Irrigational Scenario of Different Cropping Pattern of Murshidabad District, West Bengal

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ABSTRACT:

At present no proper development is possible in agriculture without irrigation. In agricultural development in the Murshidabad district the irrigation plays the most vital role. In the region the irrigation system is mainly based on shallow tube-wells and deep tube-wells as well as the factors like rainfall conditions, rise and fall of ground water and the nature of sub-soils which influence the irrigation efficiency. Irrigation is practiced in the District through the different sources**.** As most of the rivers are non-perennial accepts the Bhagirathi and the Bhairab, alternative supply of water of agricultural land like canals tube-wells. (Shallow and Deep Tube-well both) and lift irrigation are essential. The decadal analysis shows an increase the various sources of irrigation.

KEYWORDS: Irrigation, Cropping Intensity, Residuals.

INTRODUCTION:

Water is one of the natural resource and fundamental to life, livelihood, food security and sustainable development. The past scenario of man has always been marked by an intimate relationship with water. All ancient civilization was set up along the river basin which indicates the importance of water from the most primitive times. Water is indeed most essential for human life and an absolute necessity for activities like drinking, agriculture, industry and allied sectors. It is also a vital element in the development of the economy of a country or region. Earth without water cannot be imagined. The thirst of water became one of the most impressive needs of the earth during the twenty-first century. Water consumption at the global level has risen very fast due to the high rate of population growth and continues to agricultural, industrial and increasing domestic demands.

Only three percent water resources of the Earth is fresh and two-thirds of the freshwater is locked up in ice caps and glaciers. The remaining one percent, a fifth is in remote, inaccessible areas and much seasonal rainfall in monsoonal deluges and floods cannot easily be used. As time advances, water is becoming scarcer and having access to clean; safe drinking water is limited among countries. At present, only about 0.08 percent of the entire world's fresh water is exploited by mankind in ever increasing demand for sanitation, drinking, manufacturing, leisure and agriculture. Due to the small percentage of water remaining, optimizing fresh water we have left from natural resources has been a continuous difficulty in several locations worldwide.

Agriculture accounts for, on average, 70 percent of all water withdrawals globally, and an even higher share of "consumptive water use" due to the evapotranspiration requirements of crops. Worldwide, over 330 million hectares are equipped for irrigation. Irrigated agriculture represents 20 percent of the total cultivated land, but contributes 40 percent of the total food produced worldwide.

Competition for water resources is expected to increase in the future, with particular pressure on agriculture. Significant shifts of inter-sectoral water allocations will be required to support continued economic growth. Due to population growth, urbanization, industrialization, and climate change, improved water use efficiency will need to be matched by reallocation of as much as 25% to 40% of water in water stressed regions, from lower to higher productivity and employment activities. In most cases, this reallocation is expected to come from agriculture, due to its high share of water use. The movement of water will need to be both physical and virtual. Physical movement of water can occur through changes in initial allocations of surface and groundwater resources as well as conveyance of water 'sales', mainly from agricultural to urban, environmental, and industrial users. Water can also move virtually as the production of water intensive food, goods, and services are concentrated in water abundant localities and are traded to water scarce localities.

At the same time, water in agriculture will continue to play a critical role in global food security. Population is expected to increase to over 10 billion by 2050, and whether urban or rural, this population will need food and fiber for its basic needs. Combined with the increased consumption of calories and more complex foods, which accompanies income growth in much of the developing world, it is estimated that agricultural production will need to expand 70% by 2050. If this expansion is not to come at the expense of massive land conversions and the consequent impact on carbon emissions, agriculture will have to intensify. Given that irrigated agriculture is, on average, at least twice as productive per unit of land, provides an important buffer against increasing climate variability, and allows for more secure crop diversification, it is certain that irrigation will continue to play a key role in ensuring global food and nutrition security.

Water is a life-sustaining resource of several creatures and yet a vital commodity for human survival. Fortunately, Banka district gets average annual precipitation of about 1168mm. However, due to the seasonality of precipitation and inadequate water storage capacities, most of the water runoff and river water flows down uselessly and only a small proportion of available water is usually harnessed for producing and consumption purposes. On the other hand, the requirements of water resource are increasing phenomenally with the advancement of society. Now the use of water is not limited to drinking, domestic, irrigation purposes but has multiplied to a great extent. It functions as an industrial ingredient, a medium of transport and purifying agent as well as recreational asset. This is why we need greater attention for its management through recycling.

AIM AND OBJECTIVE OF RESEARCH:

The purpose of present research work is to analyze the irrigation level of cropping of Murshidabad district, West Bengal. In this research an attempt has been made to examine the main aim and objective by following.

1. To identify the irrigation intensity of the district.
2. To examine the cropping intensity throughout the district.
3. To analyze the residuals of irrigation and cropping intensity of the district

LOCATION AND EXTENT OF THE STUDY AREA:

Geographically Murshidabad District is located between $23^0$43'30" and $24^0$50'20" north latitude and $87^0$4917' and $88^0$46' east longitude. It is the northern most segment of lower Gangetic plain. The district Murshidabad is bounded by Malda district in north by Jharkhand state boundary and Birbhum district in west, Burdhaman and Nadia districts in the south and

India – Bangladesh international boundary in the east. The Bhagirathi River passes through the middle of the district from north to south. This district is divided into two parts by the river Bhagirathi. The western part having stiff clay soil, reddish in colour and undulated topography is called 'Rarh' and simultaneously the eastern part of the Bhagirathi containing alluvial and fertile soil is known as "Bagri."

The district extending over an area of 5324 km^2 and the land holding is only 0.61 hectare per persons and having a population of 7103,807 containing 3627,564 male and 34,76,243 female. 1334 person/sq.km is the population density of this district according to census 2011. Murshidabad is the 5th populated district in West Bengal. Census of India coded Murshidabad district as 333.

SOURCE OF DATA AND METHOLOGY:

For proposed research the source materials has based on secondary sources. The major secondary sources are District Census Handbook (Murshidabad, 1991-2011), District Land and Reforms, District Gazetteers (Murshidabad), Topographical maps (Survey of India), District Planning Series Maps (NATMO), Google Earth Imageries, Govt. of West Bengal and various government departmental documents, books, journals, conference papers; official websites etc. The data have been proposed to be analyzed both in ***qualitatively*** and ***quantitatively***. Various socio-economic parameters correlate to analyze critically with suitable statistical techniques (Pearsonian co-efficient of correlation, t test, goodness of fit, etc.). The above quantitative analysis has been pictured to solve with the help of various software like SPSS, MapInfo, ArcGIS, Erdas Imagine, and Google Earth Pro.

SOURCES OF IRRIGATION IN MURSHIDABAD DISTRICT:

Block wise distribution of irrigated areas shows increase in the blocks Raninagar-II, Jalangi, Berhampore, Bhagwangola-I, Bhagwangola-II, Sagardighi, Bharatpur-II, Beldanga-I, Hariharpara, Lalgola, Khargram, Domkal, Murshidabad-Jiaganj and Bharatpur-I, Beldanga-II, Nowda, Bharatpur-I, where Burwan and Raghunathganj-I where emphases is given in the development of tube-wells (Shallow and Deep). Irrigated areas show decrease in the Blocks Samserganj, Farakka, Suti-I, Suti-II and Raghunathganj-II which are due to the occurrence of flood almost in every year. Reveal a clear picture about the irrigated and non-irrigated areas of the study region.

Table No – 1 Source of Irrigation in Murshidabad district

Source of Irrigation	2001-02	2011-12
	Irrigated Area in hectare	Irrigated Area in hectare
Canal	1654	4233
Tank	13975	7909
River-lifted Irrigation	7735	11448
Deep Tube-well	10829	16539
Shallow Tube-well	624	3614
Others	78215	127352

Source: Bureau of Applied Economics and Statistics Office, Kolkata, Government of West Bengal.

DISTRIBUTION OF IRRIGATED AREA IN MURSHIDABAD DISTRICT DURING THE STUDY PERIOD

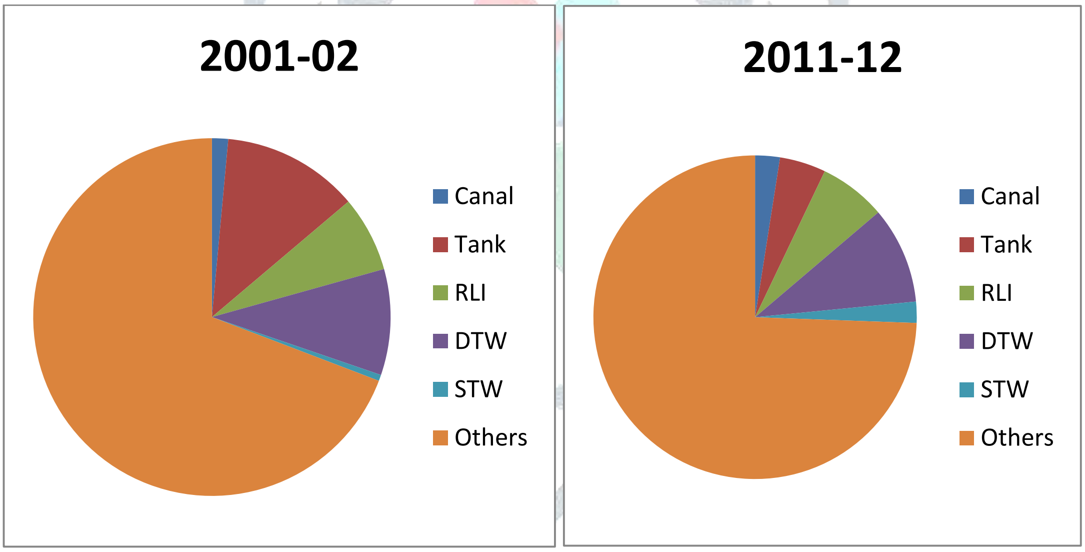

Fig. No. 1

Table No – 2 Block wise Irrigated Area and Non-Irrigated Area in Murshidabad district during the year 2001-02

Name of the Blocks	Irrigated area in hectare	Irrigated area in percentage (%)	Non-irrigated area in hectare	Non-irrigated area in percentage
Farakka	1740	39.91	2620	60.09
Samserganj	1710	80.28	420	19.72

Suti-I	2376	40.07	3554	59.93
Suti-II	1814	67.19	886	32.81
Raghunathganj-I	2700	26.35	7460	73.43
Raghunathganj-II	2170	56.96	1640	43.04
Sagardighi	4052	13.84	25228	86.16
Lalgola	5178	50.37	5102	49.63
Bhagwangola-I	2611	26.11	7389	73.89
Bhagwangola-II	36216	34.2	6187	65.8
Raninagar-I	4086	44.08	5184	55.92
Raninagar-II	3665	39.28	5665	60.72
Murshidabad-Jiaganj	5482	37.89	8988	62.11
Nabagram	5200	22.03	18400	77.97
Khargram	7658	35.24	14072	64.76
Burwan	7998	28.79	19782	71.21
Kandi	6549	36.79	11251	63.21
Bharatpur-I	3066	23.16	10174	76.84
Bharatpur-II	3664	30.82	8226	69.18
Beldanga-I	2546	18.99	10864	81.01
Beldanga-II	3035	22.12	10684	77.88
Nowda	5988	30.38	13722	69.62
Hariharpara	2404	13.2	15806	86.8
Berhampore	11902	46.35	13778	53.65
Domkal	8740	39.55	13360	60.45
Jalangi	3482	23.06	11618	76.94

Source: i) *Principal Agricultural Office, Berhampore, Murshidabad District, Government of West Bengal, India.*

ii) *Bureau of Applied Economics and Statistics Office, Kolkata, Government of West Bengal.*

Table No – 3 Block wise Irrigated Area and Non-Irrigated Area in Murshidabad district during the year 2011-12

Name of the Blocks	Irrigated area in hectare	Irrigated area in percentage (%)	Non-irrigated area in hectare	Non-irrigated area in percentage
Farakka	495	11.63	483.65	88.65
Samserganj	1268	33.86	1234.14	66.14
Suti-I	1949	27.78	1921.22	72.22
Suti-II	2524	44.79	2479.21	55.21
Raghunathganj-I	3084	54.88	3029.12	45.12
Raghunathganj-II	134	24.62	1009.38	75.38
Sagardighi	19222	82.54	19139.46	17.46
Lalgola	6092	60.08	6031.92	39.92
Bhagwangola-I	8604	87.51	8516.49	12.49
Bhagwangola-II	9725	8.12	9641.88	16.88
Raninagar-I	4945	47.1	4897.9	52.9
Raninagar-II	11445	94.06	11350.94	5.94
Murshidabad-Jiaganj	6160	42.34	6117.66	57.66
Nabagram	7393	1.46	7361.54	68.54
Khargram	20654	78.26	20575.74	21.74
Burwan	10464	57.49	10406.51	42.51
Kandi	5994	32.47	5961.53	67.53
Bharatpur-I	6631	50.08	6580.92	49.92
Bharatpur-II	8150	91.57	8058.43	8.43
Beldanga-I	8269	61.64	8207.36	38.36
Beldanga-II	6951	50.66	6900.34	49.34
Nowda	8884	49.336	8834.64	50.64
Hariharpara	13295	72.95	13222.05	27.05
Berhampore	13680	96.47	13583.53	3.53
Domkal	13284	59.87	13224.13	40.13
Jalangi	9600	94.4	9505.6	5.6

Source: i) Principal Agricultural Office, Berhampore, Murshidabad District, Government of West Bengal, India.

ii) Bureau of Applied Economics and Statistics Office, Kolkata, Government of West Bengal.

IRRIGATION INTENSITY:

Irrigation intensity of the study region truly reflects in agricultural development which is calculated on the basis of the formula.

$$\text{Irrigation Intensity (II)} = \frac{GI \times 100}{GS}$$

Where, GI is the gross irrigated area and GS is the Gross cropped area.

In 2001-02 irrigation intensity in the Murshidabad District is found to be 16.73% which is promoted to 25.06% in 2011-12 due to an expansion of irrigation facilities during the study period. The Block wise distribution of the irrigation intensity reveals increase in almost all the Blocks of the District from the year 2001-02 to 2011-12.

In 2001-02 the highest irrigation intensity is observed in the Blocks Farakka, Samserganj, Raghunathganj-II, Berhampore, Kandi, Burwan followed by Raghunathganj-I, Khargram, Bharatpur-II, Suti-I, Suti-II, Sagardighi, Lalgola, Bhagwangola-I, Bhagwangola-II, Murshidabad-Jiaganj, Nabagram, Bharatpur-I and Domkal respectively.

In 2011-12 an increase is marked in irrigation intensity mainly in the Blocks Raninagar-II, Jalangi, Domkal, Bhagwangola-I, Bhagwangola-II, Bharatpur-I, Bharatpur-II, Burwan, Khargram, Nabagram and Sagardighi followed by Berhampore, Hariharpara, Kandi, Beldanga-I, Beldanga-II, Nowda, Raninagar-I, Murshidabad-Jiaganj, Lalgola and Suti-II, respectively.

Interestingly it is observed that the Blocks Farakka and Samserganj, Suti-I, Raghunathganj-I and Raghunathganj-II reveal a decrease in irrigation intensity which is marked to the intervention of other economic activities, particularly Beedi (a kind of cigarette) making. The farmers are not interested to investment to irrigation, rather are more inclined towards the use of natural rain water.

Table No – 4 Block wise Distribution of Irrigation Intensity in Murshidabad District (2001-02 & 2011-12)

Name of the Blocks	Irrigation Intensity in percentage (%)	
	2001-02	2011-12
Farakka	26.24	6.19
Samserganj	28.75	11.71
Suti-I	19.98	12.75
Suti-II	16.65	19.93
Raghunathganj-I	23.15	13.29
Raghunathganj-II	30.16	7.42

Sagardighi	15.12	35.9
Lalgola	15.91	17.99
Bhagwangola-I	16.1	32.14
Bhagwangola-II	17.01	40.43
Raninagar-I	13.16	18.37
Raninagar-II	12.43	29.72
Murshidabad-Jiaganj	15.57	16.1
Nabagram	16.7	28.57
Khargram	21.49	55.83
Burwan	28.37	28
Kandi	25.3	21.99
Bharatpur-I	18.45	32.17
Bharatpur-II	22.47	87.4
Beldanga-I	7.28	20.35
Beldanga-II	10.22	17.16
Nowda	13.99	16.27
Hariharpara	6.33	23.74
Berhampore	25.86	20.79
Domkal	17.35	28.75
Jalangi	9.83	30.2

Source: Principal Agricultural Office, Berhampore, Murshidabad District, Government of West Bengal, India.

RESIDUAL OF IRRIGATION INTENSITY AND CROPPING INTENSITY:

Two residual maps are outlined for the year 2001-02 and 2011-12 to show the relationship between the cropping intensity and irrigation intensity. It is observed from the residual map of the year 2001-02 that the positive lines are passing through the Blocks Domkal, Berhampore, Raninagar-I, Raninagar-II, Lalgola, Raghunathganj-II, Suti-I, Suti-II, Samserganj, Farakka, Beldanga-I and Hariharpara because of the widespread use of high yielding varieties and chemical fertilizers, whereas the negative lines are passing mainly through the western part of the District. In 2011-12 the positive lines are passing through the eastern part of this District mainly in the blocks Jalangi, Raninagar-II, Berhampore, Hariharpara, Beldanga-I, Beldanga-II, Nowda, Bharatpur-II, Bhagwangola-I, Lalgola, Sagardighi, Raghunathganj-I and Raghunathganj-II whereas the negative lines are passing through the western part and northern part of this District. The zero lines, passing through the areas, reflect the perfect relation between cropping intensity and irrigation intensity.

Table No – 5 Residual showing the relationship between the irrigation intensity and cropping intensity (2001-02)

Name of the Blocks	Irrigation intensity (%) (X)	Cropping Intensity (%) (Y)	Yc = (a+bx)	Y-Yc
Farakka	26.24	152.12	170.18	-18.06
Samserganj	28.75	279.24	158.94	120.3
Suti-I	19.98	200.58	198.14	2.44
Suti-II	16.65	403.58	213.01	190.57
Raghunathganj-I	23.15	114.79	183.96	-69.17
Raghunathganj-II	30.16	188.83	152.64	36.19
Sagardighi	15.12	91.51	219.82	-128.31
Lalgola	15.91	316.54	216.29	100.24
Bhagwangola-I	16.1	162.19	215.46	-53.27
Bhagwangola-II	17.01	201.03	211.37	-10.35
Raninagar-I	13.16	334.87	228.58	106.3
Raninagar-II	12.43	316.13	231.87	84.26
Murshidabad-Jiaganj	15.57	243.39	217.84	25.55
Nabagram	16.7	131.93	212.77	-80.84
Khargram	21.49	163.98	191.37	-27.39
Burwan	28.37	101.47	160.63	-59.16
Kandi	25.3	145.41	174.35	-28.94
Bharatpur-I	18.45	125.49	204.94	-79.45
Bharatpur-II	22.47	137.16	187.01	-49.85
Beldanga-I	7.28	260.64	24.84	5.8
Beldanga-II	10.22	216.46	241.72	-25.26
Nowda	13.99	217.23	224.9	-7.67
Hariharpara	6.33	208.5	259.09	-50.59
Berhampore	25.86	179.2	171.84	7.36
Domkal	17.35	227.97	209.88	18.09
Jalangi	9.83	234.7	243.49	-8.79

Source: i) Principal Agricultural Office, Berhampore, Murshidabad District

ii) Calculated by Scholar

Table No – 6 Residual showing the relationship between the irrigation intensity and cropping intensity (2011-12)

Name of the Blocks	Irrigation intensity (%) (X)	Cropping Intensity (%) (Y)	Yc = (a+bx)	Y-Yc
Farakka	6.19	183.39	307.11	-123.72
Samserganj	11.71	289.04	292.12	-3.09
Suti-I	12.75	217.97	289.32	-71.35
Suti-II	19.93	224.76	269.83	-45.07
Raghunathganj-I	13.29	412.8	287.84	124.96
Raghunathganj-II	7.42	331.81	303.78	28.03
Sagardighi	35.89	230	226.352	3.47
Lalgola	17.99	334.07	275.1	58.96
Bhagwangola-I	2.14	272.29	236	35.59
Bhagwangola-II	40.43	205.57	214.19	-8.62
Raninagar-I	18.37	256.38	274.06	-17.69
Raninagar-II	29.72	316.46	243.26	73.21
Murshidabad-Jiaganj	16.1	262.94	280.22	-17.28
Nabagram	28.57	110.13	246.39	-136.26
Khargram	55.83	140.18	172.39	-32.22
Burwan	28	205.34	247.93	-42.59
Kandi	21.99	147.7	264.25	-116.55
Bharatpur-I	32.17	155.69	236.62	-80.93
Bharatpur-II	87.4	104.77	86.72	18.05
Beldanga-I	20.35	302.92	268.7	34.23
Beldanga-II	17.16	295.25	277.35	17.9
Nowda	16.27	303.4	279.77	23.63
Hariharpara	23.74	307.24	259.48	47.77
Berhampore	20.79	464.09	267.5	196.59
Domkal	28.75	208.29	245.91	-37.62
Jalangi	30.2	312.56	241.96	70.6

Source: i) Principal Agricultural Office, Berhampore, Murshidabad District

ii) Calculated by Scholar

CONCLUSION:

Water resource management is likely to sustain all daily life activities with proper form. In the short term, more efficient use of water could dramatically expand available resources. For example, 60 to 75 percent irrigation water of developing countries never reaches the crops or is lost as evaporation or run-off. The usable water is limited in amount, and efforts have to be made to find out the best possible uses for the same. This will necessarily involve the fixing priorities of allocation for various uses. The optimum use of water resources involves conservation. Much of development and increasing attention is being made to these aspects of the problems as the demand for water grows with increasing population and its activities. Many surveys have been made followed by experimental and constructional works to conserve a greater proportion of rainfall by means of dams and weirs along rivers and streams. Rainwater can be harvested by using appropriate methods and afforestation, desiltation of tanks and reservoirs and by watershed management methods so as to conserve the valuable water resource.

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