

Landholding Structure and Rural Land Use Pattern in the Brahmaputra Floodplain: A Comparative Study of Villages from Upper and Lower Assam

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Abstract

Landholding structure generally reflects the history of settlement, socio-cultural set-up, law of inheritance, economic condition and pattern of land ownership of the concerned areas. Land use pattern on the other hand, broadly manifests the traditional human responses to the ecological settings of the area and their changes in course of time. Therefore, to bring about any positive change in the agricultural practices, proper attention needs to be paid to the indigenous practices and experiences, which are intrinsically linked with the long-term sustainability of the associated agro-ecosystems. It is, however, disheartening to note that the indigenous system of rural land use pertaining to different ethnic communities in Assam has not been studied at the expected level.

This study is based on intensive field survey conducted in two selected villages- Muktapur in Kamrup district of lower Assam and Rangpuria in Lakhimpur district of upper Assam. Both the villages are located in the north bank floodplain of the Brahmaputra river. But, while Muktapur is inhabited by some non-tribal indigenous Assamese people, Rangpuria is inhabited by the Ahom community who are the descendants of the Ahom Kingdom of upper Assam. The size and distribution of landholdings in both the villages show notable variation in terms of fragmentation and scattering of plots which render inconvenience in implementing modern agricultural practices. Although there has been notable difference in historical and cultural backgrounds, the land use pattern in both the villages appears to be almost similar as the basic determinants are controlled by the Brahmaputra and its tributaries in both the contexts. The programmes for sustainable rural development, therefore, should pay proper attention to the indigenous land use systems evolved by the people in response to the natural environment.

Keywords: Land holding structure, land use, floodplain, rural development.

Introduction

Landholding structure exhibits certain characteristics of settlement, socio-cultural setup, economic condition, law of inheritance and pattern of land ownership of the concern area. Similarly land use also tells about the historical and socio-economic backgrounds of the people along

with the physiographic attributes, such as topography, soil and natural vegetation of the area. The process and pattern of land use broadly reflect the traditional human responses to the ecological settings of the area and their changes in course of time. The pattern of rural land use in any area is thus the result of long-continued effort of the

inhabitants to convert lands into agricultural and other productive uses.

In Assam, especially in the Brahmaputra valley, land has been reclaimed for agricultural use, mainly for paddy from time immemorial. In order to feed the growing population, efforts were made to expand the agricultural land as far as possible. Consequently cultivable waste land has become increasingly scarce in the Brahmaputra valley. It is therefore necessary to raise the productivity per unit area of the existing agricultural lands. Here lies the question of applying modern technology in agriculture. However, proper attention needs to be given to indigenous technology and experiences also, which are traditionally linked with the long-term sustainability of the associated agro-ecosystem.

Land use is one of the important components of human-environment relation that reflects peoples' indigenous perception and knowledge about the local environment. Fortunately there are some studies in Assam relating to its land use. Based on methodology followed, these studies may be broadly classified into three categories: quantitative study, study using GIS and remote sensing (RS) and field-based study. Das (2006) examined the pattern of land use change in Assam at district-level using quantitative method. Statistical data are useful to examine the variation and change of land use in a broad way, but as has been pointed out by Sharma (1990) the land use data published by the Government of Assam, especially those related to forest area are not fully reliable. GIS and RS are relatively new technologies which ensure systematic classification of land use of an area. Sharmah and Goswami (2001) examined the pattern

of land use change in the JiaDhansiri river basin by using topographical maps and LANDSAT images. Bhaskaret *al.* (2010) studied the nature of land use in the wetlands of the river island Majuliby using topographic maps and IRS-ID images. However, GIS and RS based studies at microlevel (village level) are very few as it is technically difficult to carry out such work. The works of Bhagabati and Das (1992) and Das (1992) provide good examples of such land use study. Bhagabati and Das (1992) examined the land use and land holding structure in six purposively selected villages from ecological perspectives. Das (1992) also studied the land use and land holding structure of 39 villages distributed in 8 districts of Assam. Deka and Bhagabati (2013) examined the pattern of land classification and utilization in the agro-climatic context of the Brahmaputra valley of Assam. These studies revealed the rural land use pattern of both indigenous and immigrant people at village level; however, the difference in land use pattern with respect to various castes and tribes is yet to be documented properly.

This study aims at revealing landholding structure and rural land use in two selected villages of upper and lower Assam through intensive field work. The differences in the land use practices between the villages inhabited by different population groups are also examined.

Study Area and Methodology

The villages under study are Muktapur in Kamrup district and Rangpuria in Lakhimpur district of Assam (Fig. 1). Muktapur village is inhabited by non-

tribal indigenous Assamese people with a total population of 2080 distributed in 408 households (in 2006). It is located in the north bank floodplain of the Lower Brahmaputra, about 35 km from Guwahati city and 40 km from the Bhutan Himalayan foothills. Muktapur village covers an area of 3.67 sq km with a population density of 567 persons per square kilometer. Out of the total working force of the village, nearly 80 per cent is directly associated with agriculture. The village consists of 11 *chuburis* (hamlets) inhabited by people belonging to different castes, such as Kalita, Brahmin, Ganak, Rajbongshi and Keot.

Rangpuria village on the other hand is inhabited by Ahom people who are descendants of the erstwhile Ahom Kingdom (1228-1826 AD). The total population of the village is 454 distributed in 96 households (in 2008). The village is located about 10

km away from North Lakhimpur town. Out of the 96 households in the village, 43 households are engaged in full-time farming, 47 households are in farming with some other jobs and 6 households are in non-farm activities. Both the villages are located in the northern floodplain of the Brahmaputra and as has been noted, the main occupation of the villagers is directly associated with agriculture. The people of both the villages are Hindus and they speak the language Assamese.

This study is mainly based on personal field experience and primary data collected from all the households of the villages through purposively designed schedules during 2006-2008. Necessary secondary data on land use, cropping pattern and practices, size of landholding etc. were collected from Revenue Circle Office, Census Office, Directorate of Agriculture, Government of Assam.



Fig 1: Location of Muktapur and Rangpuria village

A land use map for Muktapur village was prepared on the basis of the cadastral map (*dag* map) collected from the Revenue Office. The detailed land use map is prepared using participatory rural appraisal (PRA) method. *Dags* are basically the smallest land units of the village landscape that are usually demarcated by the village surveyors using some numbers. Land use map for Rangpuria village on the other hand was prepared using mobile GPS and personal field investigation.

Land use pattern

Muktapur village basically represents a flat alluvial plain with no any perceptible relief variation (Fig. 2). A very gentle slope from north to south broadly directs the surface run-off within the village. The villagers generally use their lands for various purposes in accordance with the local ecological conditions. In the case of rice, three different types are cultivated according to the natural water availability as well as soil condition. The land use pattern of the village shows extensive *ahu* rice fields covering its central part, while the HYV rice fields dominate in the eastern and western sides of the village. Extensive *sali* rice fields are on the other hand found in the eastern and south-western parts. The lands under double rice cropping mostly occur in the middle and southern parts of the village. Moreover, some small fragmented lands occupied by *ahu*, *sali* and HYV rice

are found scattered within the village. The grazing lands, seedling beds etc. are also seen to occur in a scattered manner. The houses (*ghars*) in Muktapur are raised in slightly high lands and are usually arranged in a linear pattern along the village roads. The houses such as *Borghar* (bed room), *Bahaghar* (drawing room), *Randhanighar* (kitchen), *Gohalighar* (cowshed), *Dhekishal* (grinding house), *Bharalghar* (granary) etc. built around the court yard bear different meanings and satisfy different purposes.

As usual, land use in the Rangpuria village is closely related to the topography (Fig. 3). The topography of the village and its surroundings is basically the result of fluvial processes of the Subansiri that originates in the Himalayas. There are gently sloped natural levees and back swamps within the village area which have contributed towards elevation variation. The back swamps are mostly used as paddy fields. The paddy fields are not flat; they slope gently and water stagnates for a long time in the lowest parts. *Sali* and *bao* rice are grown in the low-lying fields while *ahu* rice is grown in the higher fields. The natural levee is used for the development of homesteads and road. Within the homestead lands, residential houses, granaries and cowsheds are generally accommodated. Some households have ponds and vegetable gardens at the back of the residential houses.

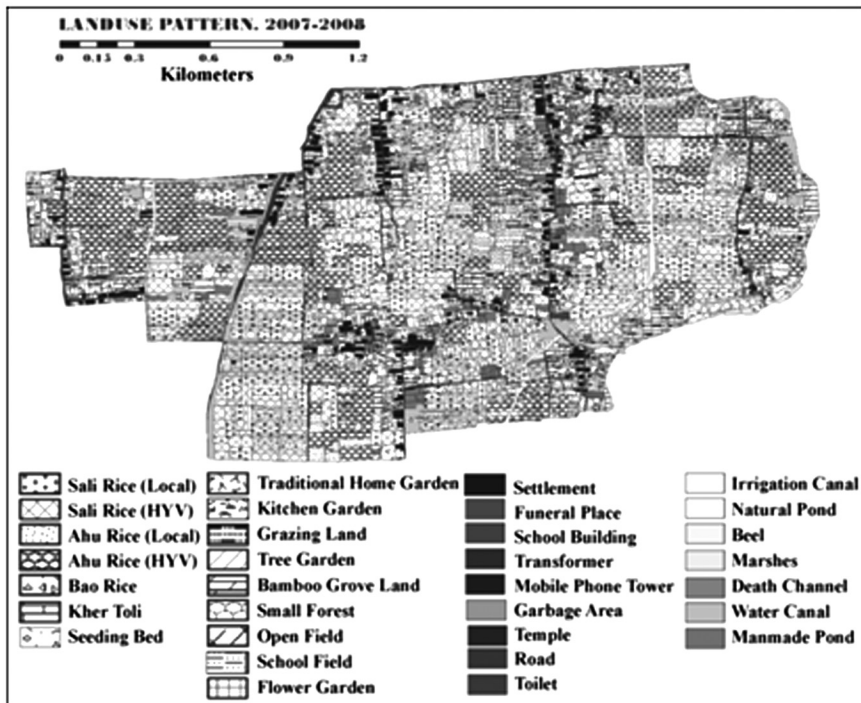


Fig. 2: Land use in Muktapur village



Fig. 3: Land use in Rangpuria village

In an Ahom village, normally the direction of buildings within the homestead is determined by the community tradition. The gate of the residential campus, cowsheds and ponds are to be located towards east or south of the homestead, while the bathrooms are built in the backside of the main house. In Rangpuria village, most of the households follow this tradition. Although the set-up and functions of different categories of land are found to differ slightly, the general land use pattern in both the villages is determined specifically by the local floodplain environment.

Landholding structure

The size of landholdings and number of plots are determined by the degree of fragmentation of holdings resulting from the law of inheritance, socio-economic set up, history of settlement and transfer of land ownership (Bhagabati and Das 1992). The average size of landholding in Muktapur

Table 1: Area under different landholding size classes

Size class (ha)	Muktapur village		Rangpuria village	
	Total land (in ha)	No. of households possessing land	Total land (in ha)	No. of households possessing land
Below 1	117.6 (40.8)	321 (79.0)	35.6 (34.0)	58 (61.1)
1 – 2	84.4 (29.3)	60 (15.0)	31.1 (29.9)	24 (25.3)
2 – 3	41.9 (14.6)	17 (4.0)	23.5 (22.6)	10 (10.5)
3 – 4	21.2 (7.4)	6 (1.0)	3.9 (3.7)	1 (1.1)
Above 4	23.2 (8.1)	4 (1.0)	10.1 (9.7)	2 (2.1)
Total	288.4	408	104.3	95

Note: Figures in the parentheses indicate the percentage to the total

Source: Field survey, 2006-2008.

village is 0.71 ha (Table 1). The highest proportion of land (40.79 %) is constituted by holdings of less than 1 ha size owned by 79 % of the total households of the village. Only 1 % of the households of the village own 8.05 % of land with the size above 4 ha. The total number of plots in the village is 2430, 34 % of which are of below 0.04 ha size (Table 2). These plots cover 4.22 % of the village's total area. The highest proportion of area (36.97 %) is distributed in 217 plots of above 0.28 ha size class.

Table 2: Area under different plot size classes

Size class (ha)	Muktapur village		Rangpuria village	
	No. of plots	Area (ha) under plots	No. of plots	Area (ha) under plots
Below 0.04	819 (34.0)	13.1 (4.2)	479 (40.0)	13.2 (15.9)
0.04 - 0.08	563 (23.0)	33.2 (10.7)	433 (36.2)	24 (28.8)
0.08 - 0.12	134 (6.0)	19.8 (6.4)	128 (10.7)	12.2 (14.7)
0.12 - 0.16	379 (16.0)	52.8 (17.1)	58 (4.9)	7.8 (9.4)
0.16 - 0.20	105 (4.0)	19.9 (6.5)	32 (2.7)	5.7 (6.9)
0.20 - 0.24	20 (1.0)	4.2 (1.4)	23 (1.9)	5.1 (6.1)
0.24 - 0.28	193 (8.0)	51 (16.8)	14 (1.2)	3.7 (4.4)
Above 0.28	217 (9.0)	114.4 (37.0)	28 (2.3)	11.5 (13.8)
Total	2430	309.43	1195	83.3

Note: Figures in the parentheses indicate the percentage to the total

Source: Field survey, 2006-2008.

In Rangpuria village, the average size of landholdings is 1.1 ha. As high as 61 % of the total households own landholdings below 1 ha size which account for 34 % of the total area of the village. Only 2 households own landholdings above 4 ha size. Marginal

farmers tend to go for sharecropping (*adhi*) in the lands owned by the large farmers. They also mortgage (*bandhaki*) land with the large farmers for cash. The total number of plots in Rangpuria village is 1195; 40 % of which are of below 0.04 ha size. These plots cover 15.9 % of the total village area. Only 2.3 % of the agricultural plots are of above 0.28 ha size.

The shape of the agricultural plot in both the villages is mostly rectangular extending from the natural levee to back swamp in the case of Rangpuria and from the dead channel and the village roads in the case of Muktapur (Fig. 4). This type of landholding system has some advantage from the perspective of risk dispersion and labour saving. In the years of

excess rainfall, rice in the low-lying fields is affected due to inundation, but good output is expected in the fields with slightly higher elevation. On the other hand, in the low rainfall years, the low-laying fields may have good output compared to the higher fields. Moreover, the timing of submergence differs from low to higher fields, which may have some bearing on the labour required for transplanting rice.

Although the background, area and population differ, the agricultural lands in both the villages are fragmented and scattered over space rendering inconvenience in performing modern agricultural practices.



Fig. 4: Field pattern in Rangpuria village

Land use change

The study of land use change at micro-level holds immense significance in planning for sustainable land use development. Rooted at individual as well as community decisions, the changes get obviously magnified and complicated with the enlargement of the size of the study area. Here, first, the land use changes at district level were examined using relevant secondary data (Fig. 5). In Kamrup district, uncultivated land and fallow land are decreasing, while the net area sown is found to increase. The cropping intensity here is gradually increasing. In Lakhimpur district, forest area has been converted into area not available for cultivation; however the net area sown remains almost same. Although the land use pattern and trend differ at district level within the State, the cropping intensity shows a similar trend. Thus, while the use of land at district level shows only little change over the decades, the village level pattern, as presented below, shows some other trend.

The change in area under different crops in Muktapur village was examined through data collected from the Revenue Circle Office (Table 3). It is clear from the table that the percentage of area under crops like sugarcane, vegetables, oilseeds, jute, blackgram, coriander, lentil etc. has been declining gradually. Mustard and rapeseeds, blackgram, lentil, coriander, *kala (khechari)*, sugarcane, jute have registered change of area by -60.01%, -78.87%, -61.46%, -75.14%, -89.27%, -95.13% and -82.89% respectively during the period 1985-2006. It also reveals that there has been a gradual decrease of the gross cropped area (-14.16

%) during the period. Moreover, the net area sown has declined by 2.18 % during the period. The level of cropping intensity was 183.76 % in 1985, which came down to 161.25 % in 2006 registering a decline of -12.25 % during the period.

The most important point behind such agricultural land use change during the recent years is the fact that unlike the earlier generation, the present generation of farmers are not interested in multiple cropping practices. Among them, only a few have taken agriculture as their main occupation or as prime source of livelihood. Moreover, the low return from agriculture, social negligence to the farming community, absence of modern irrigation facilities, gradual change in food habit, adoption of HYV and related farming packages are found to be responsible for the declining trend of intensive cropping practice.

As the past statistical records on the area under different crops were not available in the case of Rangpuria village, recent agricultural land use changes were investigated by interviewing some elderly people (Table 4). In *Kharif* season (rainy season), *ahu*, *bao* and *salirice* are grown in the village. The area under *salirice* has increased from 48 ha to 96 ha during the last decade. On the contrary, both the area and number of households growing *ahu* and *bao* rice show a decreasing trend. As a result, rice area in the village has declined from 153 ha to 117 ha (-24%). Nowadays, most of the villagers tend to grow HYV rice which yields higher than the local varieties. HYV *sali* rice is grown in the higher lands where *ahu* rice and local variety of *sali* rice were cultivated

earlier. The local variety of *sali* rice is now grown in the low lands where *bao* rice was cultivated earlier. As the yield of *ahu* and *bao* rice is low and unstable, the villagers are giving up growing these varieties. In *Rabi* season (dry season), many villagers (72%) grow vegetables such as cabbage, tomato, brinjal, potato etc. in their homesteads.

Before 1990s, along with the homestead lands, the villagers used to own newly emerged sandy lands on the banks of the Subansiri River where they raised mustard, potato and urad bean (*matimah*). Subsequently due to bank erosion, they lost major portion of the river bank land, and are

now forced to use the paddy fields for raising vegetables in the dry season. The growing need for cash drives most of the villagers to grow vegetables in the paddy fields mainly to sell in the local periodic markets.

The pattern of agricultural land use in both the villages has been changing with the introduction of new technology and high yielding crop varieties. Socio-economic as well as environmental factors also have great bearing on the land use change at the village level. These results rightly expose the real dynamics of the village land use and economy, which the district level statistics generally fail to reveal.

Table 3: Area under different crops in Muktapur village

crops	Area in hectare					% change during 1985- 2006
	1985	1990	1995	2000	2006	
Rice	196.3 (68.2)	194.7 (67.6)	196.52 (70.2)	192.55 (75.5)	184.87 (74.9)	-5.69
Mustard & Rapeseeds	16.73 (5.8)	14.85 (5.2)	17.4 (6.2)	6.02 (2.4)	6.69 (2.6)	-60.01
Black gram	5.35 (1.9)	6.69 (2.3)	3.39 (1.2)	1.94 (0.8)	1.13 (0.4)	-78.87
Lentil	5.89 (2.0)	5.35 (1.9)	3.88 (1.4)	2.67 (1.0)	2.27 (0.9)	-61.46
Coriander	5.35 (1.9)	6.02 (2.1)	4.28 (1.5)	2.4 (0.9)	1.33 (0.5)	-75.14
Kala	7.36 (2.6)	7.36 (2.6)	2.94 (1.1)	1.07 (0.4)	0.79 (0.3)	-89.27
Tree crops	38.15 (13.3)	38.68 (13.4)	39.02 (13.9)	41.49 (16.3)	42.8 (16.7)	12.19
Sugarcane	2.67 (0.9)	1.67 (0.6)	1.4 (0.5)	0.46 (0.2)	0.13 (0.1)	-95.13
Potato	4.01 (1.4)	4.15 (1.4)	5.35 (1.9)	2.67 (1.1)	3.59 (1.5)	-10.47
Vegetables	2.67 (0.9)	4.75 (1.7)	4.01 (1.4)	2.87 (1.1)	2.12 (0.9)	-20.59
Jute	1.87 (0.7)	2.21 (0.8)	0.93 (0.3)	0.6 (0.2)	0.32 (0.1)	-82.89
Others	1.33 (0.5)	1.4 (0.5)	0.73 (0.3)	0.33 (0.1)	0.67 (0.3)	-46.62
Gross cropped area	287.41	287.83	279.85	255.07	246.71	-14.16
Net sown area	156.4	156.09	157.69	155.06	152.99	-2.18
Cropping intensity	183.76	184.4	177.47	164.49	161.25	-12.25

Note: Figures in the parentheses indicate the percentage to the gross cropped area.

Table 4: Area under different crops in Rangpuria village

Crops	1990s		2009		% change of area
	HHs (n=68)	Area (ha)	HHs (n=83)	Area (ha)	
Ahu	38 (59%)	35.5	8 (10%)	2.3	-93.5
Bao	52 (79%)	69.4	20 (24%)	18.9	-72.8
Sali (LV)	68 (100%)	48.3	79 (95%)	95.9	98.6
Sali (HYV)	38 (57%)		80 (96%)		
Total rice	-	153.2	-	117.1	-23.6
Vegetables	HHs (n=83)		HHs (n=83)		
homestead	-		60 (72%)		-
paddy field	1 (1%)		26 (31%)		-
river bank	43 (52%)		12 (14%)		-

Note: Figures in the parentheses indicate the percentage to the total households

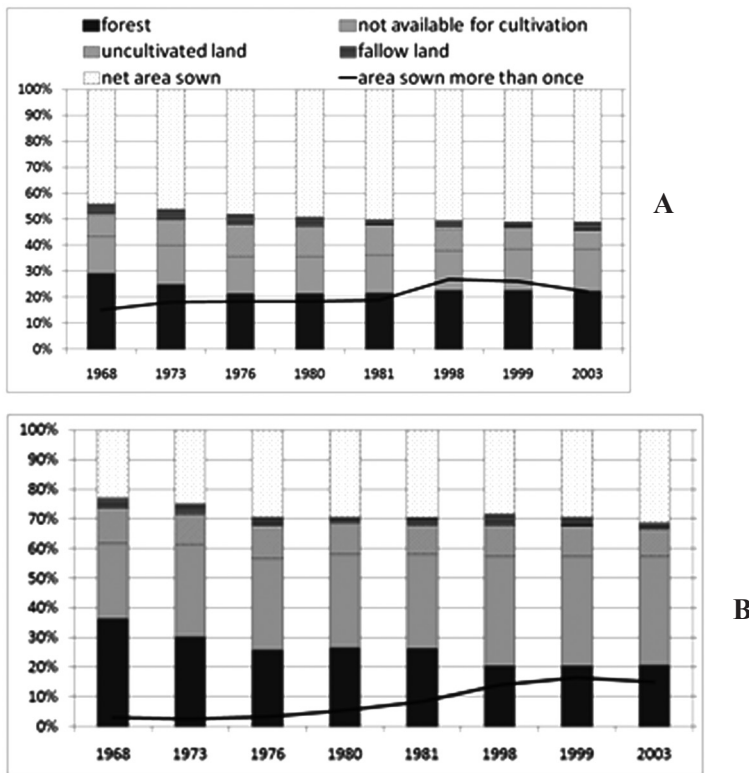


Fig. 5. Land use change in (A) Kamrup district and (B) Lakhimpur district.

Conclusion

In this study, the land use and its change and the landholding structure of Muktapur village in lower Assam and Rangpuria village in upper Assam have been investigated. Although the historical and cultural backgrounds with respect to the two villages differ notably, the land use in both the villages appears to be similar as the basic environmental control of the Brahmaputra river and its tributaries remains more or less similar in both the contexts. Such type of indigenous knowledge system associated with the adaptation to the local ecological setting could also be seen in other areas like the Bengal delta or the plains of Southeast Asia (Takaya, 1975).

As an immediate consequence of the growing population pressure, landholding size has become very small which indicates, among others, a decline in the sustainability of the traditional rural life. This problem is not only observed in the case of lower Assam where population pressure is more, but also in upper Assam with a relatively low population pressure. This demands urgent measures on the part of the government to ensure environmental and socio-economic sustainability of the rural systems operating in different parts of the Brahmaputra Valley within Assam.

Although agricultural modernization apparently contributes towards improving the

level of productivity, it has the potentiality to change the indigenous rural land use systems which evolved in harmony with nature ensuring long-term sustainability of the society and environment. Certain negative effects of agricultural modernization, such as degradation of land capability, extinction of local crop varieties and disturbances in the local ecosystems have already been reported from many areas, where indigenous cropping technology was abandoned long before. The farmers of both the villages under study also reported the gradual decline in soil fertility particularly after the introduction of high yielding varieties of crops.

Studies on indigenous land use system are essential as it can provide necessary bases for rational land use planning and sustainable development. Such studies are to be conducted on the indigenous land use practices in different micro-ecological zones of the Valley using both conventional and modern methods which may go a long way in resolving the growing problems associated with the environment and development in the area.

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