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Variability of Cropping Practices in Dolokhat Village of Lakhimpur District, Assam

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Abstract

The rural areas of the Brahmaputra valley being endowed with numerous rivers and wetlands and composed basically of fertile alluvial soils create congenial conditions for the development of the agricultural sector. With the inception of human civilization in the valley, people gradually learned the art of tilling their lands using traditional tools and methods. Thus, the traditional agricultural system prevailed in the valley and people earned their bread using this method. However, as soon as the wave of agricultural modernization penetrated into the valley's rural areas, it has altered the cropping practices and its impact on the socio-economic as well as the ecological aspects of the village. The degradation of the socio-economic, as well as the ecological conditions of the village, has altered the valleys' natural landscape creating various problems, mainly rural depopulation and agricultural land abandonment. This paper, therefore, attempts to study various methods, techniques, inputs, and implements involved in cropping practices that were operated before the 1990s and post-1990s influencing the production pattern of Dolokhat village located in Lakhimpur district of Assam. The study is carried out mainly through primary surveys using the stratified random sampling method.

Keywords: alluvium, cropping practices, agricultural modernization, production.

1. Introduction

Agriculture has been playing an important role in the economy of the Brahmaputra valley (Sharma, 2011) forming the main source of livelihoods of the rural people since the dawn of civilization. The traditional peasant farmers have been practicing subsistence agriculture using nature and its resources until the green revolution penetrated into the valley (Bhagabati and Dutta, 2001). Endowed with rich fertile alluvium carried chiefly by the river Brahmaputra, the riverine plains of Assam has also been enriched in terms of the agricultural sector involving two

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Vol-8-Issue-10-October-2019

main cropping seasons namely rabi and kharif accompanied by the monsoonal rainfall. However, with the advent of agricultural modernization in the 1980s, the overall scenario of agriculture in the Brahmaputra valley of Assam got diversified into different facets from highly sustainable to commercialized ones. The traditional way of cultivating the crops got replaced by modern tools, inputs, and implements. Such modern methods, inputs, and implements have altered the traditional rural land use patterns and practices in the valley (Deka *et. al*., 2011).

Noteworthy that, rural depopulation in the villages of the Brahmaputra valley has highly influenced and affected people's participation in the agricultural sector. It has now emerged as a global issue since a larger proportion of the workforce has transformed and started engaging themselves in secondary and tertiary activities in their nearby urban centers. Like other villages of the valley, the villages of Lakhimpur district in the northern bank plain of the river Brahmaputra has also been facing similar problems. The present work, therefore, aims to study the differential cropping practices existing in the Dolokhat village of Lakhimpur district in Assam. It has been observed that, though modern inputs have been utilized extensively yet the production of crops has not risen to a greater extent but has accelerated various health-related problems such as rheumatic pain, hair loss, skin problems, etc. that need to be addressed at the earliest. However, The people of Dolokhat largely depends on the cultivation of winter rice (s*ali dhan*) and autumn rice (*ahu dhan*). Cultivation of *bao* rice has been decreasing substantially as large tracts of the low plain are annually ravaged by the river Singra. This paper might be a basis for planners, academicians, policy-makers, ecologists, etc. for further in-depth research/study in this field so that the emerging problems get tackled.

2. Study Area

The present study has been carried out in Dolokhat village located under the jurisdiction of Naobaicha revenue circle of Lakhimpur district (**Fig.1**). The village is situated in the northern part of the river Brahmaputra and her latitudinal extension is from 27°11'09'' N to 27°09'47'' N and longitudinal extension is from 93°58'24'' E to 94°00'08'' E.The rivers Singra and Mora-Singra flow through the eastern and western part of the village respectively. The village has an average elevation of about 92.80 m from the mean sea level.

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

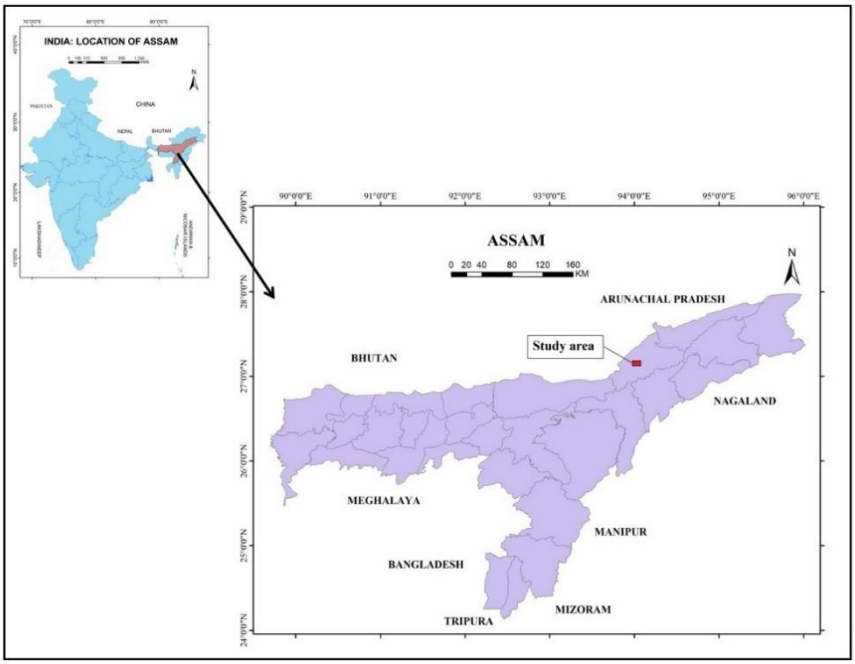

Fig. 1: Location of Dolokhat village

However, according to the Census report of 2011, the village has a total population of 2,114 settled in its area of about 4.56 square kilometers. People of different ethnic groups inhabit the village and communities like Assamese, Bengali, Nepali, *Adivasis*, *Goria*, etc.

3. Database and Methodology

The study is mainly based on the primary sources of data and information. The present status of cropping practices in the village and its changes throughout time have been studied mainly on the basis of primary data and information collected by surveying 127out of 406 households with the help of a well-designed questionnaire. While surveying the households, information on different land-holding sizes of the people, earlier agricultural production and its changes, changes in methods, techniques, inputs, and implements of cropping practices and status of farmers, etc. have been collected. Besides, participatory rural appraisal (PRA) methods, focus group discussion (FGDs) and oral interviews were also conducted among the people of different age-sex groups for understanding the nature and changes of cropping practices in the village Again, GPS survey was conducted to understand the slope and elevation pattern of the village. For surveying the households, the stratified random sampling method was used. Data and

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

information so collected have been processed and analyzed using Microsoft Word and Microsoft Excel. ArcGIS 10.9.2 has been used for preparing the map of the study area.

4. Results and Discussions

4.1.Present Status of Cropping Practices

The village, being located on the banks of the river Singra provides ample scope for practicing different crops owing to its soil fertility and water availability. At present, the village has a total agricultural land of 127.34 hectares on which varieties of rice, like winter rice (s*ali dhan*), autumn rice (*ahu dhan*), *bao* rice, vegetables, pulses, and spices are cultivated. Noteworthy that, the introduction of agricultural modernization techniques in the village has altered the overall farming scenario. Although the farmers of the village use tractors and power tillers to plough their lands, however, they still use water from the Singra river and the wetlands to irrigate their fields. Interestingly, the traditional method of tilling their lands with the help of oxen still holds an important place in the farming sector of the village. However, the present farmers use modern inputs like chemical fertilizers (nitrogen, potash, urea, phosphorus, pesticides, etc.), insecticides (Chlorpyriphos, Imidacloprid, Chlorpyriphos, etc.) and pesticides (Acephate, Alachlor, Cypermethrin, Mancozeb, etc.) to increase crop production.

Table 1: Size and distribution of sampled households' landholdings

Class Size (in ha)	Total agricultural land (in ha)	No. of households possessing lands
0 – 1	46.3 (29.49)	62 (44.44)
1 – 2	13.9 (8.85)	19 (16.24)
2 – 3	7.7 (4.90)	23 (19.66)
3 – 4	33.2 (21.15)	14 (11.97)
More than 4	55.9 (35.61)	9 (7.69)
Total	**157**	**127**

Source: Field survey, 2017-18; Note: Figures in the parentheses indicate the percentage to the total.

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

It has been found that most of the villagers have small agricultural landholdings of less than 1 hectare (**Table 1**) and on that limited land of theirs; they cultivate a number of crops making productive use of it. However, the agricultural landscape during summer is dominated by the cultivation of winter rice (*sali dhan*) while during winter, mustard cultivation dominates the agricultural land use in the village. Noteworthy that, winter rice is practiced on about 40 % of the village's total agricultural lands while *ahu* rice and *bao* rice is cultivated on 22.7% and 18% respectively. On the other hand, mustard, vegetables, and pulses are grown during winter because during this season rainfall becomes meager, so the farmers cultivate such crops, which do not require abundant water for their growth.

It is important to mention that the people of the village nowadays are not much inclined towards cultivating rice and other crops because they wanted to engage themselves as factory workers or in other businesses. Thus, the problem of depopulation has become a problem in the village. This is the only reason which has led to a decrease in the number of farmers in the village.

4.2.Changes in Cropping Practices

The wave of agricultural modernization in the Brahmaputra valley has brought a drastic change in the farming techniques (Deka and Bhagabati, 2010). The farmers of most villages situated along the valley have earlier adapted with the natural settings and adopted their indigenous methods and techniques for sustaining their livelihoods. Similarly, the agricultural practices in Dolokhat village have also undergone drastic changes in terms of its methods, techniques, cropping pattern, inputs, and implements. The changes in cropping practices have started in the village in the late 1990s and it has been more prominent since 2005. Earlier, the farmers plough and harrow their lands with the help of oxen but the power tillers and tractors have now replaced this activity. On the other hand, earlier the farmers used the water of the Singra river and other wetlands to irrigate their lands with the help of traditional tools and implements like *lahoti*, *xisoni*, etc. For this, the farmers dug out drains from the river through which the water can flow to their fields and help them in irrigating their fields. Thus, they have adopted indigenous ways and means to cultivate crops. However, at present, tube wells (TWs) diesel water pumps (DWPs) are mostly used to irrigate the agricultural fields. Noteworthy that,

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

some of the farmers still use the water of the wetlands to irrigate their lands but such farmers are very less in number

Fig. 2: Methods and inputs of cropping practices [A- Tilling lands with oxen, B-Tilling lands with power tiller, C-HYV rice, D-Local variety rice, E- Cow dung (manure) and F) Insecticide]

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

Again, as soon as the growing period of the crops starts, the farmers throw rinds of fruits and vegetables in their fields due to which the pests and insects refrain from destroying their crops as they consume the thrown rinds. Such activity is very common during the *Kati Bihu* (*Bihu* is the national festival of Assam and *Kati Bihu* is observed during mid-October), where the people use to throw *robab tenga* (*Citrus maxima*) in the fields to distract the pests and insects. However, the present farmers use pesticides and insecticides for the protection of crops. Again, the earlier farmers have used cow dung as the only manure in their fields for the growth of crops, but chemical fertilizers like nitrogen, urea, potash, phosphorus, etc. are now replacing such domestic inputs.

Table 2: Changes in cropping methods and inputs

Methods and inputs used					
Methods and inputs		**Before 1990s**	**Status of practicing**	**In 2018**	**Status of practicing**
Methods	Ploughing	With the help of oxen using traditional tools	100%	O,T, PT	O – 38.60% T – 28.20% PT- 33.20%
	Harrowing	With the help of oxen using traditional tools	100%	O, T	O - 42.72% T - 57.28 %
	Threshing	With the help of oxen using traditional tools	100%	O, Th	O - 51 % Th - 49 %
Inputs	Irrigation	Manually from the river Singra and other wetlands	100%	M, DWPs	M- 29.5% DWPs– 70.5%
	Seeds	Local seeds	100%	LS, H	LS- 36% H- 64%
	Crop protection measures	Rinds of fruits, wood ash, oil cakes, etc.	100%	I, P	I & P– 92.30% TM – 7.7%
	Manure	Cow dung	100%	F, CD	F - 70% CD – 30%

Source: Field survey, 2017-18; Note: O- Oxen, T- Tractors, PT- Power tillers, Th- Thresher, M- Manually, DWP- Diesel water pumps, LS- Local seeds, H- HYV seeds, I- Insecticides, P- Pesticides, TM- Traditional measures, F- Fertilizers, and CD- Cow dung.

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

Noteworthy that, the method of harvesting the crops has not changed over time even after the wave of agricultural modernization penetrated into the village as the farmers are still harvesting the crops manually. However, there has been a change in the method of threshing the harvested crops. Earlier, the farmers had to thresh the harvested crops with the help of a pair of oxen or more but now machines have replaced such manual labor. It is interesting to note though the threshers have been introduced in the village, the traditional method of threshing has not completely faded away.

Table 3:Trend of decrease in the number of farmers

Year	No. of farmers	Change in %
1990	57	-
2000	49	-14.03
2010	31	-36.73
2018	23	-25.80

Source: Field survey, 2017-18

It is important to mention that the number of farmers in the village has been decreasing drastically (**Table 3**) because people are no more inclined towards practicing agriculture as engaging in the service sector gives them much profit than agriculture. Therefore, the number of people engaged in both government and private sector services, businesses have increased in the village. Earlier, a farmer's sons usually become a farmer if not fully engaged,he still knew the methods and techniques of cropping practices. However, the people born after 1995 do not even know how to plough the fields.

Table 4: Changes in crop production

Crops	Area (in ha.) 2010	Area (in ha.) 2018	Change in area (in ha.)	Production (in quintals) 2010	Production (in quintals) 2018	Change in production (in quintals)
Sali	41.30	38.87	-2.43	1563.63	1733.25	+169.62
Ahu	23.20	22.23	-0.97	480.47	551.22	+70.75
Bao	25.81	17.57	-8.24	661.81	387.88	-273.93
Vegetables	16.03	19.23	+3.2	1476.23	953.44	-522.79
Black gram	25.08	12.22	-12.86	2.33	1.89	-0.44
Mustard	11.12	10.09	-1.03	1.12	0.88	-0.24
Ginger	6.55	5.07	-1.48	0.78	0.75	-0.03

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

Turmeric	12.28	8.33	-3.95	0.55	0.62	+0.07
Maize	25.09	16.04	-9.05	2.56	2.06	-0.5
Total	**186.46**	**149.65**	-36.81	**4189.48**	**3631.99**	-557.49

Source: Field survey, 2017-2018

It is important to mention that there has been a decrease in the total area of crop fields (**Table 4**) mainly because of the increasing human population and the concomitant growth of their settlements and riverbank erosion caused by the river Singra during floods. It has been observed that the production of *sali* and *ahu* rice have increased though there has been a decrease in their total cultivable area only because of using HYV seeds. It should be mentioned that the people of Dolokhat village do not prefer cultivating *bao* rice as it has low output from which the farmers do not gain much profit. Therefore, people have mainly chosen the low-lying *bao* rice fields to fill up with earth and build houses on them thus, *bao rice* fields are decreasing constantly. On the other hand, the lands on which the villagers usually cultivated vegetables, mustard and black gram have been eroded by the river which has posed to be the main reason behind the gradual decrease in their production. However, the excessive layer of sands deposited by the river during floods has also made the soil unsuitable for the growth of vegetables. Ginger and turmeric are usually cultivated by the locals on a small scale for self-consumption so their production varies each year.

5. Prospects

Since the village is transversed by the river Singra through the eastern part and Mora-Singra river flowing through the western part, thus, it provides ample scope for growing various crops. The fertile alluvium deposited by the floods every year supports the growth of rice and other food crops in the village. Noteworthy that since floods sweep off the village especially in May, June, and July, therefore agriculture cannot be practiced during those months. So, during the rest of the months, multiple cropping practices can be practiced so that the peasant farmers of the village can compensate for the loss of production during the rainy season. Thus, modification of the crop calendar with adjustments to floods can also reduce its impact on production loss during the floods (Bora, 2003). On the other hand, the traditional cropping practices which are purely organic in nature should be encouraged in the village so that people's good health can be maintained (Rankoana, 2017) on one hand and preserving the folk culture and traditions on the other. Besides, integrated farming and pisciculture, duck rearing, etc. can be practiced which will

ISSN: 2277-2995
Vol-8-Issue-10-October-2019

boost the rural economy (Deka, 2013). Duck rearing can be considered as one of the easiest activities that people in the village can practice since they keep on feeding themselves in the water of different types of wetlands. Therefore, along with rearing ducks, especially in the man-made ponds (locally called as *pukhuris*) pisciculture can be well practiced as the droppings of ducks are good sources of carbon, nitrogen, and phosphorus (Biswas, 2015) which helps in the natural growth of the fishes (Bhuyan, 2018). On the other hand, the focus should be put on the problem of rural depopulation since it has become a burning issue in rural areas across the globe which has urged the need to stabilize and solve the matter.

6. Conclusion

The above study discusses the present status and changes that have taken place in cropping practices in Dolokhat village located in Lakhimpur district. Agricultural practices in Dolokhat village has been practiced using traditional methods and techniques since the beginning of human settlements. However, with the changes over time, traditional methods, techniques, inputs and implements, and cropping pattern has substantially changed. Since traditional agricultural systems are both ecologically and economically adaptable and organic in nature (Deka and Bhagabati, 2010), therefore, the farmers should focus on traditional cropping practices (TCP). Noteworthy that, the present agricultural produces have caused many diseases in people like rheumatic pain, hair loss, skin diseases, and several others. It is very important to mention that the present farmers are not aware of the amount of chemical fertilizers, pesticides, insecticides, etc. that need to be applied to the agricultural fields, and hence when the inhabitants consume such produces, the question on maintaining stable and good health arise at this point. On the contrary, with the use of modern tools and implements, the traditional tools and implements are now rarely found in the village. Thus, the folk culture and tradition associated with it has been suffering a lot. Therefore, unless proper agricultural modernization is being implemented in the village, TCP should be followed at the earliest, which will not only ensure good human health but also help in the sustainable functioning of the village's ecosystem.

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ISSN: 2277-2995
Vol-8-Issue-10-October-2019

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