



IMPACT OF IRRIGATION ON CROPPING INTENSITY IN HUGLI DISTRICT OF WEST BENGAL, INDIA

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Abstract

Irrigation is essentially the artificial application of water to overcome deficiencies in rainfall for growing crops (Cantor, L.M 1967). Growth of population of consequent need for larger agricultural production, the requirement of irrigation has increased a great deal (Tyagi, B.P, 2000). Nearly 70% of the country's gross cropped area depends exclusively on rainfall, which is unevenly distributed both in respect of time and space (Mamoria, C.B, 1999). The district Hugli retains its basic rural characteristics with over 70% of its total population depending on Agriculture and its position as one of the major producers of cereals in the state. The District has well developed irrigation infrastructure with a higher cropping intensity of about 241%. Cropping intensity plays an important role in the agricultural development of any region. Higher cropping intensity shows intensive use of land for agricultural purpose. This paper attempts to find out the spatial pattern of change in irrigation intensity, and also the relation between irrigation intensity and cropping intensity in Hugli District at C.D. Block level for the years of 2004-05 and 2018-19. Karl Pearson's Product Moment Correlation Coefficient method has been adopted to measure the relationship between irrigation intensity and cropping intensity. These analyses provide a clear areal differentiation in case of crop grown and also give avenue to future planners to establish more economically sustained agricultural system.

Key Word: Irrigation Intensity, Cropping Intensity, Net Cropped Area, Gross Cropped Area, Areal differentiation.

1. INTRODUCTION

Irrigation is an ancient approach to promoting agricultural development. It is so because in the present day modernized agricultural pattern, the

increasing use of modern agricultural inputs and marking the use of various chemicals for soil conservation more effective, require more water for irrigation. The less use of agricultural inputs results

only in a low level of production. Thus, we see that irrigation affects the level of agricultural production. Recent advances in agricultural technology have further enhanced the importance of irrigation as it is pre-requisite for the adoption of these technologies. Irrigation is essentially the artificial application of water to overcome deficiencies in rainfall for growing crops. Irrigation as a protective measure to supplement rainfall and precaution against the failure of crops is always practiced in the various parts of the world. It is very vital to overcoming the basic problems of the agriculture. The intensity of irrigation means the percentage ratio between the net areas irrigated to net area sown. Intensive use of land for cropping acts as an indicator of regional development. It is determined by cropping intensity that denotes the number of crops cultivated per unit area per year

(Boyce.) Cropping intensity is the magnitude of gross cropped area to its net cropped area. Cropping Intensity implies the number of crops raised on an arable area during the agricultural area.

2. STUDY AREA:

The district Hugli is lying in between $22^{\circ}39'32''$ North and $23^{\circ}07'20''$ North, $87^{\circ}30'20''$ East and $88^{\circ}30'15''$ East longitude. The district is bordered on the north by the districts of Bankura and Bardhaman, on the south by the district of Haora, on the east by the Bhagirathi (Hugli river) demarcating the district of Nadia towards north and North Twenty Four Parganas district east and the west and south-west by the district of Medinipur. This district has a total area of 3149 Sq. Kms and it ranks 13th among all the districts

of West Bengal. Hugli has 18 C.D. Blocks with the District Headquarter in Chinsurah.

3. OBJECTIVES:

The main objectives of the study are as follows:

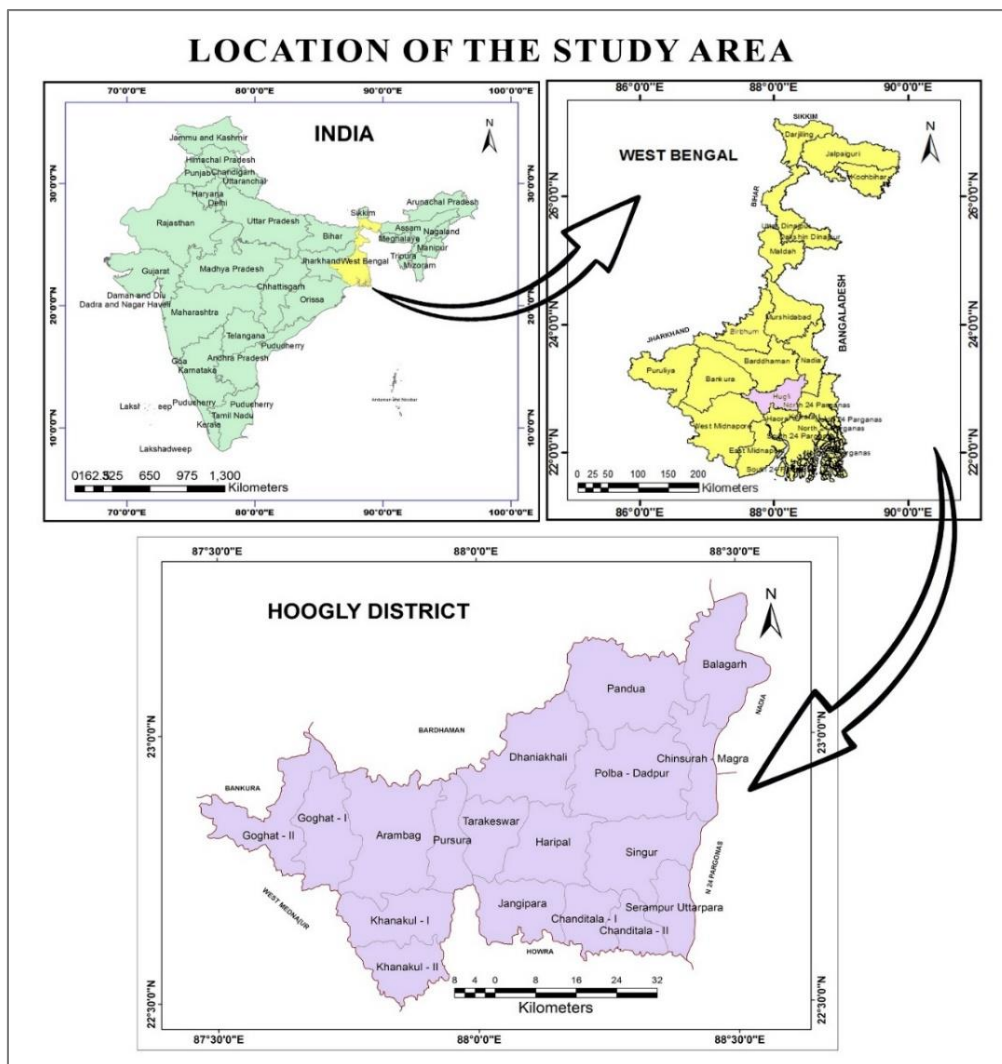


Table: 1

| | | |
|--|---------|---------|
| Main Agricultural Features | 2004-05 | 2018-19 |
| Total Geographical Area (sq. km) | 3149 | 3149 |
| Net Cropped Area (In Thousand Hector) | 225.17 | 212.09 |
| Gross Cropped Area (In Thousand Hector) | 478.51 | 468.09 |
| Cropping Intensity (%) | 215% | 256% |
| Gross Irrigated Area | 351.56 | 395.64 |
| Irrigation Intensity | 72.47% | 81.87% |

Source: Principal Agricultural Office, Chinsurah.

- To identify the Irrigation intensity in Hugli District
- To detect the spatial- temporal variation of Irrigation intensity in block level.

- To identify the Cropping intensity in Hugli District.
- To detect the spatial- temporal variation of cropping intensity in block level.
- To find out the relationship between irrigation intensity and cropping Intensity of the 18 C. D. Blocks in Hugli district during the period of 2004 - 05 and 2018-19.

4. DATABASE AND METHODOOLOGY:

Data source :The present study is based on the secondary data which have been collected from the Principal Agricultural Office of Chinsurh , Hugli District, Government of West Bengal , Ex-Engineer , Agricultural Mech , Hugli , Ex-Engineer , Agri Irrigation , Hugli , Statistical Hand Book , Census Of India, District Library of Hugli, Hugli District.

5. RESULT AND DISCUSSION:

Table: 2. Block wise Cropping Intensity of Hugli District.

Methods and Techniques: The collected Data have been presented statistically and cartographically .The following formula is used here:

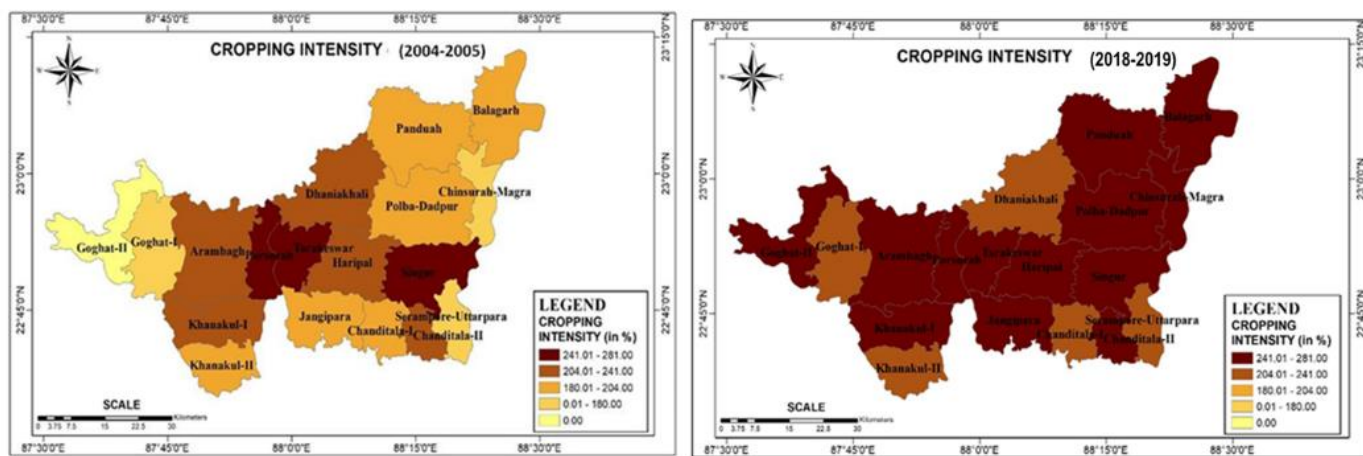
1. C.D. Block wise Cropping Intensity has been calculated for the years 2003-04 and 2018- 2019 using the following formula (after Bureau of Applied Economics and Statistics, Government of West Bengal)

Cropping Intensity= (Gross cropped Area/Net Cropped Area) ×100

2. C.D. Block wise Irrigation Intensity has been calculated for the years 1994-95 and 2010-11 using the following formula (after Bureau of Applied Economics and Statistics, Government of West Bengal)

Irrigation Intensity= (Gross Irrigated Area/Gross Cropped Area) ×100

3. The relationship between Irrigation Intensity and Cropping Intensity at C.D. Block level for the years 1994-95 and 2010-11 has been shown using the Coefficient of Correlation (Karl Pearson, 1896) formula.



| Name of Blocks | Cropping Intensity in percent (2004-05) | Cropping Intensity in percent (2018-2019) |
|---------------------|---|---|
| Dhaniakhali | 242 | 240 |
| Panduah | 190 | 260 |
| Balagarh | 248 | 265 |
| Chinsurah - Mogra | 200 | 255 |
| Polba-Dadpur | 193 | 255 |
| Tarakeswar | 279 | 290 |
| Haripal | 230 | 285 |
| Singur | 236 | 280 |
| Jangipara | 220 | 270 |
| Chanditala-I | 210 | 230 |
| Chanditala-II | 189 | 260 |
| Srerampur-Uttarpara | 168 | 230 |
| Goghat-I | 159 | 240 |
| Goghat-II | NA | 245 |
| Arambagh | 221 | 250 |
| Khanakul-I | 238 | 245 |
| Khanakul-II | 205 | 240 |
| Pursurah | 302 | 260 |

Source: - Computed by Author.

Table: 3 Block wise cropping intensity classification

Source: Computed by Author

Figure 2: Change in Cropping Intensity in different blocks from 2004-2005 to 2018-2019

Source: Census of India, 2001-2011

Table: 4. Block wise Intensity of Irrigation in Hugli District.

| Name of the blocks | Intensity of irrigation | |
|----------------------------|-------------------------|--------------|
| | 2004-05 | 2018-19 |
| Chinsuarh -Mogra | 69.56 | 91.19 |
| Polba-Dadpur | 60.25 | 62.18 |
| Pandua | 72.99 | 90.64 |
| Dhaniakhali | 76.80 | 77.16 |
| Balagarh | 58.83 | 89.19 |
| Srerampur-Uttarpara | 56.85 | 98 |
| Jangipara | 55.89 | 90.72 |
| Chanditala-I | 93.15 | 92.35 |
| Chanditala-II | 44.81 | 61.13 |
| Tarakeswar | 98.88 | 67.29 |
| Haripal | 61.00 | 82.93 |
| Singur | 84.65 | 73.40 |
| Arambagh | 81.80 | 83.47 |
| Pursurah | 78.16 | 92.61 |
| Goghat-I | 81.02 | 41.49 |
| Goghat-II | | 41.49 |
| khanakul-I | 81.55 | 68.34 |
| khanakul-II | 75.88 | 88.34 |

Source: - Calculated by author.

According to the variation of the Intensity of Irrigation in 2004-2005 and 2018-19 (Table -5) the District has been divided in the following regions.

Intensity of Irrigations:

Table - 5

| Regions | Intensity of Irrigation on percentage to gross cropped area | Name of the blocks (2004-05) | Name of the blocks (2018-19) |
|---------|---|--|---|
| Low | Below 50 | Chanditala-II | Goghat –I , Goghat – li |
| Medium | 50 -70 | Srerampur-Uttarpara , Jangipara, Balagarh Chinsurh – Mogra , Polba-Dadpur, Haripal | Polba – Dadpur, Chanditala-II , Tarakeswar , Khanakul – I |
| High | 70 -90 | Pandua , Dhaniakhali , Singur , | Balagarh , Singur, Arambagh |

| | | | |
|-----------|----------|--|--|
| | | Arambagh , Pursurah , Goghat –I ,Goghat-II, Khanakul-I,Khanakul-II | ,Khanakul-II , Dhaniakhali , Haripal |
| Very High | 90 above | Chanditala – I , Tarakeswar | Chinsurh – Mogra , Srerampur-Uttarpara, Pandua , Jangipara , Pursarh ,Chanditala-I |

Source: - Computed by author

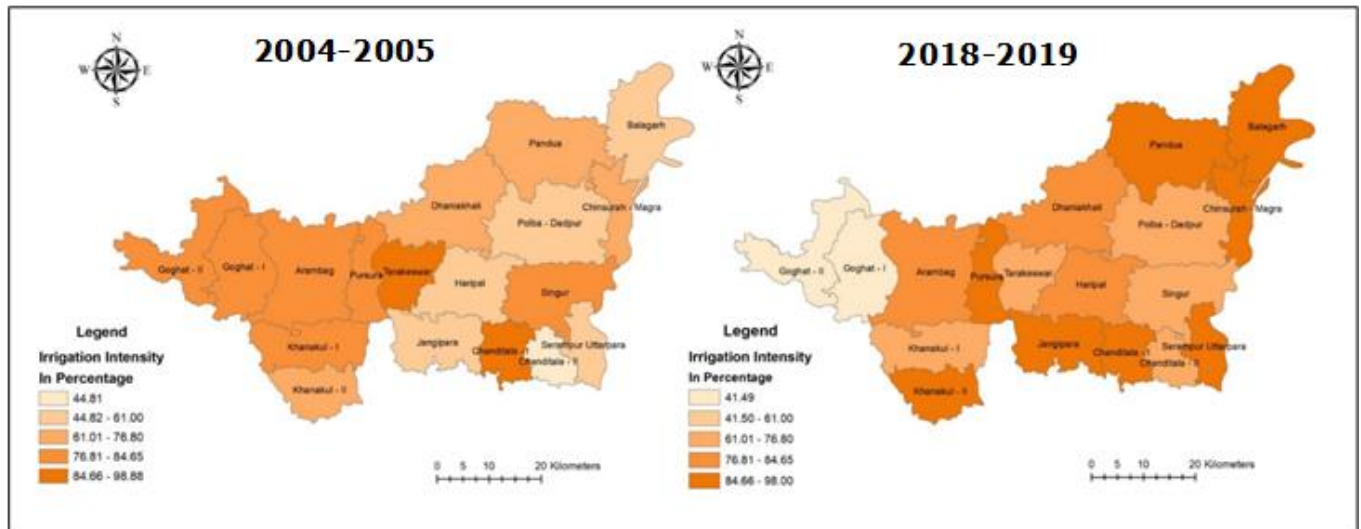


Figure 3: Irrigation Intensity of Hugli District 2004-2005 and 2018-2019

Source: District Statistical Handbook

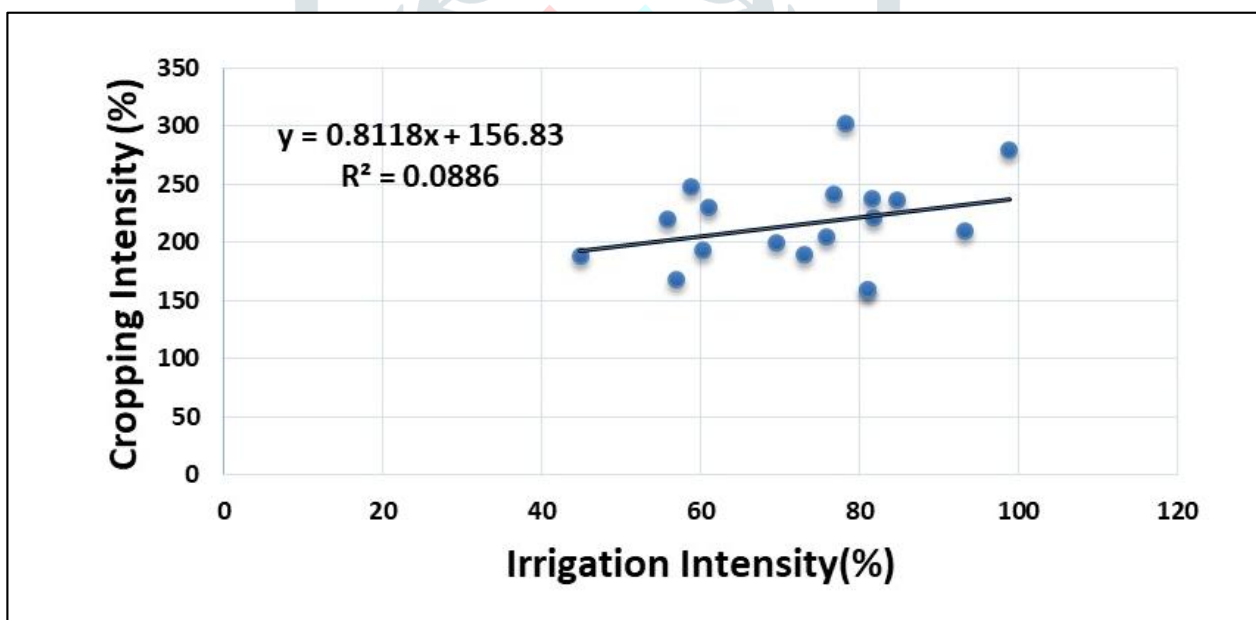
Table-6. Irrigation Intensity and Cropping Intensity in 18 C.D.BlocksHugli District (2004-05 and 2018-19).

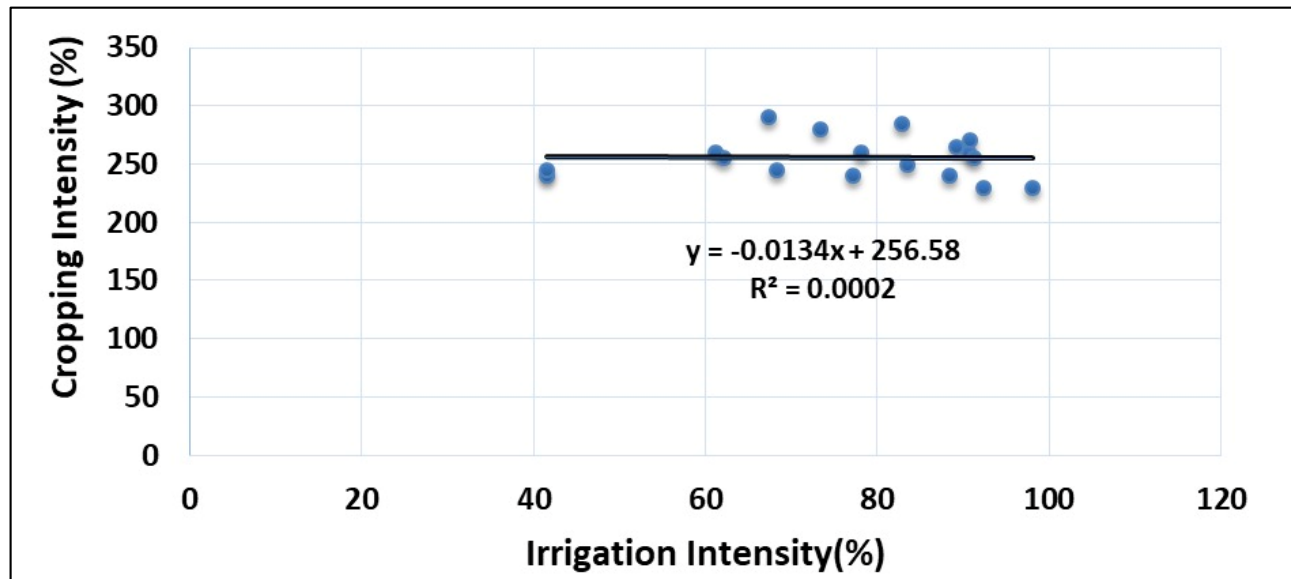
| Name of C.D. Blocks | Irrigation Intensity(%) 2004-05 | Cropping Intensity (%) 2004-05 | Irrigation Intensity(%) 2018-19 | Cropping Intensity (%) 2018-19 | Change in Irrigation Intensity(2004-05 to 2018-19) | Change in Cropping Intensity (2004-05 to 2018-19) |
|---------------------|---------------------------------|--------------------------------|---------------------------------|--------------------------------|--|--|
| Dhaniakhali | 76.80 | 242 | 77.16 | 240 | -0.36 | -2 |
| Panduah | 72.99 | 190 | 90.64 | 260 | -17.65 | 70 |
| Balagarh | 58.83 | 248 | 89.19 | 265 | -30.36 | 17 |
| Chinsurh - Mogra | 69.56 | 200 | 91.19 | 255 | -21.63 | 55 |
| Polba-Dadpur | 60.25 | 193 | 62.18 | 255 | -1.93 | 62 |
| Tarakeswar | 98.88 | 279 | 67.29 | 290 | 31.59 | 11 |
| Haripal | 61.00 | 230 | 82.93 | 285 | -21.93 | 55 |

| | | | | | | |
|---------------------|-------|-----|-------|-----|--------|-----|
| Singur | 84.65 | 236 | 73.40 | 280 | 11.25 | 44 |
| Jangipara | 55.89 | 220 | 90.72 | 270 | -34.83 | 50 |
| Chanditala-I | 93.15 | 210 | 92.35 | 230 | 0.8 | 20 |
| Chanditala-II | 44.81 | 189 | 61.13 | 260 | -16.32 | 71 |
| Srerampur-Uttarpara | 56.85 | 168 | 98 | 230 | -41.15 | 62 |
| Goghat-I | 81.02 | 159 | 41.49 | 240 | 39.53 | 81 |
| Goghat-II | NA | NA | 41.49 | 245 | -41.49 | 0 |
| Arambagh | 81.80 | 221 | 83.47 | 250 | -1.67 | 29 |
| Khanakul-I | 81.55 | 238 | 68.34 | 245 | 13.21 | 7 |
| Khanakul-II | 75.88 | 205 | 88.34 | 240 | -12.46 | 35 |
| Pursurah | 78.16 | 302 | 78.16 | 260 | 0 | -42 |

Source : Calculated by author.

Graph 1 : Impact of Irrigation on Cropping Intensity in Hugli District of West Bengal, India (2004-2005)





Graph 2 : Impact of Irrigation on Cropping Intensity in Hugli District of West Bengal, India (2018-2019)

6. FINDINGS :

The increasing rate of cropping intensity was not uniform and shows a disparity in block level. The block level rate of cropping intensity in different year (2004-05 and 2018-19) is representing in above table. In the year 2004-05 low cropping intensity found in 5 blocks , viz Panduah, Polba-Dadpur, Chanditala-II, Serampore-Uttarpara,Goghat-I.In 2018-19 positive changes in cropping intensity , no blocks found in low category.In this period above 240% Cropping Intensity have been recorded in the district, except 2 blocks ,(Chanditala-I,Serampore-Uttarpara,) year , 2018-19 .Moderate cropping intensity shown in 8 blocks (Singur,Haripal , Jangipara, Chanditala-I,Arambagh, Khanakul-I, Khanakul-II, Chinsurh-Mogra) in 2004-05.

But slower movement in agriculture sector was shown in some urbanized block namely Singur, as a consequence of Singur movement. Pursurah recorded the highest cropping intensity (302%) in 2004-05, but lost its position in2018-19. Due to Land reforms,

improved irrigation management, using of H.Y.V seeds and chemical fertilizer and applied high agricultural management training, mechanization in the

Sector, the positive cropping intensity recorded in every block of the district in 2018-19. Total area came into a very stable position in agriculture sector cropping intensity of Serampur –Uttarpara and Chanditala block are little bit slower than others due to its urbanized position.

Low intensity of irrigation is seen in the blocks of Chanditala II in 2004-05 and Goghat –I and Goghat-II in 2018-19.Moderate intensity of irrigation is found in Serampore-Uttarpara , Jangipara, Balagarh,Chinsurh-Mogra,Polba-Dadpur and Haripal 2003-04. It is found in also Polba-Dadpur block, Chanditala-I,Tarakeswar and Khanakul-I block in 2018-19 , where the percentage of index varies from 50-70 percent . High intensity of irrigation has been visible in the blocks of Panduah , Dhaniakhali , Singur, Arambagh,Pursurah, Goghat-I , Goghat-II, Khanakul-I , Khanakul-II in 2003-04 and Balagarh , Singur . Arambagh, Khanakul-Ii, Dhaniakhali and Haripal in 2018-19. In these blocks intensity of ierrigation varies from 70-90 percent. Very high intensity of irrigation has been

seen only two blocks (Chanditala-I , Tarakeswar) in 2003-04 and six (Chinsurh-Mogra , Serampore-Uttarpara , Panduah , Jangipara , Pursurha and Chanditala –I.

The dependency of cropping intensity on irrigation intensity has decreased from 2004-2005 to 2018-19 as the value of r became 0.0886 in 2004-2005(Graph-1) to 0.0002 in 2018-19(Graph-2). It indicates that the relation between irrigation intensity and cropping intensity remained positive but it became weaker i.e. the dependency of cropping intensity on irrigation intensity is reduced in Hugli District from 2004-2005 to 2018-19.

7. CONCLUSION :

The study reveals that the cropping intensity in Hugli District is not solely dependent on the irrigation but

on the other factors also. Irrigation intensity increased but not equally at block level. Recent advances in agricultural technology have further enhanced the importance of irrigation as it is pre-requisite for the adoption of these technologies. Irrigation should be improved through moderate use of chemical fertilizer and also to avoid ground water table depletion. With the improvement of irrigation, adoption of improved seeds, fertilizers and mechanization are the important factors which increase cropping intensity. There are only two ways to satisfy the increasing food and other demands of the country's rising population either expanding the net area under cultivation or intensifying cropping over the existing area.

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