Spatial and Temporal Variation of Agricultural Land use in Dibrugarh District

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Abstract

Land is a scarce resource which needs optimum use and proper preservation of its constitutents. But the two crucial aspects of land- quality and quantity are under serious threat due to the intensive and extensive use of land both for agricultural and non- agricultural purposes. The present study deals in agricultural land use taking Dibrugarh district as the study area. Agricultural land use in the district is meant for the cultivation of rabi and kharif crops depending on terrain condition, soil quality and other varied physical features. About 50 percent of land in the district is primarily utilized for the purpose of agriculture and allied activities. This paper attempts to study the spatial variation in the land use, cropping pattern, crop concentration and the spatial distribution of various crops of Dibrugarh district. The study is based on secondary data and the methodology adopted in this paper is both descriptive and analytical.

Keywords: Land, scarce, cropping pattern, crop concentration.

Introduction

Land use presents an extremely complex pattern, falling into different types as mentioned below. This complex land use pattern is the result of centuries of human settlement and development representing the interaction of physical, historical, social and economic factors.

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Objectives

1. To study the spatial variation in the land use of Dibrugarh district.
2. To study the cropping pattern, crop concentration and the spatial distribution of various crops.

Data Base and Methodology

The study is based on secondary data. The seven revenue circles of Dibrugarh district are selected randomly for the study. The sources of secondary data are Statistical Hand Book, Assam, 1996 and 2015.The methodology adopted in this paper is both descriptive and analytical.

Discussion

As per the recommendation of the Standing Advisory Committee on Statistics, F.A.O., the Government of India adopted a classification of land use in 1950 and accordingly the land use in Dibrugarh district is classified under nine categories, namely,

(i) Forest,
(ii) Land put to non- agricultural purposes,
(iii) Barren and uncultivable land,
(iv) Permanent pastures and grazing land,
(v) Miscellaneous tree crops and groves not included in net area sown,
(vi) Cultivable waste,
(vii) Fallow other than current fallows,
(viii) Current fallows and
(ix) Net area sown.

Table 1.1

Land Utilisation in Dibrugarh District

Serial no.	Category of use	1991		2015		Variation between 1991 and 2015
		Hectares	P.C.	Hectares	P.C.	P.C.
1	Area under forest	28,000	8.28	21,794	6.45	(-) 01.83
2	Area not available for cultivation	1,34,000	39.63	134999	39.93	(+) 00.30
(a)	Area put to non-agricultural uses	1,22,000	36.08	117873	34.86	(-) 01.22
(b)	Barren and uncultivable land	12,000	3.55	17126	5.06	(+) 01.51
3	Other uncultivated land excluding fallow land	41,000	12.13	26134	7.73	(-) 04.40
(c)	Permanent pastures and grazing land	6,000	1.77	4905	1.45	(-) 00.32
(d)	Miscellaneous tree crops and groves not included in net area sown	27,000	7.99	12449	3.68	(-) 04.31
(e)	Cultivable waste	8,000	2.40	8780	2.59	(+) 00.19
4	Fallow land	11,000	3.25	9564	2.83	(-) 00.42
(f)	Current fallows	5,000	1.48	5553	1.64	(+) 00.16
(g)	Fallow land other than current fallows	6,000	1.77	4011	1.18	(-) 00.59
5	Net area sown	1,25,000	39.67	145609	43.06	(+) 03.39
6	Total cropped area	1,60,000	47.23	167999	49.68	(+) 02.45
7	Area sown more than once	35,000	10.35	22390	6.62	(-) 03.73

Percentage based on 2015.

Source: Statistical Hand Book, Assam, 1996 and 2015.

Table 1.1 presents the land utilisation statistics of Dibrugarh with significant variation between 1991- 2015. During this period there occurred changes in all the

categories of land. There is increase in barren and uncultivableland, cultivable waste, current fallows and net area sown. On the other hand, there is decrease in the areas under forest (Dihingmukh, Joypur, Jokai and others), areas put to non- agricultural uses, permanent pastures and grazing land, miscellaneous tree crops and groves, fallow land other than current fallows and area sown more than once.

For the convenience of land use of the region, it is classified mainly into four categories i.e. (a) Forests, (b) Uncultivable lands, (c) Cultivable lands and (d) Cultivated lands.

Forests

Area under forest includes area actually forested or lands classed or administered as forests whether state- owned or private and whether wooden or maintained as potential forest land.

Table 1.1 reveals that the forest area covered 8.28 percent of the total geographical area in 1991 which reduced to 6.45 percent in 2015. As 33.3 percent of the total area under forest is essential inorder to maintain an ecological balance, therefore, there is no scope for further extension of arable land into the forest land. During the field survey, it was found that there has been tremendous pressure of population on forest land for agriculture and settlement.

Uncultivable lands

From the land use statistics, uncultivable land includes area under non-agricultural uses and barren and uncultivable land of the district in a comprehensive manner. This category had increased from 39.63 percent in 1991 to 39.93 percent in 2015 because there are many swamp and marshy lands in the char areas of the Brahmaputra. These lands are inundated by the water of the Brahmaputra river during the flood period and thus because of extensive sand deposits vast tracts of land are rendered unfit for agriculture and human settlement. Frequent soil erosion is also one of the cause for vast areas of barren and uncultivable land. Area under non- agricultural uses had declined from 36.08 percent in 1991 to 34.86 percent in 2015. Similarly, barren and uncultivable land increased from 3.55 percent to 5.06 percent during the period.

Cultivable lands

Here the cultivable lands are those lands which could be cultivated but at present because of some reason are not under plough. These lands are also considered as potential lands because they have potential of cultivation and presently provide fuel and fodder in rural areas. In this study, cultivable land includes permanent pastures and other grazing land, land under miscellaneous tree crops and groves, cultivable waste land and fallow land.

With the high growth rate of population the area under permanent pasture and grazing land had decreased during the period from 1.77 percent in 1991 to 1.45 percent in 2015 due to unauthorised occupation and extension of settlement. Similarly, area under cultivable waste had increased from 2.4 percent to 2.59 percent during the period. On the other hand, land under miscellaneous tree crops and groves had undergone a declining trend from 7.99 percent in 1991 to 3.68 percent in 2015. In order to maintain an ecological balance there should be an increase of area under miscellaneous tree crops. The category fallow land had recorded a decreasing trend from 3.25 percent in 1991 to 2.83 percent in 2015.

Cultivated lands

Cultivated lands are those areas which fall under the heading 'Net area sown' in the statistics of land use. All those areas which are under cultivation or under plough at a given time are said to be the cultivated land.

The net area sown had been steadily increasing since 1991. In 1991, it was 39.67 percent which increased to 43.06 percent in 2015, recording 3.39 percent rise during the period. The main reason for this increase in the net area sown is due to the conversion of uncultivable lands, fallow lands and other arable lands into cultivable one. If the culturable wasteland and total fallow land were added to the present net area sown, the total area available to cultivation would be 48.48 percent. If adequate facilities were provided, cultivation could therefore, be extended to about 5.42 percent of culturable waste and fallow land taken together.

Area sown more than once

Area sown more than once has recorded a declining trend from 10.35 percent in 1991 to 6.62 percent in 2015 indicating poor crop intensity. The lower crop intensity in

Dibrugarh is primarily due to adverse physical conditions like successive waves of flood and subsequent disruption of agricultural activities, drought conditions besides other socio- economic hindrances.

Area under total cropped land

The total cropped land in Dibrugarh is only 49.68 percent in 2015 while it recorded 47.23 percent in 1991. Inadequate irrigation facilities have been the main reason for which multiple cropped areas could not be increased in Dibrugarh.

Circle-wise variation ofland utilisation

In the seven circles of the district, the total geographical lands within their jurisdiction have not been used in the same proportion under different categories. Area not available for cultivation is highest in Naharkatia circle (36.80 percent) and lowest in Dibrugarh east (1.27 percent). Other uncultivated land excluding fallow lands are also highest in Naharkatia (17.10 percent) and lowest in Moran circle (1.89 percent). The category fallow lands are again highest in Naharkatia (15.18 percent) and lowest in Moran circle (0.04 percent).

Volume of change in land use

For the quantitative measurement of the overall volume of change in land use in Dibrugarh, during the period 2009- 2011, the Weaver's index is used here with a slight modification. The symbols for crops used by him are replaced by the symbols given to various land use classes. The indices of volume of change for different circles of Dibrugarh are presented in Table 1.2.

The index of volume of change in land use is a measure of the percentage of land actually involved in the transfer of area from one category to the other for every circle. Map 1.1 provides comparative views of the area where land use pattern has been relatively dynamic (over 2.0 percent) and by contrast, other areas where it has been relatively stable (under 0.5 percent). During the period 2009- 2011, the outstanding change (over 2.0 percent) took place only in Naharkatia circle. Rapid socio- economic changes are observed in this area under the impact of cultivators. Land under different categories are relatively stabilised in Dibrugarh east, Dibrugarh west, Tengakhat and Tingkhong

circles (Map 1.1). Areas of both maximum and minimum agricultural potentials are included in the category of relative stability; the former is near the level of optimum exploitation and the latter is least exploited due to agronomic limitations. In contrast to the areas of rapid and slow changes, there are the areas of semi- dynamic changes (0.5-2.0 percent). Moran and Chabua have witnessed such moderate changes. Increase in forest area and decrease in other uncultivated land excluding the fallows made the land use pattern dynamic on the one hand and little increase in net area sown make the same less dynamic on the other. The basic elements of physical environment have continued to exercise strong influence on the general pattern of change in land use.

Table 1.2

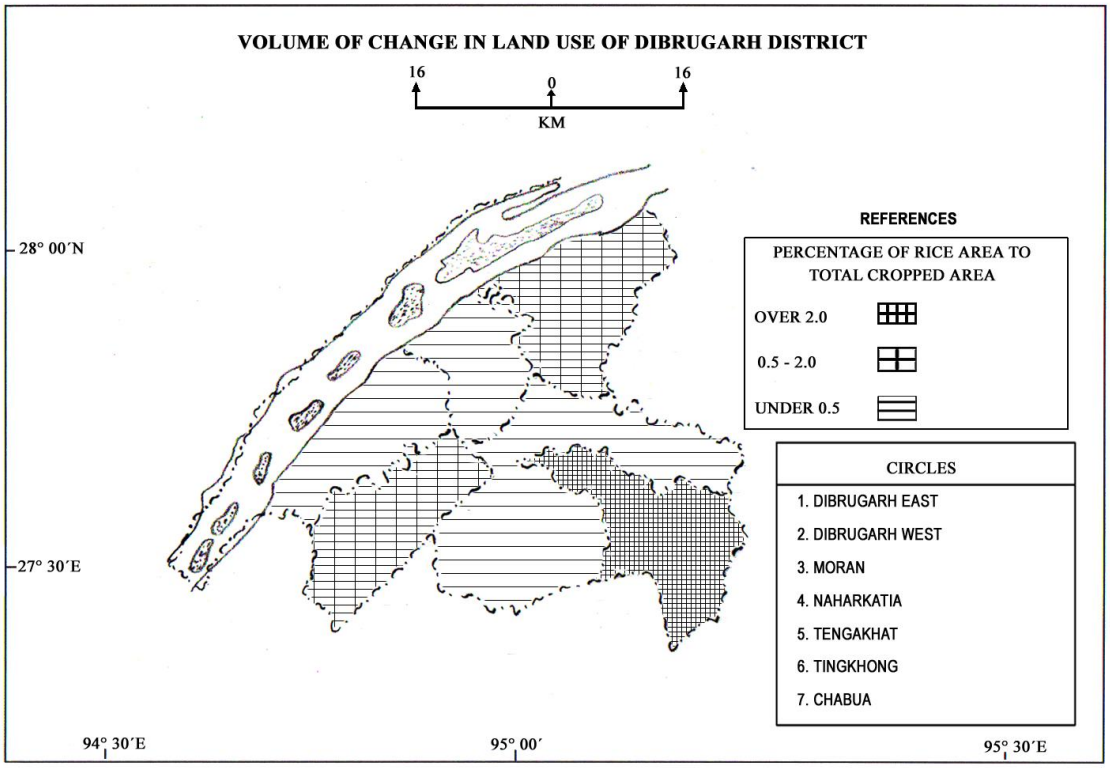
Index of Volume of Change in Land Use in Dibrugarh District, 2009-2011

Revenue Circles	**Index**	**Category**
Dibrugarh east	0.099	Stable
Dibrugarh west	0.46	Stable
Moran	0.79	Semi- dynamic
Chabua	0.52	Semi- dynamic
Tengakhat	0.03	Stable
Naharkatia	7.24	Dynamic
Tingkhong	0.002	Stable
Dibrugarh	**0.66**	**Semi- dynamic**

Source: Economics and Statistical Office, Dibrugarh, 2011.

Note: Index of volume of change in land use is the summation of differences of percentages of land use categories of increase divided by that of decrease for the period in question.

MAP 1.1



Source: Economics and Statistical Office, Dibrugarh, 2011.

The analysis of the volume of change reveals the following facts:

(1) The land use change in Dibrugarh as a whole is very much minimal (0.66 percent), but there is a spatial variation of it ranging from 0.002 percent to 7.24 percent.

(2) Forest area has increased in Dibrugarh west (11.88 percent). Consequently, the overall decrease is significant being 1.85 percent in the district from 2009- 2011.

(3) The largest percentage decline ranging from under 9.34 percent in Tengakhat to over 45.20 percent in Tingkhong has been observed in the areas not available for cultivation. Significant increase of 1.6 percent in Naharkatia has occurred in this category of land.

(4) Other uncultivated land has increased in Naharkatia (9.7 percent), Chabua (8.5 percent), Dibrugarh west (2.43 percent), Tengakhat (0.81 percent) and Tingkhong (0.15 percent). Considerable reduction of 7.12 percent in Dibrugarh east and 5.70 percent in Moran has been in respect of this category of land.

(5) There is increase or decrease in respect of fallow lands in all the circles. Highest decrease of 11.97 percent is experienced in Tengakhat, while increase of 11.98 percent is recorded in Naharkatia. Slight reduction has been observed in Moran (2.6 percent) followed by Dibrugarh east (2.06 percent) and Tingkhong (0.16 percent).

(6) The category of land under net area sown has increased in Chabua to 2.88 percent due to pressure of population on cultivable land.

(7) The land use combination change is uniform in four circles, namely, Dibrugarh east, Dibrugarh west, Moran and Chabua. The area under forests and other uncultivated land excluding fallow lands has increased while other categories of land have shown a tendency to decrease.

The above analysis makes it clear that a large proportion of the district's total geographical area is not suitable for agriculture. Whatever land available for cultivation, has already been brought under the plough.

Table 1.3
Distribution of Agricultural Land in Dibrugarh District, 2011
(Area in Hectares)

Revenue Circles	**Net area sown**	**P.C.**	**Area sown more than once**	**P.C.**	**Total cropped area**	**P.C.**
Dibrugarh east	6,763.80	15.40	953.48	2.13	5,810.32	13.27
Dibrugarh west	21,094.96	46.40	18.00	0.04	21,094.96	46.40
Moran	23,676.13	39.38	NA	NA	23,676.13	39.38
Chabua	15,585.99	44.08	80.00	0.23	15,538.67	43.90
Tengakhat	16,536.07	32.76	NA	NA	16,536.07	32.76
Naharkatia	18,941.00	36.00	2545.50	4.84	21,486.50	40.80
Tingkhong	187.01	0.36	3,3378.75	65.50	33,565.76	65.86

Source: Economics and Statistical Office, Dibrugarh, 2011.

The above Table shows that the net area sown under crops, area sown more than once and total cropped area in Dibrugarh. Among the circles, Dibrugarh west (46.4 percent) ranked first in net area sown followed by Chabua (44.08 percent), Moran (39.38 percent) and Naharkatia (36.00 percent). The lowest net area sown is recorded in Tingkhong (0.36 percent). Area sown more than once is highest in Tingkhong (65.50 percent) while lowest in Dibrugarh west (0.04 percent). Tingkhong ranked first with 65.86 percent of total cropped area followed by Dibrugarh west (46.4 percent) and Chabua (43.9 percent). The lowest total cropped area is recorded in Dibrugarh east (13.27 percent).

Table 1.4
Spatial Concentration of Agricultural Land in 1999 and 2011

Location Quotient value		**1999**	**2011**
Low	Below 0.9	Tengakhat and Tingkhong	Moran and Tingkhong
Moderate	0.9- 1.3	Moran and Chabua	Dibrugarh east, Dibrugarh west, Chabua and Naharkatia
High	Above 1.3	Dibrugarh east, Dibrugarh west and Naharkatia	Tengakhat

Source: Economics and Statistical Office, Dibrugarh.

Agricultural land comprising net area sown, current fallows, other fallows and culturable waste have gone through tremendous change during the decade 1999- 2011. The Location Quotient is used to show the spatial pattern in agricultural land of the district. As such, their spatio- temporal variation in agricultural land has been depicted in the Table 1.4.

Spatial variation of agricultural land in seven circles was marked by three concentration zones of agricultural land. The low concentration (below 0.9) in 1999 was found in Tengakhat and Tingkhong while in 2011 Moran and Tingkhong was in this zone. The moderate (0.9- 1.3) concentration was in Moran and Chabua in 1999 and in 2011 it was found in Dibrugarh east, Dibrugarh west, Chabua and Naharkatia. The highest concentration (above 1.3) was available in Dibrugarh east, Dibrugarh west and Naharkatia in 1999 while in 2011 only Tengakhat was in this zone.

Agricultural land use

In Dibrugarh, agricultural land use meant the cultivation of soil for growing crops, leaving insignificant areas for grassland, poultry farming, horticulture, pisiculture and dairy farming unlike developed agricultural regions of the world.

The area under food crops decreased from 91,710 hectares in 2009 to 81,948.65 hectares in 2011while the area under non- food crops also decreased from 88,347 hectares in 2009 to 49,670.84 hectares in 2011. It has been observed that among the food crops, rice occupies the highest area. In 1999, out of the total cropped land, 1,240 hectares was under rice cultivation which increased to 74,199.44 hectares in 2011. The predominance of food grain crops in the districts agriculture indicates little commercialisation of agriculture in Dibrugarh.

Food grain production in Dibrugarh

Rice is the major crop claiming the lion's share in the area, besides being the dominant staple in the dietary habits of the people. This is evident from the fact that rice, as a major crop is grown thrice a year.

The production pattern of rice shows no subsistence increase from 1999 to 2011. The production of other crops like maize, wheat and sugarcane has stagnated from 1999 to 2011. The slow growth of crops could be attributed to inadequate production technology, high susceptibility to insects, pests and diseases and weather aberrations (including flood) that lead to stagnation yield of these crops. Considering the growing and harvesting period, rice in Dibrugarh is categorised into three main groups: Winter rice, autumn rice and summer rice.

Among cereals, next to rice, maize is an important crop in the district. It is mostly concentrated in Dibrugarh west and Chabua. Maize covered an area of 75 hectares in 2009- 2010 and produced 142 million tonnes of grains in the district. In the same period, wheat covered an area of 128 hectares in the district. It is cultivated in all the circles, but is mostly concentrated in Chabua. Sugarcane is grown more or less evenly in all the circles of the district. Sugarcane is however, significantly concentrated in Dibrugarh west and Tengakhat. The total area under sugarcane cultivation in 2009- 2010 is 42 hectares of the district's total cropped area. The cultivation of potato is done throughout the district but not on a large scale. Potato covers an area of 630 hactares of the total cropped area in the district and is mainly concentrated in Dibrugarh west and Moran. Pulses are also important food crop of the district grown mainly in Dibrugarh west, Moran, Chabua and Tengakhat.

Pulses occupy 965 hectares of the district's total cropped area in 2009- 2010. About 90 percent of the area under pulse is grown as rabi crops. A variety of sub- tropical fruits such as Banana, Assam lemon, Orange, Coconut, Areca nut, Jackfruit, Papaya, Litchi, along with spices such as Ginger, Turmeric, Chilli, Black pepper, etc. are mainly grown in homestead gardens (Bari) to meet out the domestic demands and surplus if any, are sold in the markets.

Spatial variation in cropping pattern

The spatial variation in the cropping pattern of the district could be best measured by crop concentration. Table 1.5 summarizes the measurement of crop concentration of six principal crops in seven circles of the district in the year 2009- 2010 with the help of Location Quotient method. The six crops are selected on the basis that they occupy individually 1 percent or more of the cropland in the district.

Table 1.5

Index of Concentration of Crops, 2009- 2010

Revenue Circles	Autumn rice	Winter rice	Summer rice	Maize	Wheat	Pulses	Sugarcane	Spices & Condiments	Composite Index
Dibrugarh east	0.0008	1.02	0.001	0.00	1.50	0.30	1.40	0.80	5.02
Dibrugarh west	0.002	0.996	0.0013	0.22	1.00	1.70	1.30	1.00	6.22
Moran	0.001	1.00	0.0001	0.04	0.50	1.70	0.60	1.00	4.84
Chabua	0.004	0.97	0.0011	0.33	1.00	1.70	1.40	2.00	7.40
Tengakhat	0.001	0.99	0.002	0.07	1.00	1.70	1.60	1.00	6.37
Naharkatia	0.001	1.00	0.003	0.009	0.50	0.25	1.00	1.50	4.26
Tingkhong	0.001	1.01	0.001	0.00	0.05	0.20	0.40	1.50	3.16

Source: Economics and Statistical Office, Dibrugarh, 2010.

Note: Concentration index of crop 'a'= area of crop 'a' in the component areal unit/ area of crops in the component areal unit÷ area of crop 'a' in the entire district/ area of all crops in the entire district.

Different crops is designated as 'a'.

Table 1.5 shows clearly that winter rice is concentrated in Dibrugarh east, Moran, Naharkatia and Tingkhong. On the other hand, summer rice, autumn rice and maize show weak concentration in all the seven circles. Wheat is concentrated in Dibrugarh east, Dibrugarh west, Chabua and Tengakhat. In case of pulses, concentration is found in Dibrugarh west, Moran, Chabua and Tengakhat whereas sugarcane is concentrated in Dibrugarh east, Dibrugarh west, Chabua, Tengakhat and Naharkatia. In spices and condiments concentration is found in Dibrugarh west, Moran, Chabua, Tengakhat, Naharkatia and Tingkhong.

Crop-combination regions

The crops are generally grown in combinations and it is rare that a particular crop occupies a position of total isolation other crops in a given area at a given point of time.

In this work, Nelson's method has been used and accordingly, crop- combinations in different regional units are ascertained by the use of mean (X) and standard deviation (ó) of hectareage under different principal crops. Only the crop hectareage with a value more than the mean are included in the combination.

Table 1.6

Crop- Combination according to Nelson's Method, 2009- 2010.

Revenue Circles	**Crop- Combination**		
	1st rank (> $\bar{}$.	**2nd rank** $\bar{}$ $\bar{}$. σ)	**3rd rank** $\bar{}$ $\bar{}$ + σ)
Dibrugarh east	NA	Wheat	NA
Dibrugarh west	Autumn rice, Winter rice, Summer rice, Maize and Sugarcane	Wheat	NA
Moran	NA	Winter rice	NA
Chabua	Autumn rice, Maize and Wheat	Sugarcane	Summer rice
Tengakhat	Sugarcane	Summer rice and Wheat	NA

Naharkatia	NA	NA	Winter rice and Sugarcane
Tingkhong	NA	NA	Winter rice

Source: Computed by the author.

Table 1.6 reveals that in 2009- 2010, out of the seven circles, only three circles have first ranking crops namely, Dibrugarh west (autumn rice, winter rice, summer rice, maize and sugarcane) Chabua (autumn rice, maize and wheat) and Tengakhat (sugarcane). In respect of first rank, Tengakhat emerges to be mono- cropped containing sugarcane while Dibrugarh west and Chabua are multiple- cropped. Number of crops included in the first rank is larger than that of the second and third rank. The circles that has second ranking crops are Dibrugarh east (wheat), Dibrugarh west (wheat), Moran (winter rice), Chabua (sugarcane) and Tengakhat (summer rice and wheat). Four circles namely, Dibrugarh east, Dibrugarh west, Moran and Chabua are mono- cropped in respect of second rank containing wheat, winter rice and sugarcane respectively, while Tengakhat emerges to be multiple- cropped. Numbers of crops included in the third rank are the lowest containing three crops only. Summer rice is the third ranking crop in Chabua, winter rice and sugarcane in Naharkatia and winter rice in Tingkhong. In respect of third rank, Naharkatia emerges to be multiple- cropped and Chabua and Tingkhong are mono- cropped. Dibrugarh west, Moran and Tengakhat does not have any third ranking crop. If the ranking process is not continued beyond the third rank, then it appears that winter rice, which is the dominant crop in all the circles does, not appear in the crop- combinations of Dibrugarh east, Chabua and Tengakhat in any of the three ranks of Nelson's Method. This condition is natural since wheat, maize and cash crops are increasingly grown in those circles at the cost of winter rice hectareage. Absence of winter rice in the Table does not mean that it is not grown in those circles. It is rather because of the fact that winter rice hectareage in those circles fall below the mean value of the district. As a whole, Dibrugarh east, Moran and Tingkhong appears to be mono- cropped, whereas Dibrugarh west, Chabua, Tengakhat and Naharkatia are multiple- cropped.

Reasons for spatial variation in cropping pattern

Spatial variation in cropping pattern in the study area is due to various reasons. Some such reasons are mentioned below:

1. The soil of the district consists of clay loam covering an area of 2,55,062 hectares (76.59 percent of the total geographical area) followed by clay soil with 8.78 percent, sandy soil 7.60 percent and sandy loam soil 7.03 percent. Large area under clay soil is present in two circles namely Tengakhat (43.05 percent) followed by Dibrugarh east circle (36.6 percent). Clay loam soil covers a large area in Dibrugarh east (19.05 percent) while Chabua circle covers only 4.86 percent. Area under sandy soil is highest in Chabua (37.75 percent) and lowest in Tingkhong (2.05 percent). Similarly, sandy loam soils are again highest in Moran (25.06 percent) and lowest in Tingkhong (1.21 percent) respectively.
2. A total of 23,280 hectare area of the district fall under very good cultivable land. Tengakhat possesses the highest area under Class I (4489 hectares) whereas Chabua possess the lowest area (1880 hectares).
3. Irrigation potential of the district is not fully utilized as the cultivators are reluctant to take advantage of irrigation facilities. Only 9.24 percent of the total cultivable area of the district was actually irrigated. Among the revenue circles, the highest percentage of irrigated area was highest in Moran (16.19) followed by Tingkhong (13.25) whereas the lowest was recorded in Dibrugarh East (4.53).
4. One of the reason for the variation in cropping pattern both temporally and spatially is the increase of population in the study area from 11.85 lakhs in 2001 to 13.26 lakhs in 2011. The decadal growth rate is 11.92. The density of population has also increased from 351 persons per sq. km. in 2001 to 392 persons per sq. km. in 2011. This increase of population exerts pressure on the agricultural land which results in variation in landuse.
5. Among the revenue circles of Dibrugarh, Dibrugarh east, Moran, Chabua, Tengakhat and Tingkhong has more than 65 percent of the total rice area under HYV rice. On the other hand, Dibrugarh west and Naharkatia exhibits a low percentage of area (less than 65 percent).6. Of the total cultivable area the consumption of fertilizer was highest in Tengakhat (21.5) followed by Moran (19.9) whereas Chabua recorded the lowest percentage of 6.7. Moreover, the consumption of pesticide was highest in Dibrugarh west (14.6) followed by Tingkhong (14.5) while Chabua recorded the lowest percentage (13.8).

Conclusion

Thus it can be concluded that though the study area has immense potentialities for agricultural development yet it is characterised by a low percentage of cultivable land, extraordinarily high percentage of rice hectareage in the total area sown and spatial variation in cropping pattern. It is the varying physical factors namely rainfall, temperature and soil along with the differences in the adoption of modern farm technology which has resulted in spatial variation in agriculture. Moreover, as the scope for physical expansion of arable land is very much limited there is often a marked intensification of agriculture (more output per unit of land or labour) and farming on environmentally sensitive land such as areas that are not strictly for crop cultivation eg. forest land, grazing lands and other waste lands due to increasing food demand.

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