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A Comprehensive Appraisal of the Farming Scenario in Riverine Areas of Lower Assam, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The present investigation was undertaken to study the comprehensive appraisal of the farming scenario of Riverine (*Char*) areas of lower Assam based on prevailing climatic parameters, soil properties, present cropping patterns and farmers socio-economic conditions. Three *Chars* of the district, *viz.*, Faujdar *Char*, Simlabari and Bamunpara Part IV were selected for the study. The study used a multistage purposive cum random sampling design. The average monthly temperature in the chars ranged from 18.9 to 28.6^{o}C, which was usually suitable for most crops like sali paddy, maize, chilli etc. The analysis of physics-chemical parameters of the soil reveals a predominance of sand and sandy loam texture. The available N, P and K contents ranged from 84.2 to 108.5, 38.6 to 42.3 and 127.9 to 152.6 kg/ha, respectively. The average yield efficiency percentages were observed highest (320.21%) in potato. The per cent pest infestation was recorded as15-25% for almost all the crops studied.

Keywords: Char; cropping pattern; insect; questionnaire.

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1. INTRODUCTION

The riverbed of the Brahmaputra is dotted with a number of riverine areas (*Chars*) all along its length in the plains of Assam. These *Chars* are formed by the suspended materials brought from the catchment areas of the rivers on account of any obstruction in the course of the rivers. Out of 3.61 lakh ha of *Char* area, an arable area of 2.42 lakh ha is supporting a large population of the farming community [1] around 2,300 villages [2]. Economic backwardness limits *Char* dwellers' livelihood options. The income opportunities of farmers are severely restricted by recurring floods and erosion [3]. As per a report [2], the Dhubri district encompasses 480 numbers of villages in the *Char* areas covering an area of 64,767 hectare. The socio-economic backwardness is a matter of serious concern in the *Char* areas. For the majority of the *Char* dwellers, agriculture is the primary source of livelihood [4]. Identification and quantification of socio-economic factors inhibiting the growth and development of *Char* farmers can pave the way to eradicate the problems of *Char* people.

Most of the *Chars* are made up of alluvial deposits, mostly silt and sand. The wide variation in physical and natural features, combined with the natural fertility of the alluvial deposits, facilitates the cultivation of a wide variety of rabi and summer crops [5]. The ease of tillage operations in the *Char* land assists farmers to take up various crops [6,7].

In the Char area, a study was conducted to determine the suitability and performance of several crops. To increase its agricultural productivity, considering the immediate and future opportunities of these lands, an evaluation was attempted to study the suitability and performance of various crop. An attempt has also been made to prepare an appropriate cropping plan for further enhancement in crop productivity in the study area.

2. RESEARCH DESIGN AND METHODOLOGY

2.1 Selection of the Study Area

A preliminary survey cum Participatory Rural Appraisal (PRA) programme was carried out in 2021 in three villages of Dhubri district, *viz*., Faujdar *Char*, Simlabari and Bamunpara Part IV (Fig. 1). The study used a multistage purposive cum random sampling design.

2.2 Period of Study

Necessary information was collected based on a survey using a standard questionnaire during the first quarter of 2021 through multiple visits to the study area.

Secondary data from various sources *viz.,* District Agricultural Office, Dept. of Economics and Statistics, Assam Agricultural University, Jorhat are used to corroborate demography, land tenure system, crop activity, land use and cropping pattern, farming system and price of inputs and outputs, the maximum and minimum area under certain crops, net benefit and cost benefit analysis. The average yield efficiency percentage (AYEP) was calculated as:

$$AYEP = \frac{\text{Average crop yield per ha in the given area}}{\text{Mean crop yield per ha in the state}} \times 100$$

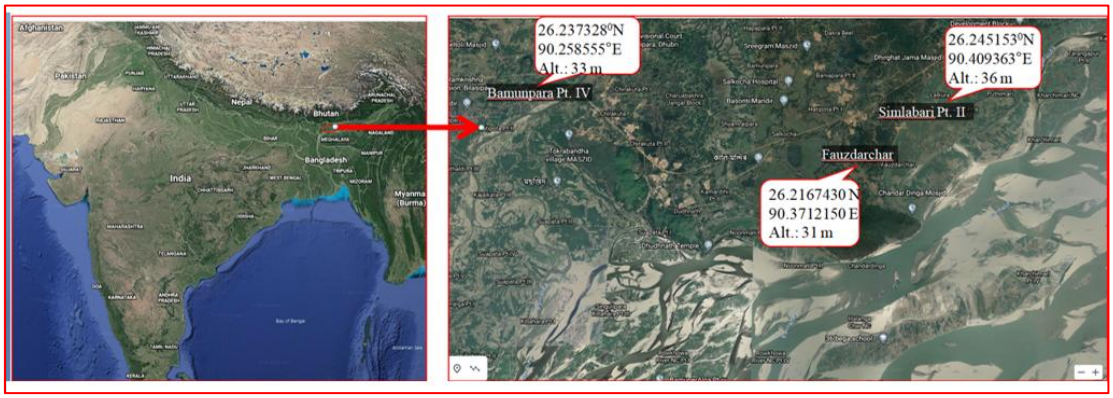

Fig. 1. Location of the study areas with GPS coordinates

Chart 1. Coordinates of the survey area

Sl. No.	Village	GPS Coordinates		
		Longitude	Latitude	Altitude
1.	Faujdar *Char*	26.2167430 N	90.3712150 E	31 m
2.	Bamunpara part IV	26.237328^{0}N	90.258555°E	33 m
3.	Simlabari	26.245153^{0}N	90.409363°E	36 m

Soil samples (0- 15 cm) were collected from different *Char* areas under the study and analysed. Particle size distribution, soil reaction, organic carbon, and available N, P and K were estimated following standard methods.

3. RESULTS AND DISCUSSION

3.1 Climate

On an average, annual rainfall in the *Char* areas is 1,856 mm. The monsoon, pre-monsoon, post-monsoon, and winter seasons account for 63.19, 26.38, 6.95, and 3.48 percent of annual rainfall, respectively. Rainfall is intermittent and inconsistent during the months of November to February (Fig. 2). The rain that falls on occasion during this time helps to repair soil moisture shortage. However, depending on the time and strength of the rain, standing rabi crops may be harmed. The average monthly temperatures in the chars range from 18.9 to 28.6 ^{o}C, which is ideal for the most crops.

Rice is a thermal sensitive crop with a temperature suitable for growth varying by the growth phase of the crop [8]. The day temperature upto 35^{o}C and night temperature of upto 25^{o}C are suitable for rice growth during the sali paddy growing period. At tillering, the crop requires a higher temperature than in other stages of its growth. The crop requires 26.50-29.50^{o}C for flowering. At ripening rice requires 20-25^{o}C. Rice performs very well in areas receiving average annual rainfall of 1000-1500 mm or more. The prevailing weather conditions at the visited chars were well within the suitable ranges for *sali* paddy.

Chilli thrives in temperatures ranging from 18 to 27^{o}C during the day and 15 to18^{o}C during the night [9]. Above this range, a warmer night temperature triggers flowering. The weather condition during the chilli growing winter months is congenial in the *Char* areas of Dhubri. Well aerated and well drained soil condition of the visited *Char* areas also supports proper growth, flowering and fruiting of chillies.

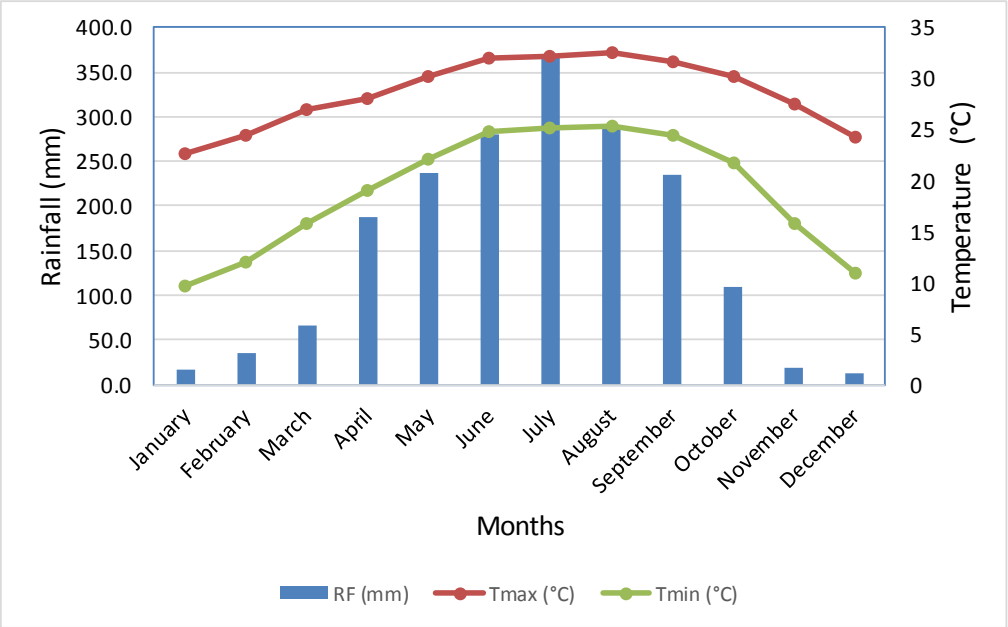

Fig. 2. Weather parameters prevalent in *Char* areas [average of ten years (2012 – 21)]

Maize seeds grow best at temperatures between 18 and 20 ^{o}C [9]. As long as there is enough water accessible to the plant, the crop can withstand hot and dry weather. During the vegetative and ripening stages, it is also relatively tolerant of water shortages. Except for very sandy soil, maize grows well on most soils. The favourable agro-ecological conditions in Char support excellent crop growth of maize. Jute is a tropical crop that thrives in a wide range of climates. Its ideal temperature range is 18-33^{o}C. The crop is mostly self-pollinated and requires long daylight for its growth. It grows very well in areas having an annual rainfall of 1,500 mm or more, with the occurrence of at least 250 mm of rainfall in each of the months of March, April and May [10].

3.2 Soil Characteristics

The soils in the study areas have a layered sandy and silty deposit with uneven relief. Soils are formed by a variety of environmental factors such as vegetation, relief, drainage, and sedimentation age, all of which combine to produce varied patterns of soil fertility, crop adaptability, land use, and agronomic techniques.

The soil samples were collected during our field visits from the Fauzdar, Bamumparapart IV and Simlabari *char*s. The physio-chemical parameters of the soils of the three *Chars* under study (Table 1) indicated that soils contain sand in a large proportion and the texture varied from sand to loamy sand. Meager quantities of the organic matter (0.38 to 0.51%) in the areas can be attributed to the recent deposit of sand in the top layer. By and large, the nutrient status of the soils was found to be medium to high (Table 2).

The available N, P, and K concentrations ranged from 84.2 to 108.5 kg/ha, 38.6 to 42.3 kg/ha, and 127.9 to 152.6 kg/ha, respectively. These soils are usually suited for a wide range of crops. *Char* soil is usually productive because blue-green algae and microorganisms fix nitrogen in the soil after seasonal flooding. The addition of organic matter and nutrients from decomposed plants and wildlife benefits the flooding as well. The seasonal variation in aerobic and anaerobic soil conditions also increases the availability of phosphorus and perhaps potash to plants [11].

3.3 Production Status of Various Crops

The yield performance of summer rice (6600 kg/ha) is superior in the study area compared to sali rice (5400 kg/ha) owing to favourable prevalent weather conditions during the summer season. It is observed that the average yield efficiency of summer and *sali* rice are 254.53 and 250.00 per cent, respectively compared to the state average (Table 3). Among various pulses grown in *Char* areas, blackgram exhibits great promise with 175.59 AYEP. In the case of oilseed crops, the AYEP of rapeseed, lentil, niger and sesamum are 194.49, 117.80, 161.29 and 84.51, respectively. Jute is a popular crop among the farmers and performs reasonably well in the *Char* areas with an AYEP of 162.31. The performance of potatoes (AYEP: 320.21) is very encouraging and suitable soil and climatic conditions might be attributed to such higher yield in the study area. Chilli, though cultivated extensively by the *Char* dwellers and resulted in better yield compared to the state average (AYEP: 146.99), the incidence of pests and diseases are of major concern for realizing the potential yield.

Table 1. Physical and chemical characteristics of soil

Location	Colour	Sand	Silt	Clay	Texture	pH	OC (%)
Faujdar *Char*	10YR7/1	85.8	10.7	3.5	Loamy sand	6.7	0.48
Bamunpara part IV	10YR7/1	78.6	12.5	8.9	Loamy sand	6.8	0.51
Simlabari	10YR6/1	92.4	3.5	4.1	Sand	6.5	0.38

Table 2. Nutrient status of the soil

Location	Available N (kg/ha)	Available P (kg/ha)	Available K (kg/ha)
Faujdar *Char*	108.5	38.6	134.4
Bamunpara part IV	122.7	42.3	152.6
Simlabari	84.2	40.5	127.9

Table 3. Average yield efficiency percentage of major crops

Crops	Av. yield in the study area(kg/ha)	Av. yield in State (kg/ha)	Av. yield efficiency percentage (AYEP)
Sali rice	5400	2160	250.00
Summer rice	6600	2593	254.53
Rapeseed	1200	617	194.49
Back gram	1050	598	175.59
Green gram	900	753	119.52
Lentil	900	764	117.80
Niger	900	558	161.29
Sesamum	600	710	84.51
Jute	3600	2218	162.31
Potato	24000	7495	320.21
Chilli (green)	1439	979	146.99

3.4 Recommended Land Use Pattern

The major determinants of crops and cropping system in the *Char* areas are soil and climate as well as food security, market pricing and local farming practice. *Rabi, summer*, and *Kharif* are the three cropping seasons that overlap in the Char-areas under investigation. The rabi season is normally free of floods, although the later half of the summer and the beginning of the kharif seasons coincide with floods. The crops farmed in the Char areas include chilli, maize, jute, rice, peanut, wheat, millets, oilseeds, onion, garlic, sugarcane, peas, and pulses. The crops are more diverse during the rabi season due to the favorable weather conditions.

Rice is a common crop in every *Char*. *Sali* rice is cultivated by the farmers in medium and in spite of the great risk of flood damage, as the monsoon ensures the water requirement of the crop without irrigation. *Boro* rice (Summer paddy) is also common in all the *chars* under the study. *Ahu* rice (pre-monsoon season) is also grown in most of the *chars*. Hybrid maize cultivation is also found in all the *chars* under the study. In most of the *chars* of the Dhubri district, Jute is the single most dominant crop in the summer season. Sesame is grown in the pre-monsoon (April-June) season in the *char* areas under the study. Though pumpkin is more popular, different kinds of vegetables are also grown. Onion, chilli, and mustard are traditionally cultivated in chars during the *rabi* season (dry period). The spices like chilli, black cumin and coriander are also cultivated extensively. Lathyrus, cowpea, soybean and watermelon are also cultivated in the study area to a limited extent.

The prevailing cropping pattern, however, varies from area to area in the *Char*. Several cropping patterns are followed in every *Char*. However, most of the patterns have at least one fallow season, though in a few patterns, two or three crops are also grown, especially in the medium high land. The number of crops in the *rabi* season (dry period; November - March) is much higher than that in summer (April-June) or *kharif* season. The suggested cropping patterns for the *Char* areas are as follows:

1. Direct seeded early summer rice (February to May) - transplanted late winter rice (August to November)
2. Summer vegetables (February to May) - transplanted late winter rice (August to November) - potato/pea (December to February)
3. Summer vegetables (February to May) - transplanted late winter rice (August to November) - groundnut/pea (December to February)
4. Summer rice/summer pulse (February to May) - fallow – potato/vegetables/toria/wheat/pea (December to February)
5. Groundnut/melons (February to May) – fallow – early pulse/vegetables (December to February)
6. Summer rice (February to June) – fallow – sweet potato (September to February)

Different cropping patterns may be suggested for the *Char* areas under the study based on soil suited to crops, socio economic conditions, length of growing period of crops, prevailing pattern of flooding, BC ratio, etc. Crop diversification relying on the introduction of new cultivars and adoption of locally adaptable agro-technologies may be suggested to address these issues. It is worth mentioning that, wheat is excluded as one of the major crops of the study

areas due to problems associated with threshing, storage, pre-harvest sprouting, etc. Concurrently, late transplanted winter rice may be a viable alternative for such locations. To evade the flood, two crops before and after its occurrence could be suggested. Moreover, the choice of the crop is mainly driven by the market demand, soil types, and available resources at the disposal of the farmers. It is expected that implementations of the suggested cropping pattern would enhance the productivity of crops in the areas under study.

3.5 Major Insect Pests

Pests and disease were highlighted as threats to agricultural production and storage by farmers, input dealers, extension personnel, and NGO staff across all the chars.

The weather has an impact on the occurrence of pests and diseases in the fields. Pests and diseases become more prevalent during cold, foggy, hot, and seasonal weather changes. Pest and disease incidences are influenced by the quality of seed, its processing/treatment before sowing, the preceding monsoon's flood, and the soil condition.

Maize and jute are less affected than chilli. Plant, stem and root rotting, turning of plant and root into yellow color, leaf curl, turning of leaf into white color, formation of root nodule, and cutting of roots and plant bases are some of the pest- and disease-related hazards for chilli. Among the major pests and diseases for chilli, cutworm, aphid, thrips, mite, leaf curl virus and anthracnose are common.

Table 4. Major insect pests with per cent infestation

Crop	Major insect pests	% infestation
Sali rice	Yellow stem borer	20-25
	Leaf folder	20-23
	Case worm	15-18
	Gundhi bug	30-35
	Whorl maggot	15-20
Summer rice	Yellow stem borer	15-20
	Leaf folder	15-22
	Case worm	12-15
	Gundhi bug	25-30
Rapeseed	Aphids	30-35
	Saw fly	15-20
Back gram	Aphids	20-25
	Pod borer	15-20
Green gram	Aphids	20-25
	Pod borer	18-20
Potato	Cut worm	15-20
	Red ant	20-25
	Mole cricket	20-25
Jute	Bihar hairy caterpillar	15-20
Tomato	Fruit borer	25-30
	Aphids	15-20
	White fly	15-20
Okra	Jassids	20-25
	White fly	15-20
	Fruit borer	15-25
Brinjal	Shoot and fruit borer	20-25
Chilli	White fly	15-20
	Fruit borer	20-25
Cole crops	Cut worm	15-20
	Diamond back moth	10-15
	Aphids	15-20
Maize	Cut worm	15-20
	Maize borer	20-25

(Data represents the average of three Char villages)

Different pests and diseases like cutworm stem borer, aphid, and leaf blight damage maize crop at the early growth stage, while hairy caterpillar, semi-looper, and stem rotting affect jute at the mid-stage. Insects and rodents also destroy the stored chilli and jute.

The major insect pests along with percent infestation in all the surveyed *Char* villages of the district are depicted in Table 4. From the investigation it was recorded that in all the crops pest infestation was recorded as15-25%. Simple random sampling was used to obtain data in all of the crop fields. Pesticides are used by the majority of farmers to control pests.

4. CONCLUSION

In view of the findings of the present study, some tangible measures may be adopted focusing on the areas of soil testing, IPM, capacity building, infrastructure facilities, etc in the *Char* areas of the district. Multiple cropping and intercropping should be actively encouraged. Mobilization of institutional support for the creation of permanent assets, assured and timely availability of critical inputs, market linkage, credit facilities, etc is the need of the hour. It is expected that the socioeconomic standard of the farmers in the study area can be uplifted with the introduction of modern technologies and other amenities in conjunction with the recommendations provided. However, further investigations encompassing a larger study area with higher numbers of parameters concerning the socioeconomic status of the community may be advocated.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. GoA. Economic Survey of Assam. Directorate of Economics and Statistics, Govt. of Assam; 2018.
2. GoA. Assam Human Development Report. Govt. of Assam, Guwahati, Assam; 2016.
3. Chakraborty G. The 'Ubiquitous' Bangladeshis. Econ. Pol. Weekly. 2012;47(38):21-23.
4. Nath RK, Sarma B, Choudhury M, Ahmed P, Upamanya GK, Khayer SM, Rahman M, Sarma GK, Ahmed FA, Sarma R. Socio Economic Status of Farming Community of Char Area of Dhubri District, Assam. Asian J. Agril. Ext. Econ. Sociol. 2021;39(9):14-20.
5. Talukder MC, Goswami GK, Basumatary A, Das AK. Crop suitability for Char areas of Nalbari district, Assam. Agropedology. 2009;19 (1):41-46.
6. Borkakati K, Talukdar MC, Choudhary AK, Hazarika GN, Bamah UC, Vadivelu S. Sand deposition by floods in Dhemaji district of Assam, submitted to the Commissioner, Agriculture, Govt. of Assam; 1999.
7. Vadivelu S, Baruah U, Bhaskar BP, Thampi J, Sarkar D, Butte PS. Evaluation of soil-site suitability to rice-baesd cropping system in the river island of Majuli, Assam. J. Ind. Soc. Soil Sc. 2005; 53:35- 40.
8. Wassman R, Jagadish SVK, Sumfleth K, Pathak H, Howell G, Ismail A, Serraj R, Edona E, Singh RK, Heuer S. Regional vulnerability of climate change impacts on Asian rice production and scope for adaptation. Adv. Agron. 2009;102: 91-133.
9. Doorenbos J, Kassam AH. Yield response to water. FAO Irrigation and Drainage. 33, Rome; 1979.
10. Banglapaedia Banglapaedia-the national encyclopaedia of Bangladesh. Asiatic Society of Bangladesh, Dhaka; 2006.
11. Brammer, H Agro-ecological aspects of agricultural research in Bangladesh. The University Press Limited, Dhaka; 2000.

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