	5 (12.50)	2 (5.00)	0 (00.00)	40 (100.00)
Bilasipara	19 (47.50)	12 (30.00)	6 (15.00)	3 (7.50)	0 (0.00)	40 (100.00)
Raniganj	20 (50.00)	15 (37.50)	3 (7.50)	2 (5.00)	0 (0.00)	40 (100.00)
Total of all circles	**55 (45.83)**	**44 (36.67)**	**14 (11.67)**	**7 (5.83)**	**0 (0.00)**	**120 (100.00)**

Figure within brackets indicate percentage to the total

Land holding (in hectare) of the respondent farmers

In addition to the own farming area, some of the farm families leased-in some farming land from other farmers of the locality as depicted in Table 2. In Chapar ADO circle, except medium group of farmers all other of farmers leased-in some area from fallow farmers. In Bilasipara ADO circle both marginal and small group of farmers adopted the practice while in Raniganj ADO circle, only some marginal farmers leased-in some area from others for farming. A total of 2.07 hectare area was leased in all the three ADO circles. In Chapar and Raniganj ADO circles, the highest area was covered by small group of farmers while in Bilasipara circle it was calculated for semi-medium group of farmers (29.80 per cent). In Chapar and Bilasipara ADO circles, the lowest area was covered by medium group of farmers and in case of Raniganj circle it was recorded for medium group of farmers (15.43 per cent)

Table 2: Land holding (in hectare) of the respondent farmers

Land availability	ADO Circles			All ADO circles
	Chapar	**Bilasipara**	**Raniganj**	
	Total (ha)	**Total (ha)**	**Total (ha)**	**Total (ha)**

Own Land (A)	55.35 (98.65)	59. 71 (98.53)	50. 70 (99.18)	165. 76 (98.77)
Marginal	11.52	12.73	16.60	40.80
Small	20.91	15.96	17.85	54. 72
Semi medium	13.8	18.06	7.89	39. 75
Medium	9.12	12.96	8.36	30.44
Leased in Land (B)	0.76 (1.35)	0.89 (1.47)	0.42 (0.82)	2.07 (1.23)
Marginal	0.34	0.55	0.42	1.31
Small	0.22	0.34	0	0.56
Semi medium	0.20	0	0	0.20
Medium	0	0	0	0.00
Total land Holding (C= A+B)	56.11 (100.00)	60.60 (100.00)	51.12 (100.00)	167.83 (100.00)
Marginal	11.86 (21.14)	13.28 (21.91)	17.02 (33.29)	42.16 (25.12)
Small	21.13 (37.66)	16.30 (26.90)	17.85 (34.92)	55.28 (32.94)
Semi medium	14.00 (24.95)	18.06 (29.80)	7.89 (15.43)	39.95 (23.80)
Medium	9.12 (16.25)	12.96 (21.39)	8.36 (16.35)	30.44 (18.14)

Figure within brackets indicate percentage to the total

Major AAU rice varieties adopted by the farmers in the study area and number of farmer

Winter rice varieties adopted by farmers in the study area and number of farmer

Farmers generally grow high yielding varieties and some traditional varieties in lieu of hybrid varieties during kharif season. The detail has been presented in Tables (3, 4 and 5). The situation of growing of winter rice had been grouped as flood affected area and flood free area. In flood affected areas, the farmersprefered to grow the varieties like Ranjit sub1, Bahadur Sub 1, Prafulla, Gitesh, Swarna Sub 1 and Bina Dhan 11 in all the three ADO circles under study. Out of these varieties, Ranjit sub1, Bahadur sub 1, Prafulla, Gitesh and Swarna sub 1 was developed and recommended by Assam Agricultural University. In case of flood free areas, the farmers prefered to grow some varieties like Ranjit, Bahadur, Mahsuri, Yamuna, Ranjana, Malchira, Goyeswari, Basmati, and some popular traditional varieties like Phulpakhri and Kola joha. Here, the varieties namely, Ranjit, Bahadur, Mahsuri was developed and recommended by Assam Agricultural University. Other popular varieties of rice adopted by the farmers were developed in West Bengal and Bangladesh.

In ADO circle Chapar and Bilasipara, the highest percentage of farmers preferred to grow Ranjit sub 1 variety (45.00 per cent and 60.00 per cent, respectively) followed by Swarna

sub 1 and Bahadur sub 1 variety in flood affected situation from last three to four years. The variety BinaDhan 11 was less adopted by the respondent farmers in both the ADO circles. It might be due to that the variety was introduced in the study area only two years back. In Raniganj ADO circle, the highest 70.00 per cent farmers adopted the variety Ranjit Sub 1 in flood affected situation followed by the variety Bahadur sub 1 (40.00 per cent) and Swarna sub 1 (37.50 per cent). The variety Gitesh was adopted by only 5.00 per cent farmers. Before introduction of these varieties, the farmers could hardly harvest the crop.

The variety Ranjana was grown by the highest percentage of respondent farmers (70.00 per cent) in Chapar ADO circle in flood free situation and this variety was found very popular in the study area due to its higher production and better quality, followed by Ranjit (67.50 per cent) and Malchira (45.00 per cent). The lowest 2.5 per cent farmers grew the variety Kolajoha (a traditional scented rice variety). In Bilasipara ADO circle, 92.50 per cent farmers grew the variety Ranjana followed by the variety Yamuna (82.50 per cent) and Ranjit (77.50 per cent) and the lowest 2.50 per farmers grew Kolajoha variety. In Raniganj ADO circle, the highest 90.00 per cent farmers grew the variety Ranjit followed by Ranjana (62.50 per cent and Yamuna (4.50 per cent). Here, the high yielding scented rice variety Ketekijoha was grown by 2.50 per cent respondent farmers. Based on the land situation, the productivity performance of the varieties like Ranjana, Malchira and Yamuna was also very satisfactory like the variety Ranjit. Varieties like Bahadur and Mahsuri is also equally popular in the study area; but due non-availability of suitable land for these two varieties the percentage of adoption by the farmers was found less.

It is observed from the Table 3, Table 4 and Table 5 that the farmers under marginal and small category farmers grew more number of rice varieties as compared to the semi medium and medium categories of farmers. It might be due to that the 82.50 per cent farmers were belonged to these two categories and the remaining 17.50 per cent farmers were belonged to the other two categories (Table 1). Other reasons may be that the farmers under semi medium and medium categories grow their crops both for consumption as well as commercial purposes for which they prefer to restrict with some specialized varieties. A similar findings was reported by Goswami*et al*. (2010)[11].

Summer rice varieties adopted by farmers in the study area and number of farmer

Rice is the major crop in the district. Both winters as well as the summer rice are grown by the farmers. In reality, it was found that in case of summer rice all the respondent farmers replaced the traditional and high yielding rice varieties with the hybrid rice varieties because of

shorter duration (135-140 days) and potentiality of higher productivity (7-8 ton/ha). The most popular varieties in the study area for summer rice were Improved BD 28, DRH 836, MC 13, PAC 837, PAC 807, D238Gold, PAN 2423. All these varieties are hybrid and no one was developed by Assam Agricultural University. The return from the production of traditional and high yielding varieties of summer rice becomes difficult to compensate the higher cost of production and ultimately the farmers were bound to give up those varieties. Out of 120 numbers of respondents, no farmer grew AAU rice varieties during summer season.

Table 3: Major Winter rice varieties grown in the study area and number of farmer

ADO Circles	Situation	Farmers' categories								Total of all farmers
		Marginal		Small		Semi medium		Medium		
		Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	
Chapar	Flood affected area	Ranjit sub1	6 (3.50)	Ranjit sub1	8 (47.06)	Ranjit sub1	2 (40.00)	Ranjit sub1	2 (100.00)	18 (45.00)
		Bahadur Sub 1	3 (18.75)	Bahadur Sub 1	8 (47.06)	Bahadur Sub 1	2 (40.00)	Bahadur Sub 1	1 (50.00)	14 (35.00)
		Prafulla	3 (18.75)	Prafulla	4 (23.53)	Prafulla	0 (0.00)	Prafulla	0 (0.00)	7 (17.50)
		Gitesh	2 (12.50)	Gitesh	3 (17.65)	Gitesh	0 (0.00)	Gitesh	0 (0.00)	5 (12.50)
		Swarna Sub 1	6 (37.50)	Swarna Sub 1	8 (47.06)	Swarna Sub 1	2 (40.00)	Swarna Sub 1	1 (50.00)	17 (42.50)
		BinaDhan 11	0 (0.00)	BinaDhan 11	1 (5.88)	BinaDhan 11	0 (0.00)	BinaDhan 11	0 (0.00)	1 (2.50)
	Flood free area	Ranjit	12 (75.00)	Ranjit	10 (58.82)	Ranjit	3 (60.00)	Ranjit	2 (100.00)	27 (67.50)
		Bahadur	2 (12.50)	Bahadur	2 (11.76)	Bahadur	1 (20.00)	Bahadur	1 (50.00)	6 (15.00)
		Mahsuri	3 (18.75)	Mahsuri	2 (11.76)	Mahsuri	3 (60.00)	Mahsuri	0 (0.00)	8 (20.00)
		Yamuna	5 (31.25)	Yamuna	6 (35.29)	Yamuna	0 (0.00)	Yamuna	2 (100.00)	13 (32.50)
		Ranjana	13 (81.25)	Ranjana	10 (58.82)	Ranjana	3 (60.00)	Ranjana	2 (100.00)	28 (70.00)
		Malchira	8 (50.00)	Malchira	7 (41.18)	Malchira	1 (20.00)	Malchira	2 (100.00)	18 (45.00)
		Goyeswari	3 (18.75)	Goyeswari	1 (5.88)	Goyeswari	0 (0.00)	Goyeswari	0 (0.00)	4 (10.00)
		Phulpakhri	3 (18.75)	Phulpakhri	2 (11.76)	Phulpakhri	0 (0.00)	Phulpakhri	0 (0.00)	5 (12.50)
		Basmati	1 (6.25)	Basmati	2 (11.76)	Basmati	0 (0.00)	Basmati	0 (0.00)	3 (7.50)
		Kola Joha	1 (6.25)	Kola Joha	0 (0.00)	Kola Joha	0 (0.00)	Kola Joha	0 (0.00)	1 (2.50)

| | Total | | 16
(100.00) | | 17
(100.00) | | 5
(100.00) | | 2
(100.00) | 40 |

Figure within brackets indicate percentage to the total

Table 4: Major Winter rice varieties grown in the study area and number of farmer

ADO Circles	Situation	Farmers' categories								Total of all farmers
		Marginal		Small		Semi medium		Medium		
		Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	
Bilasipara	Flood affected area	Ranjit sub1	8 (42.11)	Ranjit sub1	10 (83.33)	Ranjit sub1	5 (83.33)	Ranjit sub1	1 (33.33)	24 (60.00)
		Bahadur Sub 1	4 (21.05)	Bahadur Sub 1	6 (50.00)	Bahadur Sub 1	2 (33.33)	Bahadur Sub 1	0 (0.00)	12 (30.00)
		Prafulla	1 (5.26)	Prafulla	2 (16.67)	Prafulla	0 (0.00)	Prafulla	0 (0.00)	3 (7.50)
		Gitesh	1 (5.26)	Gitesh	2 (16.67)	Gitesh	0 (0.00)	Gitesh	0 (0.00)	3 (7.50)
		Swarna Sub 1	8 (42.11)	Swarna Sub 1	6 (50.00)	Swarna Sub 1	1 (16.67)	Swarna Sub 1	2 (66.67)	17 (42.50)
		BinaDhan 11	0 (0.00)	BinaDhan 11	2 (16.67)	BinaDhan 11	1 (16.67)	BinaDhan 11	1 (33.33)	4 (10.00)
	Flood free area	Ranjit	11 (5.89)	Ranjit	11 (91.67)	Ranjit	6 (100.00)	Ranjit	3 (100.00)	31 (77.50)
		Bahadur	3 (15.79)	Bahadur	6 (50.00)	Bahadur	4 (66.67)	Bahadur	1 (33.33)	14 (35.00)
		Mahsuri	4 (21.05)	Mahsuri	5 (41.67)	Mahsuri	0 (0.00)	Mahsuri	0 (0.00)	9 (22.50)
		Yamuna	13 (68.42)	Yamuna	12 (100.00)	Yamuna	5 (83.33)	Yamuna	3 (100.00)	33 (82.50)
		Ranjana	16 (84.21)	Ranjana	12 (100.00)	Ranjana	6 (100.00)	Ranjana	3 (100.00)	37 (92.50)
		Malchira	2 (10.53)	Malchira	8 (66.67)	Malchira	5 (83.33)	Malchira	3 (100.00)	18 (45.00)
		Goyeswari	2 (10.53)	Goyeswari	5 (41.67)	Goyeswari	3 (50.00)	Goyeswari	3 (100.00)	13 (32.50)
		Phulpakhrri	5 (26.32)	Phulpakhrri	2 (16.6)	Phulpakhrri	2 (33.33)	Phulpakhrri	1 (33.33)	10 (25.00)
		Basmati	0	Basmati	1	Basmati	1	Basmati	1	3

		(0.00)		(8.33)		(16.6)		(33.33)	(7.50)
	Kola Joha	0 (0.00)	Kola Joha	1 (8.33)	Kola Joha	0 (0.00)	Kola Joha	0 (0.00)	1 (2.50)
	Total	**19 (100.00)**		**12 (100.00)**		**6 (100.00)**		**3 (100.00)**	**40**

Figure within brackets indicate percentage to the total

Table 5: Major Winter rice varieties grown in the study area and number of farmer

ADO Circles	Situation	Farmers' categories								Total of all farmers
		Marginal		Small		Semi medium		Medium		
		Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	Varieties	No. of farmer	
Raniganj	Flood affected area	Ranjit sub1	13 (65.00)	Ranjit sub1	12 (80.00)	Ranjit sub1	2 (66.67)	Ranjit sub1	1 (50.00)	28 (70.00)
		Bahadur Sub 1	8 (40.00)	Bahadur Sub 1	6 (40.00)	Bahadur Sub 1	1 (33.33)	Bahadur Sub 1	1 (50.00)	16 (40.00)
		Prafulla	0 (0.00)	Prafulla	2 (13.33)	Prafulla	0 (0.00)	Prafulla	0 (0.00)	2 (5.00)
		Gitesh	0 (0.00)	Gitesh	3 (20.00)	Gitesh	0 (0.00)	Gitesh	1 (50.00)	4 (10.00)
		Swarna Sub 1	5 (25.00)	Swarna Sub 1	10 (66.6)	Swarna Sub 1	0 (0.00)	Swarna Sub 1	0 (0.00)	15 (37.50)
		BinaDhan 11	0 (0.00)	BinaDhan 11	4 (26.6)	BinaDhan 11	2 (66.67)	BinaDhan 11	0 (0.00)	6 (15.00)
	Flood free area	Ranjit	16 (80.00)	Ranjit	15 (100.00)	Ranjit	3 (100.00)	Ranjit	2 (100.00)	36 (90.00)
		Bahadur	3 (15.00)	Bahadur	2 (13.33)	Bahadur	0 (0.00)	Bahadur	0 (0.00)	5 (12.50)
		Mahsuri	6 (30.00)	Mahsuri	2 (13.33)	Mahsuri	2 (66.67)	Mahsuri	0 (0.00)	10 (25.00)
		Ketekijoha	0 (0.00)	Ketekijoha	0 (0.00)	Ketekijoha	1 (33.33)	Ketekijoha	0 (0.00)	1 (2.50)
		Yamuna	12 (60.00)	Yamuna	3 (20.00)	Yamuna	2 (66.67)	Yamuna	2 (100.00)	19 (47.50)
		Ranjana	15 (5.00)	Ranjana	5 (33.33)	Ranjana	3 (100.00)	Ranjana	2 (100.00)	25 (62.50)
		Phulpakhri	0	Phulpakhri	0	Phulpakhri	0	Phulpakhri	2	2

| | | | (0.00) | | (0.00) | | (0.00) | | (100.00) | (5.00) |
| | **Total** | | **20** **(100.00)** | | **15** **(100.00)** | | **3** **(100.00)** | | **2** **(100.00)** | **40** **(100.00)** |

Figure within brackets indicate percentage to the total

Factors responsible for adoption of AAU rice varieties

There are a number of factors responsible for adoption of AAU rice varieties. Some of the important factors were availability of seeds, area (ha) under cultivation, educational qualification of farmers, productivity of the varieties, type of seeds used, occurrence of flood, availability of high yielding rice varieties developed by other states, and extension service facilities (Table 6). Out of these factors, all factors had shown positive relationship with the adoption of the varieties developed by AAU except the factor availability of high yielding rice varieties developed by neighbouring states. The factors availability of seeds and extension service facilities were found significant at 0.01 probability level. Thus, it suggests that with the increase in availability of seeds and extension service facilities, there is more adoption of AAU recommended rice varieties. Similar result was reported by Ghimire*et al.* (1915)[12] for the factor availability of seeds and Adesina*et al.* (1993)[8] for the factor extension service facilities. The factors like area (ha) under cultivation and occurrence of flood were found significant at 0.05 probability level. It suggests that with the increase in area (ha) under cultivation and occurrence of flood, there is more adoption of AAU rice varieties. The variable availability of high yielding rice varieties developed by other neighbouring states was significant at 0.01 level but it was negatively significant. Thus, it could be said that with the increase in availability of high yielding rice varieties developed by other neighbouring states, the adoption AAU rice varieties would be decreased. This was a very serious problem in regards to adoption of AAU rice varieties in Dhubri district because, the district located in the interstate boundary lines with West Bengal and international boundary line with Bangladesh. So, their high yielding varieties of rice and other crops are easily accessible to the farmers of the district.

The R-square was calculated as 0.916 and this suggested that 91.6 per cent of the variation in adoption of AAU rice varieties is attributed to the variables.

Table 6: Factors responsible for adoption of AAU rice varieties:

Relationships between the dependent and independent variables

(Dependent variable: Adoption of AAU major rice varieties)

Variables	Coefficients	Standard Error
Intercept	2.638	0.426
Availability of seeds (X1)	0.663*	0.059

Area (ha) under cultivation (X2)	0.436	0.331
Educational qualification of farmers (X3)	0.418**	0.034
Productivity of the varieties (X4)	0.221	0.045
Type of seeds used (X5)	0.014	0.026
Occurrence of flood (X6)	0.446**	0.154
Availability of high yielding rice varieties developed by other states (X7)	- 0.681*	0.045
Extension service facilities (X8)	0.851*	0.143
	$R^2 = 0.916$	

* 0.01 significant, ** 0.05 significant

availability of labour, size of farm, availability of extension service facilities, market demand of the variety, credit facilities and gender orientation

CONCLUSION

Dhubri is an agriculturally developed district. Farmers in the district mostly grow both winter as well as summer rice. From the study, it has been observed that though a good number of rice varieties were developed by Assam Agricultural University, Jorhat yet owing to some problems like distance, improper extension mechanism, non-availability of seeds, ignorance of the farmers, lack of motivation to the farmers, all the varieties could not reach the farmers field. To overcome these problems it is necessary to make some policies so that it can be made available to the farmers.

REFERENCE
1. Statista Research Department, September 11, 2021
2. Statistical Hand Book Assam 2020
3. Barah BC, Betne R, Bhowmick BC. Status of rice production system in Assam-A Research Perspective.In:Prioritization of Strategies for Agricultural Development in North-East India. Barah, B.C. (ed.). Proceedings No. 9, National Centre for Agricultural Economics and Policy Research (ICAR), NEW DELHI, INDIA; 2001
4. District Agriculture Office, Dhubri, Assam

5. Chang TT. The impact of rice in human civilization and population expansion. Interdisciplinary Sci. Rev. 1987;12(63): 9.

6. Singh RB. Research and development strategies for increased and sustained production of rice in Asia and the pacific. FAO/RAP Publication No.1992/17; 1992

7. Adesina AA, Seidi S. Farmers' perceptions and adoption of new agricultural technology: Analysis of modern mangrove rice varieties in Guinea-Bissau. Quart. J. Internat. Agric. 1995;34(4) 358-371.

8. Adesina AA, Zinnah MM. Impact of modern mangrove swamp rice varieties in West Africa: Sierra Leone and Guinea. Internat. Rice Res. Notes. 1993;18(4): 36.

9. Press Information Bureau, Government of India, Ministry of Agriculture and Farmers Welfare.

10. Xaba BG. Factors Affecting the Productivity and Profitability of Vegetables Production in Swaziland. Journal of Agricultural Studies. 2013;1(2): 3-52.

11. Goswami B, Ziauddin G, Datta SN. Adoption behaviour of fish farmers in relation to scientific fish culture practices in West Bengal. Indian Res. J. Extn. Edu. 2010;10(1):24-28.

12. Ghimire R, Wen-chi H, Shrestha RB.. Factors Affecting Adoption of Improved Rice Varieties among Rural Farm Households in Central Nepal. Rice Science. 1015; 22(1):35-43.