IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 11, Issue 11 Ver. II (November 2018), PP 41-47
www.iosrjournals.org

An Analysis of Spatio-Temporal Changes in the Pattern of Cropping Intensity in Undivided Sivasagar District, Assam (India)

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Abstract: *The study of agricultural sustainability has been a prime concern of all the nations around the world. Keeping its importance in view strategic steps are being adopted and harnessed by the nations aiming at bringing about a drastic change in cropping pattern which results in intensification of crops grown. India is also no exception from it. However, in respect of Sivasagar district it is observed that in spite of having immense potentiality in accelerating cropping intensity, the district is lagged far behind. Single cropping system is still being practised in the larger portion of the district. Most of the farmers are still accustomed to the traditional patterns of cultivation which is essentially required to be reiterated and renovated. Hence, the present study entitled 'An Analysis of Spatio-Temporal Changes in the Pattern of Cropping Intensity in Undivided Sivasagar District, Assam (India)' bears immense significance targeting indirectly at bringing about a holistic awareness in pursuing further study to investigate the feasible problems and prospects related to cropping intensity in the district. The key objective of the study is to analyze the spatial variation and the temporal perspective of the changing pattern of cropping intensity in Sivasagar district. The calculation of cropping intensity in the paper is based on the secondary data collected from the Directorate of Economics & Statistics, Govt. of Assam. The finding drawn reveals that the scenario of cropping intensity in Sivasagar district is not satisfactory at all in comparison to that of state level or national level.*

Key Words: *Cropping Intensity, Sivasagar District, Spatio-temporal Changes, Compound Annual Growth Rate*

Date of Submission: 17-11-2018 Date of acceptance: 04-12-2018

I. Introduction:

Cropping intensity refers to growing of a number of crops from the same area in an agricultural year. Study of cropping intensity is one of the important aspects in the arena of agricultural geography since the productivity of an area depends on the magnitude of cropping intensity of the area. Besides, the study of intensity of cropping in any region reflects the different socio-economic and geographical factors influencing agriculture and helps us in adopting new agricultural strategies in accelerating productivity of crops. The cropping intensity of an area may be either higher or lower based on the proportion of the gross sown area absorbed in an agricultural year. Thus, higher cropping intensity refers to the higher proportion of the gross sown area. The volume of gross sown area primarily depends on the increment of the area sown more than once; and the expansion of area sown more than once must be prime concern of a highly populous country like India where pressure of population on the net sown area is very considerably swelling. There are only two means to cope up with the increasing demand of food in the country – one is the expansion of the net area sown and the other is the intensification of cropping over the existing area. However, the net sown area of the country has already risen by about 20% since independence and reached a point from where no further increase can be expected. Thus, raising the cropping intensity is the only viable option left.

II. The Study Area:

Sivasagar district is situated in the North-Eastern part of Assam between 94°25 and 95°25 longitude and 26°45 to 27°15 latitude east of Guwahati. Earlier Sivasagar was the capital of the mighty Ahoms, who had ruled Assam for more than six hundred years before the advent of the British. Sivasagar district, which included present Jorhat district as a sub-division of the greater Sivasagar district, had remained undivided till 1st July, 1983. In 1983, as Jorhat was curved out of the greater Sivasagar district, its geographical area was restricted only to 2668 sq km. The district is located at Upper Brahmaputra Valley of agro-climatic zone[1] of the state. The northern and the western parts of the district are bounded by Dibrugarh and Jorhat district of Assam respectively and the eastern and southern part is bounded by Arunachal Pradesh and Nagaland. Sivasagar district consists of 3 civil sub-divisions – Sivasagar, Nazira and Charaideo[2]; 7 Revenue Circles; 9 Community Development

Blocks, 5 Municipal Boards, 118 Gaon-Panchayats, 9 Anchalik Panchayats, 24 Mouza, and 878 census villages (866 inhabited villages and 12 uninhabited villages). The district occupies 2668 sq km. Out of it, Sivasagar sub-division, Nazira sub-division and Charaideo sub-division cover 999.55, 441.65 and 1226.8 sq km respectively. [3] It is also worthwhile to mention here that Sivasagar district had consisted of only five revenue circles namely Dimow, Sivasagar, Amguri, Nazira and Sonari till 1991. In 1991, Mahmora Revenue Circle was split curving out one part (Khaloighugura Mouza) from Dimow Revenue Circle and the other part (Mahmora Mouza) from Sonari Revenue Circle. In 2013, Sapekhati Revenue Circle was formed out of Sonari Revenue Circle. Hence, at present, the undivided Sivasagar district comprises seven Revenue Circles namely Dimow, Mahmora, Sivasagar, Amguri, Nazira, Sonari and Sapekhati.

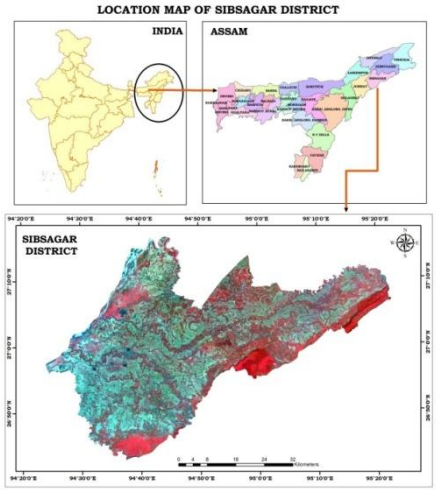

Fig. 1: Map showing the location of Sivasagar District in Assam (India)

Objectives:

The following objectives are formulated to investigate the research problem:

i) To analyze the spatio-temporal changes of cropping intensity in Sivasagar district.
ii) To give importance to the improvement of cropping intensity in the district.

III. Methodology:

The study is carried out with the help of secondary data collected from Directorate of Economics and Statistics, Government of Assam. To analyze the cropping intensity in Sivasagar district, a period of thirty years is assumed based on the data of agricultural land use pattern of the district from 1985-86 to 2015-16 at an interval of five years i. e. 1985-86, 1990-91, 1995-96, 2000-01, 2005-06, 2010-11 and 2015-16. The entire spatio-temporal changing trend of cropping intensity index of the district is shown with the help of both table and maps. The following index values are assumed in drawing the cropping intensity maps – more than 120 as high, between 115-120 as medium, and below 115 as low. These index values are assumed exclusively for Sivasagar district only.

Cropping intensity has been computed by dividing total cropped area of the region by the net area sown i.e.

$$\text{Cropping Intensity} = \frac{\text{Total Cropped Area}}{\text{Net Area Sown}} \times 100$$

IV. Analysis And Findings:

The average cropping intensity of Sivasagar district was 111.73% against 146% of Assam in 2015-16. If Bhatia's index of cropping intensity is applied as the benchmark then the distinct surely falls into weaker region. Bhatia has categorized a given area as a weaker region if the index of cropping intensity of the area is found less than 130%[4]. The index of cropping intensity of Sivasagar district, as shown in Table 1, exposes that no revenue circle crossed 130% from 1985-86 to 2015-16. In 1985-86, the value of cropping intensity was 120.38% only in Sivasagar district which steadily reduced to 107.81% in 2010-11 and thereafter it rose up to 111.73% in 2015-16. All the revenue circles, except Dimow, were gripped by receding trend from 1985-86 to 2015-16. Dimow was the only revenue circle to be marked by its positive compound annual growth rate at 0.39%. The cropping intensity of Dimow revenue circle was 109.23% in 1985-86 and went up to 122.93% in 2015-16. Though it receded to 105.24% in 1990-91, it again rose up to 116.41% in 1995-96% and 118.35% in 2000-01 and thereafter it is seen deceasing to 115.63% in 2005-06 and 107.75% in 2010-11. In 2015-16, Dimow remained on the top among all the seven revenue circles. In case of Mahmora revenue circle, though the index

of cropping intensity is seen growing up from 115.04% in 1995-96 to 116.09% in 2000-01 and 120.11% in 2005-06, yet it steadily declined to 112.58% in 2015-16. The growth of cropping intensity index is seen positive in Sivasagar revenue circle between 1985-86 and 1990-91. In 1985-86, it was 127.31% which went up to 129.03% in 1990-91 and thereafter it steadily dwindled to 124.11%, 118.78% and 110.74% in 2000-01, 2005-06 and 2010-11 respectively. However, the cropping intensity index again increased to 117.92% in 2015-16. But having compared with that of 1985-86, it ensured a negative trend. The negative trend of cropping intensity index is observed much more conspicuous in Amguri revenue circle where a recession of 22.61% was recorded between 1985-86 and 2015-16. In 1985-86, the cropping intensity index remained on the top with 127.95% among all the six revenue circles of the district. However, in the succeeding six intervals of five years, it very unexpectedly continued declining to 105.34% in 2015-16. The same negative trend was again seen in Nazira and Sonari revenue circles also over the past years. Both Nazira and Sonari recorded 119.45% and 122.48% respectively in 1985-86. In Nazira, it gradually squeezed to 103.99% in 2015-16 by a negation of 15.46%. Likewise, Sonari was marked by a recession of 12.14% between 1985-1986 and 2015-16. However, the recession in Sonari is obviously possible since Sapekhati revenue circle split from it in 2013 and thus Sapekhati, as Table 1 shows, recorded 113.55% cropping intensity in 2015-16. The entire spatio-temporal changing trend of cropping intensity index of the district is shown with the help of both Table 1 and Fig. 2 to Fig. 8.

Table 1: Intensity of Cropping in the Revenue Circles of Sivasagar District, from 1985-86 to 2015-16

SL No	Index of Intensity (year-wise) / Revenue Circles	1985-86	1990-91	1995-96	2000-01	2005-06	2010-11	2015-16	Increase or decrease in area (between 1985-86 and 2015-16)	Compound Annual Growth Rate
1	Dimow	109.23	105.24	116.41	118.35	115.63	107.75	122.93	13.7	**0.39**
2	Mahmora	-	-	115.04	116.09	120.11	112.57	112.58	-2.46	**-0.11*** **
3	Sivasagar	127.31	129.03	127.69	124.11	118.78	110.74	117.92	-9.39	**-0.26**
4	Amguri	127.95	110.11	112.06	104.31	109.64	105.07	105.34	-22.61	**-0.65**
5	Nazira	119.45	111.48	113.81	106.67	105.12	104.49	103.99	-15.46	**-0.46**
6	Sonari	122.48	113.94	108.51	106.29	106.25	107.99	110.34	-12.14	**-0.35**
7	Sapekhati	-	-	-	-	-	-	113.55	0.0	0.0
8	**Sivasagar District**	**120.38**	**113.09**	**114.59**	**111.19**	**111.05**	**107.81**	**111.73**	**-8.65**	**-0.25**

Source: Computed by the Researcher based on the data collected from Directorate of Economics and Statistics, Guwahati, Government of Assam

*** Compound Annual Growth Rate is shown in 20 years.

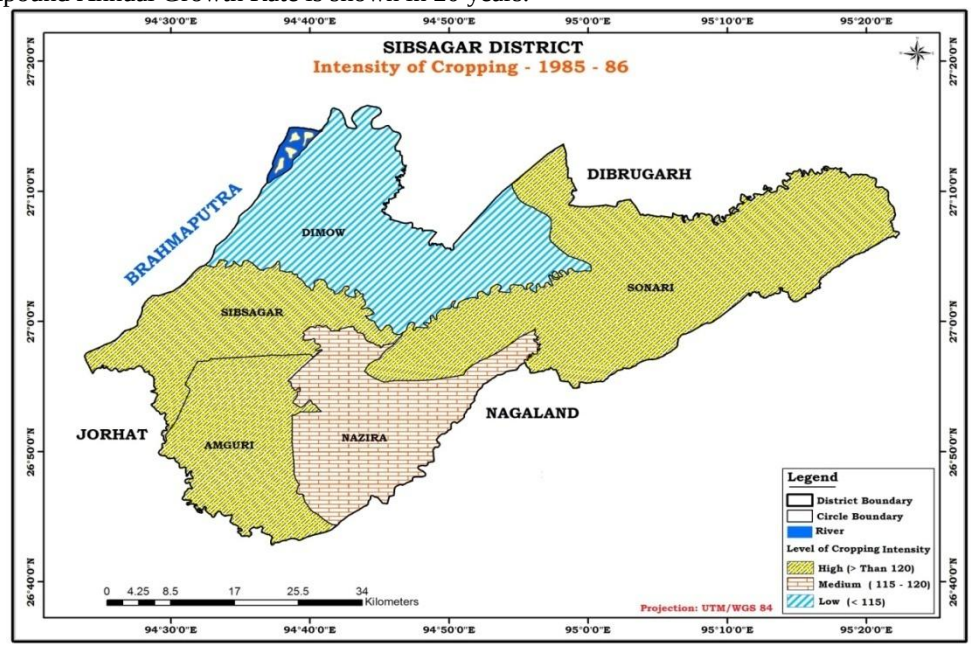

Fig. 2: Map showing spatial variation of cropping intensity in Sivasagar district in 1985-86.

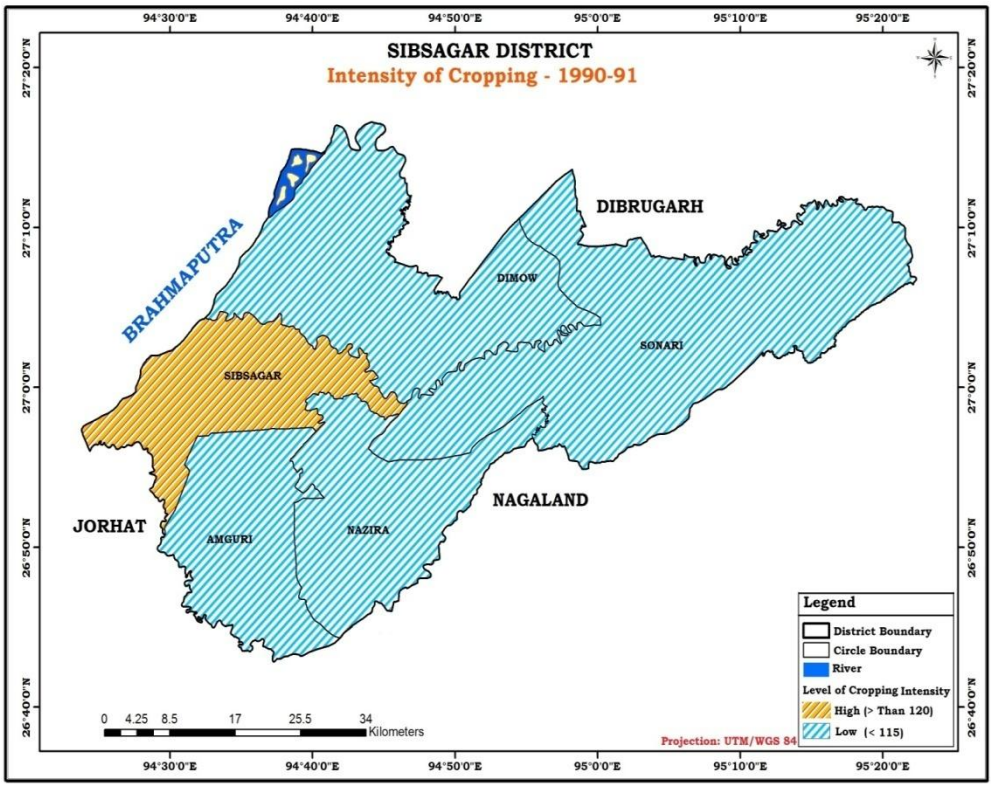

Fig. 3: Map showing spatial variation of cropping intensity in Sivasagar district in 1990-91.

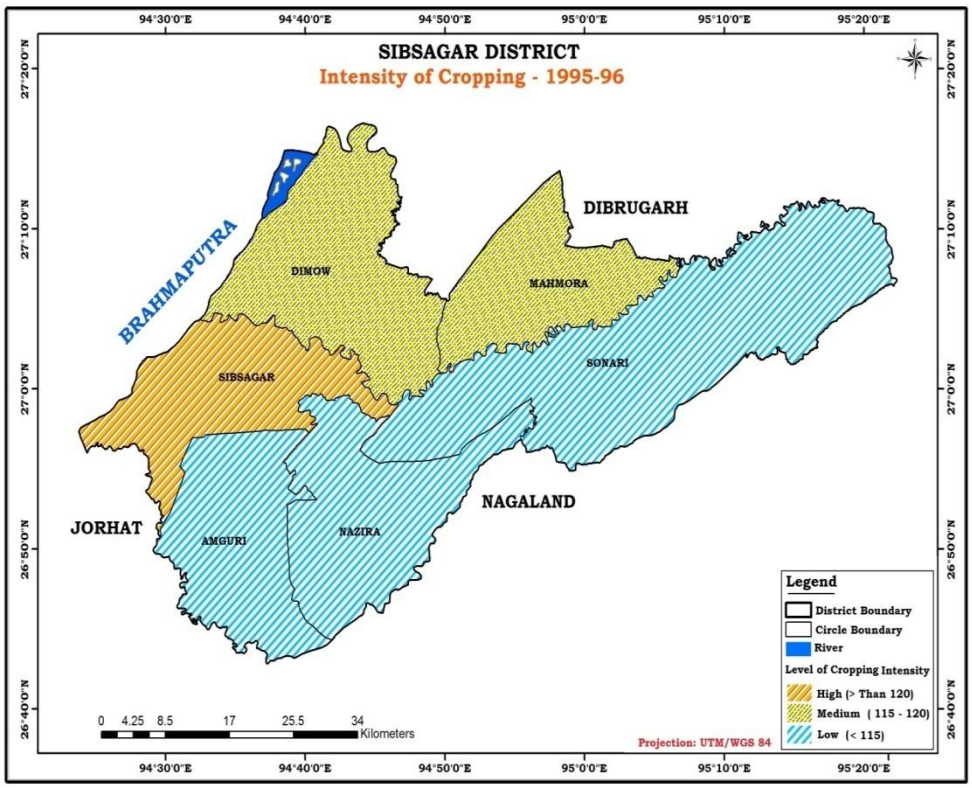

Fig. 4: Map showing spatial variation of cropping intensity in Sivasagar district in 1995-96.

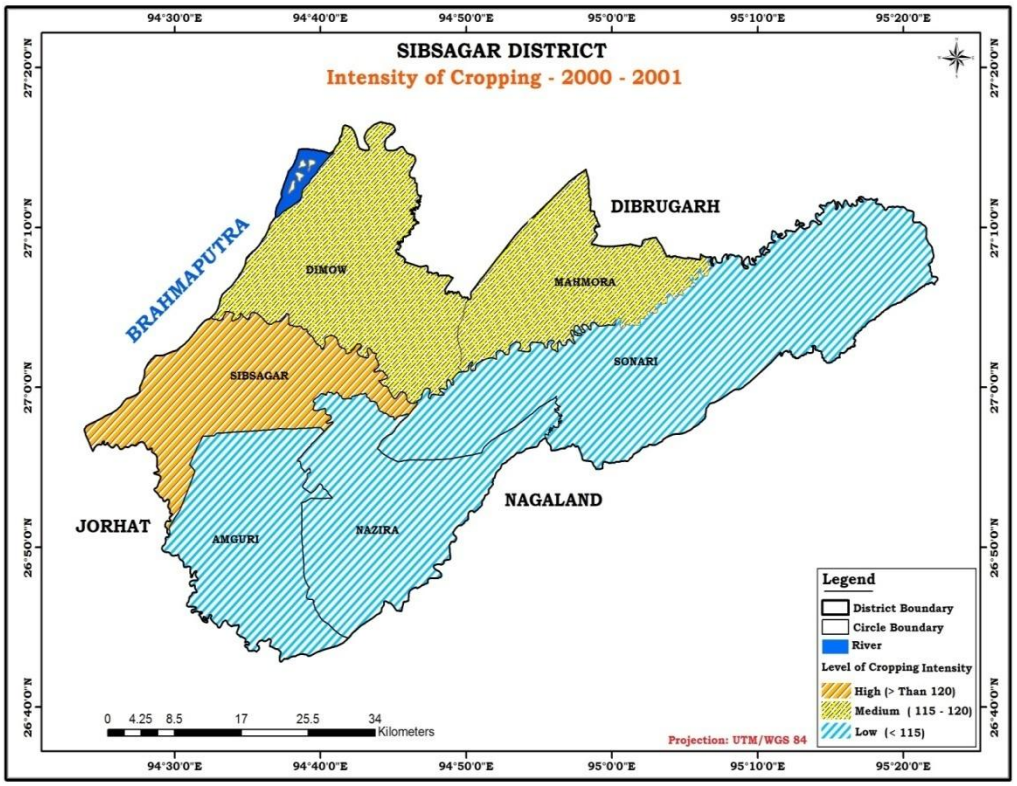

Fig. 5: Map showing spatial variation of cropping intensity in Sivasagar district in 2000-01.

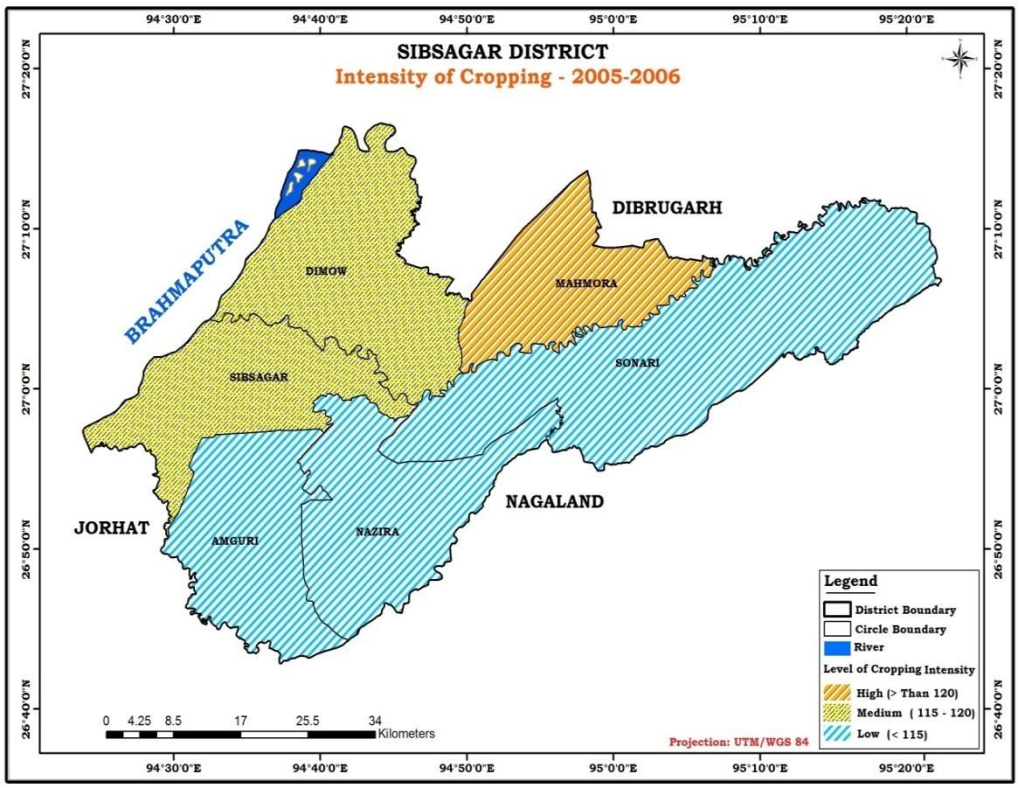

Fig. 6: Map showing spatial variation of cropping intensity in Sivasagar district in 2005-06.

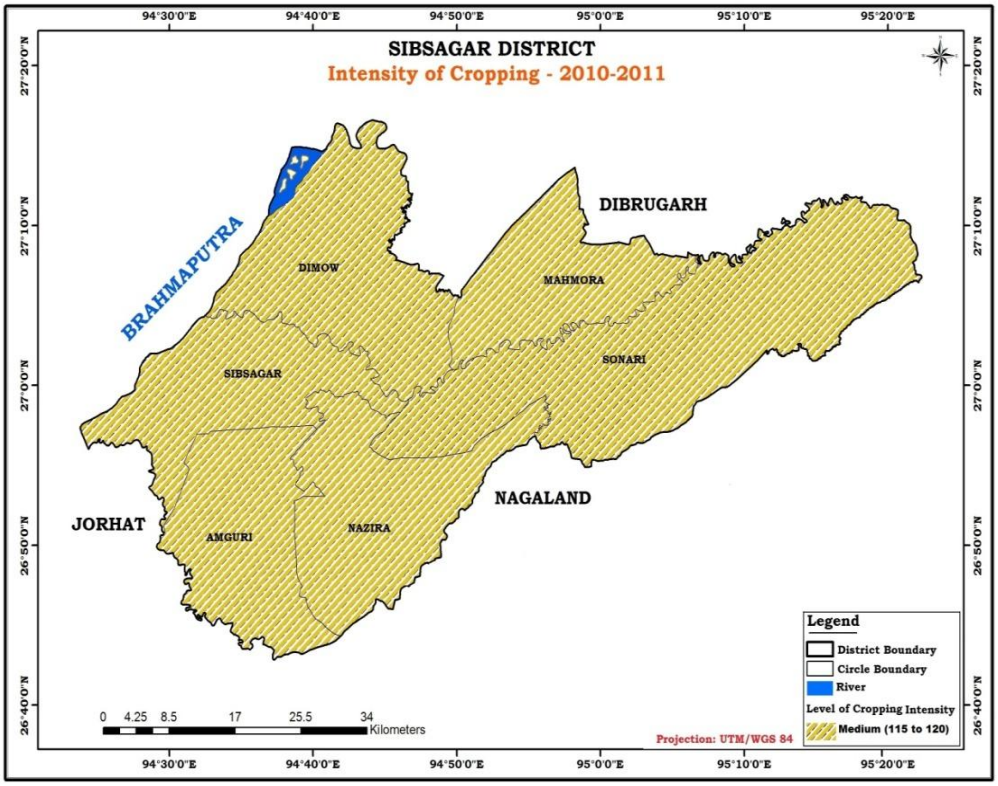

Fig. 7: Map showing spatial variation of cropping intensity in Sivasagar district in 2010-11.

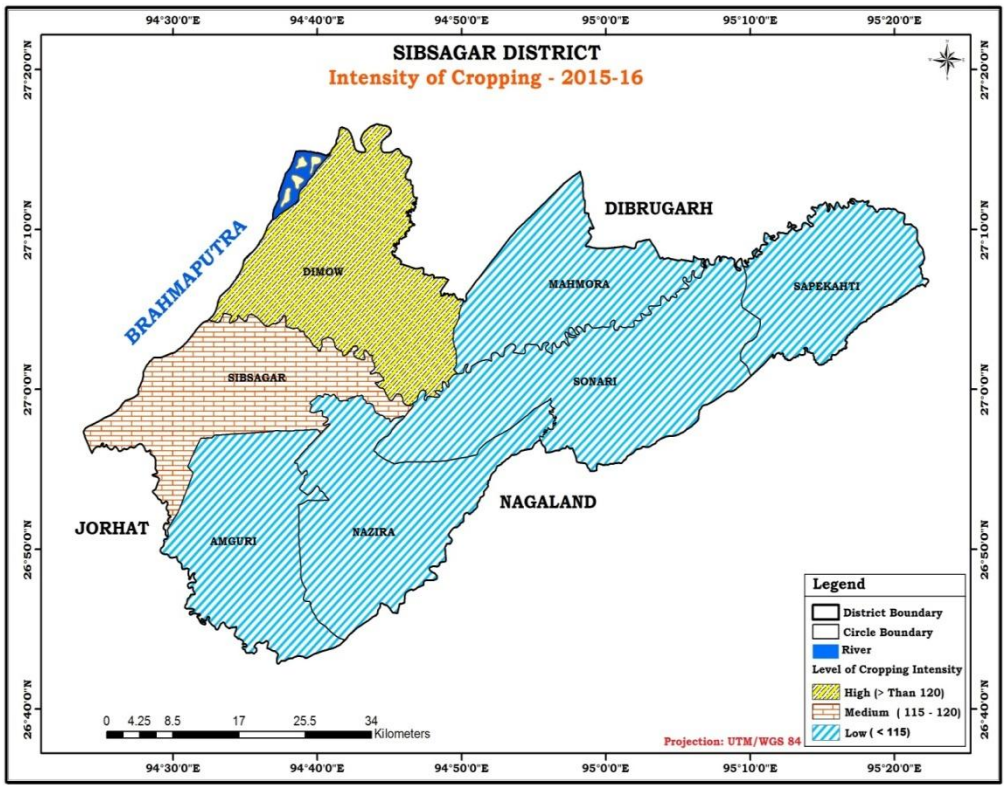

Fig. 8: Map showing spatial variation of cropping intensity in Sivasagar district in 2015-16.

V. Conclusion & Suggestions:

From the above analysis, it has come to light that the scenario of cropping intensity in Sivasagar district is not satisfactory at all in comparison to that of Assam. Nevertheless, there are some major factors responsible for battering the index of cropping intensity in the district. Lack of irrigation facilities, inadequacy of proper

planning in agricultural activities, expansion of tea garden in agricultural area etc are some of the most conspicuous factors behind it. Facility of irrigation still remains far behind. The agricultural activities in the district primarily hinge on weather conditions. The fate of the farmers is determined by the average rain fall in the district. Hence, it is seen that winter paddy is the dominant crop of the district. Very scanty portion of agricultural area is facilitated with irrigation in the district. On the other hand, it is also very important to note that, like the other districts of upper Assam such as Golaghat, Jorhat, Dibrugarh and Tinsukia, Sivasagar is also gifted with a very conducive geo-climatic condition for tea cultivation. The cultivators have contrived to expand tea garden area as much as possible in the district with the hope of getting maximum return from tea plantations. The return of tea plantations is much higher than that of the most dominant crop – paddy. It is therefore seen that the district is marked by an increasing trend of tea plantation area against the decreasing trend of area absorbed in paddy and other crops in the district. So, expansion of tea plantations in agricultural area can be accounted to be another significant factor which affects in the growth of cropping intensity in the district.

To wind up the study, the following suggestions are put forward:

1. Since the district is characterized with its shrinkage of cropped land and decline of cropping intensity, more priority should be given to the acceleration of productivity of the crops grown in the district. Lack of irrigation facility is the main hindrance to the decline of cropping intensity in the district. It is very regretful to state that the irrigation system is still in a very deplorable condition in the district. What has been done regarding it is not sufficient. A holistic and strategic cum scientific step is urgently required in the practical ground to mitigate it. Priority should be given to sincere survey and classification of the cropped land; and the feasibility of irrigation scope must be extracted thereof. Minor irrigation projects like lift irrigation and deep tube well irrigation must be extensively initiated in the grass root level. Creation of small ponds in the midst of the fields, covering the marshes and the depressed areas with the twin aims of irrigation and pisciculture can be an appropriate approach towards increasing the irrigation-potential in the area. Project of rain-harvesting can be implemented as an alternative means of it. Besides, the two main tributaries namely the Dikhow and the Dichang, and the other small flows can also be harnessed positively as the source of supplying water to the cropped areas.
2. Adoption of improved technology can never be possible if the farm size is not raised to an economically feasible unit. Therefore, fragmentation of land holdings should be prohibited by legislation. Non-cultivators should not be allowed to possess cultivable land. The name of the genuine cultivators should be officially registered; and cooperative farm societies should be established in order to inspire and make them responsible to accelerate agricultural economy.
3. Government can also influence cropping intensity through legislative and administrative measures. Steps may be taken by the government to ease or subsidize the supplies of farm inputs and knowledge. Cropping intensity depends on availability of agriculture related facilities such as high yielding of seeds, fertilizers and manures; adoption of crop rotation, mixed cropping, relay cropping etc; improved facilities for plant protection, water-storage, marketing, transport etc. Hence, adequate and immediate measures should be taken on the part of government regarding it targeting the benefit of the cultivators.

The term ‘Green Revolution’ seems to be mocking in respect of the district. Without doing something special dynamically the concept of ‘Green Revolution’ would always remain bogus. It is also true that some efforts are taken to distribute tractors, power tillers, water pumps, spray machines, HYV seeds etc amongst the farmers. Green Revolution, in the true sense of the term, can never be brought about only by distributing the aforesaid means of cultivation. A holistic step on modernized agriculture, as initiated in the states i.e. Haryana, Punjab, Maharashtra etc is a must in the district.

References:

[1]. The agro-climatic zone is nothing but a climatically classified location suitable to agriculture. The National Commission on Agriculture classified India into 127 agro-climatic zones in 1971.
[2]. Charaideo Sub-division was declared a district in 2015. However, it is included in the study area (hence undivided Sivasagar district) since the spatio-temporal changes of cropping intensity is shown from 1985-86 to 2015-16.
[3]. Sivasagar District at a Glance 2009.
[4]. Bhatia, S. S., (1965), Patterns of Crop Concentration and Diversification in India, Economic Geography, Vol. 41, No. 1, pp. 39-56.

Ms. Manashi Gogoi"An Analysis Of Spatio-Temporal Changes In The Pattern Of Cropping Intensity In Undivided Sivasagar District, Assam (India) "IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) 11.11 (2018): 41-47.