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Utilization of Irrigation on agriculture in Uttar Dinajpur District, West Bengal, India

Suchandra Neogi
Research Scholar
Department of Geography
The University of Burdwan
West Bengal, India

Abstract

Irrigation is practised in those areas where rainfall is seasonal and the amount is not satisfactory for crop production. The monsoonal land having seasonal rainfall, require irrigation either from canal, tank or well so as to ensure agricultural production. In India rainfall is seasonal and the distribution of rainfall is uneven. India has the largest acreage of land under irrigation. In the high irrigated area the cropping intensity is found high and in the low irrigated area cropping intensity is found low. This article focussed on the present status of irrigation and cropping pattern on block basis in the Uttar Dinajpur district, in West Bengal, India. After applying different methods and technique (Pearson's product moment correlation co-efficient, Regression line etc.). It has been concluded that the districts has a positive relation between two variables. Though the ground water utilisation is the main source of irrigation but other sources are also used to increase the cropping intensity in the region. Some blocks gets high irrigation facilities but the facilities is not well enough.

Key words: *1.Irrigation, 2.Irrigation by Teesta Canal, 3.Cropping Intensity , 4.Suggested remedial measures.*

Introduction:

Water potential in India is vast. This can be tapped and usefully employed for irrigation. Irrigation is the artificial application of water to the land or soil. It is used to assist during periods of inadequate rainfall. Irrigation also has a few other uses in crop production. Cropping intensity is generally high in the well irrigated area is found low in less rainfall area. The intensity of cropping refers to raising a number of crops, from the same land during one agricultural year. Higher the index, greater is the efficiency of land use .

The cropping intensity has direct correlation with assured irrigation which enables farmers to go for multiple cropping and use higher dose of fertilisers and HYV seeds. As the water availability is high so the high yielding variety seed can be introduced in the district. High yielding variety seeds needs to be introduced with organic farming as the cattle population is good in the district. As the agricultural sector is mainly dependent on good irrigation facility the whole area needs to be brought under good irrigation facility. Soil amelioration will result in increased crop yield. The aforesaid area is high potential to in increase cropping intensity to 250. 63% of net cropped area is irrigated and multiple cropping is practiced, for that reason Uttar Dinajpur stands first in rate of growth of good grain productivity among all the district of West Bengal.

Location: After bifurcation of West Dinajpur district Uttar Dinajpur was created on 1st April 1992. The district occupies an area of 3142 km^2 enclosed by Bangladesh on the east, Bihar on the west, Darjeeling

district and Jalpaiguri district on the north and Malda district and South Dinajpur district on the south and lies between latitude 25 ^{0} 11' N to 26^{0} 49' N and longitude 87^{0} 49'E to 90^{0} 00'E. The district is one of the most backward in the state.

Hydrogeology: The district is peculiar in shape very much like the blade of a scythe .The flow of the river shows that the land is flat, sloping gently towards the south .The soil of the district may be classified as old alluviam, alluvium in the transition phase and new alluvium. Generally the soil of the district is fertile 46.32% and 22% of the total cropped area are of sandy loam and loam.
Internal drainage of the soil is good .The entire soil group is moderately rich in phosphate and potash content. The major river systems are Kulik, Nagar and Mahananda. This river network provides sufficient surface water all over the district. The northern portion of Uttar Dinajpur has two indentified fault structures running on either side of it, known respectively as the Kishanganj & Kartoya faults. Underground water supply and management is satisfactory in this region. Ground water occurs both under unconfined and confined condition within the explored depth maximum 600 mbgl. Aquifers are fairly thick and regionally extensive with large yield prospect of about 150 m^{3}/ hr .Ground water can be utilised through heavy tube wells within 120 mbgl and shallow tubewells within 60 mbgl (Central Ground Water Board, West Bengal)

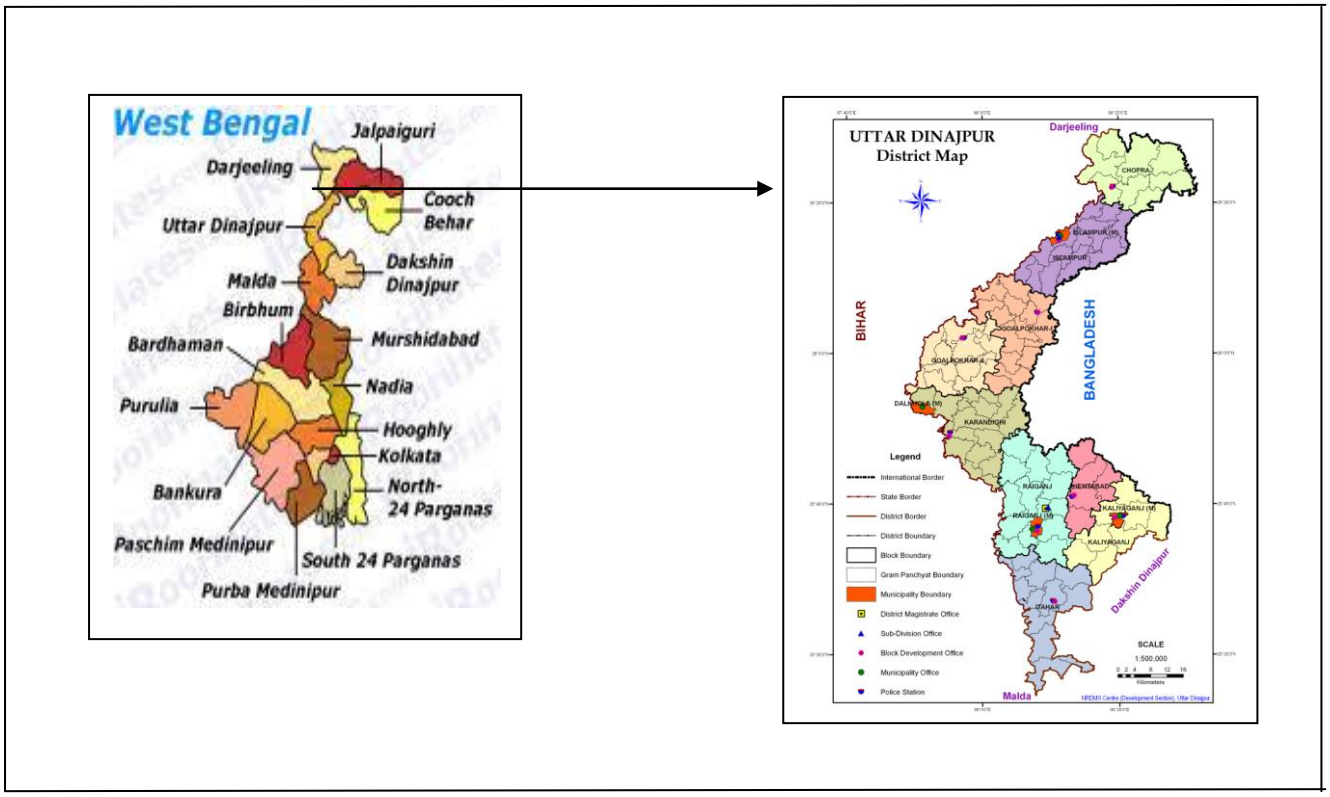


Fig 1 : Locational map of the study area

Materials and methods : The entire work mainly based on secondary data i.e, collected from District Statistical Hand book of Uttar Dinajpur (2008), District Census Handbook of Uttar Dinajpur (2011), Central Ground Water Board ,West Bengal (CGWB),Comprehensive District Agriculture Plan for Uttar Dinajpur District and many others research papers .

Data for block level irrigated area of Uttar Dinajpur district has been calculated from comprehensive district agriculture plan for Uttar Dinajpur district. Considering these two variables,

product moment correlation coefficient (Karl Pearson's method), Regression analysis have been done with the Microsoft Excel - 2007 software. Finally different thematic maps also have been prepared.

Result &discussion

Irrigation: Irrigation potential upto 2000-01 reveals that GW has been the main source of irrigation in Uttar Dinajpur. Shallow GW table, high rainfall and occurrence of alluvial soil have created opportunities for easy access to GW by the local farming community. On an average about 56% of total potential is utilised by the farmers for irrigation from GW sources. As such, it is desirable to tap the potential to a further extent and to bring more cropped area under irrigation leading to higher cropping intensity and production. Hemtabad block leads the table in irrigation coverage whereas Goalpokher I has irrigation the lowest irrigation coverage.

The normal rainfall of the district is 1971.00 mm. The climatic condition is characterized by hot summer abundant rainfall and humidity. About 63% of net cropped area is irrigated .There is large water area is the district which can be used as sources of irrigation.

The rivers are either rain fed or perennial with the source from the normal snow melt from the Himalayas. Presence of Kulik, Mahanada, Dauk Nagar and a number of others streams provide sufficient surface water all over the districts. High irrigation potential already created in this region through tube wells, deep tube well and other water bodies. Approx 151631 ha. area is under irrigation coverage. Soil type is predominantly sandy loam to loam which great prospect of GW recharge only 54.08% of total irrigation potential is utilised only 30% of TIPC by surface water is used.

The district on an average has good rainfall and it is spread over the months. The ground water recharge is also good because of the good rainfall. It is surprising that even then irrigation potential is less.

With the help of irrigation department, it is necessary to increase the irrigation potential in the district. As the individual farmers are not having enough money, are largely depends upon monsoon for water needs.

Table no – 1
Year wise average rainfall in mm

Year	Rainfall (mm)
2003	2117.1
2004	1766.8
2005	2014.7
2006	1613.0
2007	1726.3

Source :Agricultural Finance Corporation Ltd .Kolkata

In this district the gross irrigated area = 310.892(ha), net irrigation area = 272.58 and rainfed area is 194.908 ha. Ground water is main source of irrigation on but there are other sources of irrigation also present. There are many sources of irrigation which are used in the district .Below the following tables are show about the sources of irrigation.

Table no – 2
Year wise different sources of irrigation

Year	Govt. canal	Tank	HDTW	MDTW	LDTW	STW	RLI
2001-02	7413	7413	186	7	18	40837	16
2002-03	7413	7413	191	7	-	40940	11
2003-04	10417	10417	196	7	47	35785	11
2004-05	10456	10456	169	7	18	51344	13
2005-06	10494	10494	178	17	52	55312	17

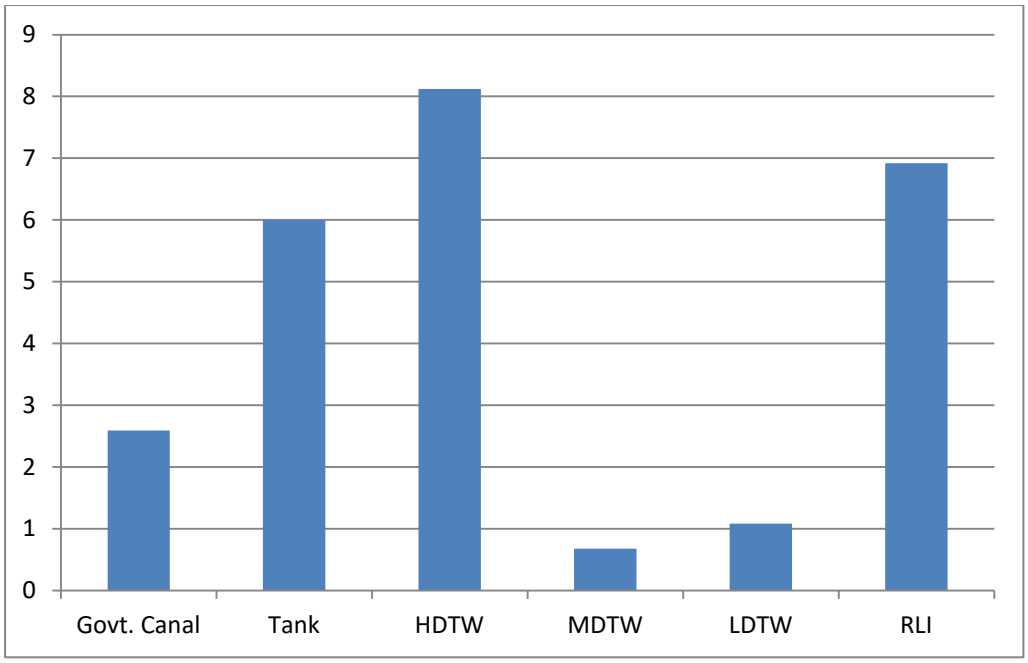
Source :- Agri Marketing Board ,West Bengal .

Table no – 3
Area irrigated by different sources in uttar dinajpur district

Sources of irrigation	Area (in%)
Govt.canal	2.59
Tank	6.00
HDTW	8.12
MDTW	0.68
LDTW	1.08
RLI	6.92

Source :- Agrimarketing board ,west bengal .

Area irrigated by different sources in uttar dinajpur (2005-06)



On the basis of irrigation (in percentage) utilisation in area, there are three categories would be identified.

Irrigation utilisation area

i) **Low irrigated area:** Uttar Dinajpur district has nine blocks, among them only blocks falling in this category i.e., Islampur and Goalpokher –I, where irrigation utilization is below 60%.

ii) **Medium irrigated area:** Six blocks – Chopra, Goalpokher - II, Karandighi, Raiganj, Kaliaganj and Itahar are included with the percentage values ranging between 60 - 80.

iii) **High irrigation area:** Only Hemtabad block falling in this category with a percentage value exceeds 80.

Table no – 4

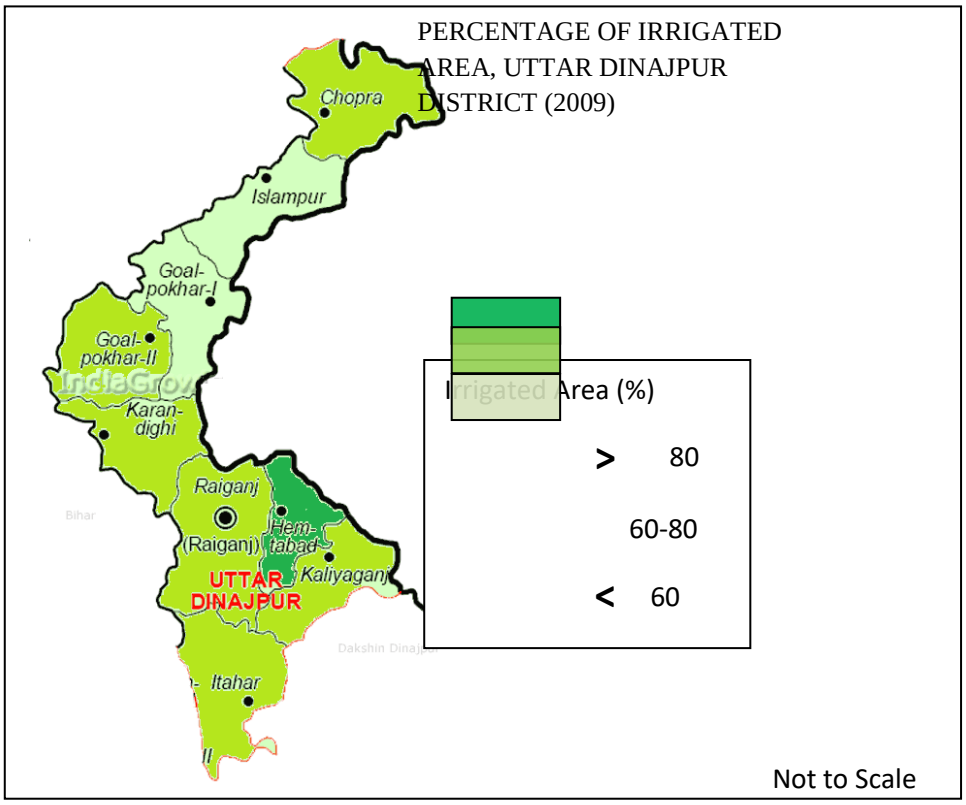
Block wise distribution of irrigated area &cropping intensity, uttar dinajpur district, 2009.

Sl. No.	Name of the Block	Irrigated Area (%)	Net sown Area (hec)	Total cropped Area (hec)	Cropping intensity
1	Chopra	60	22260	37840	169.99
2	Islampur	58	26000	36010	138.5
3	Goalpokher-I	55	29500	35840	121.49
4	Goalpokher -II	61	29076	32208	110.77
5	Karandighi	68	29061	38584	132.77
6	Raiganj	63	35200	47421	134.72
7	Hemtabad	81	16653	19160	115.05
8	Kaliaganj	67	23360	31160	133.39
9	Itahar	60	30182	34856	115.49

Source :- (C-Dap, Uttar dinajpur district,West bengal)

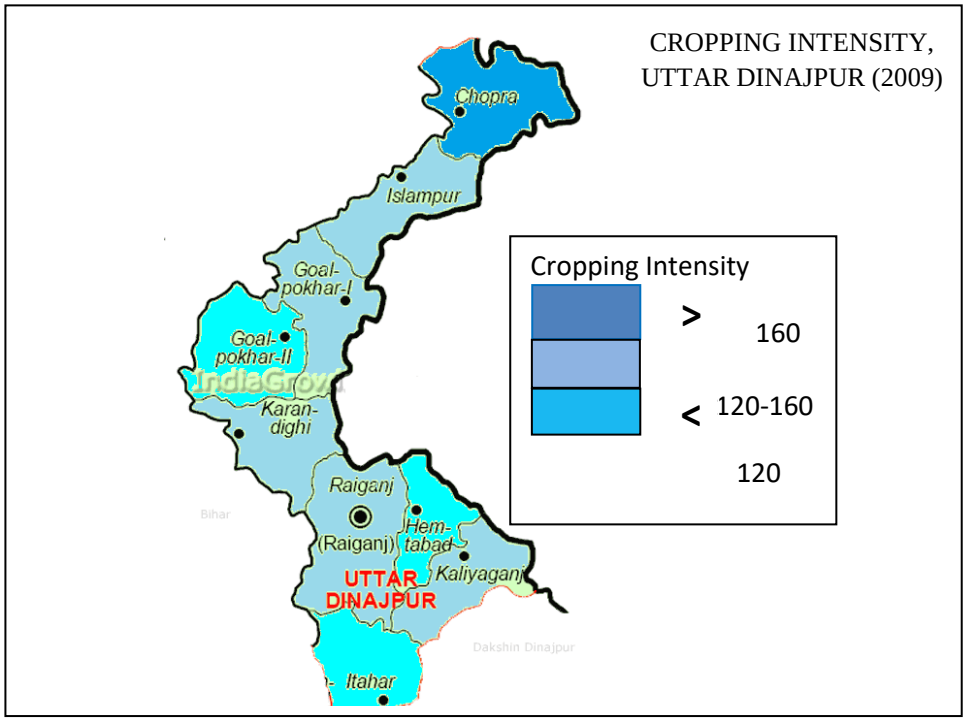
Only in Hemtabad block, the highest percentage of irrigated area is found. So it may be considered that the ground water utilisation in irrigation and surface irrigation is very high here. In this district less percentage irrigated area is Goalpokher - I. Here surface irrigation utilised sufficiently. Though the district has abundant source of ground water and also has good annual rainfall but the farmers are less dependent on surface water than the ground water. Non optimum use of ground water through proper irrigation methods, presence of acidic soils and non availability of water during non monsoon periods has of led to low crop production. Inadequate irrigation and drainage system is the basic cause for water stagnation. Since drainage in this district tends to be inefficient, a portion of the monsoon runoff regularly gets impounded between the months of August & February, reducing the extent of land available for crop agriculture in the affected blocks. Elsewhere within the district where the topography is more regular and drainage is unobstructed, prime conditions usually exist for irrigated agriculture. Rainfall patterns vary quite widely within Uttar Dinajpur with sharp divergence in annual precipitation between the five southern blocks of Karandighi, Raiganj, Hemtabad, Kaliaganj and Itahar and the four Terai blocks of Chopra, Islampur, Goalpokher- I, Goalpokher – II. Thus while southern most Itahar receives around 1400-1500 mm of rain annually, northern most Chopra receives much higher precipitation ranging between 240-2700 mm per annal. This is the main cause for uneven distribution of irrigation over the district. The irrigation facility is much higher in that block which have not sufficient supply of water for cultivation.

Irrigation by teesta canal: Teesta Barrage Project is envisaged to provide annual irrigation to an area of 5,27,000 ha in the six district of north Bengal, Uttar Dinajpur is among of them. One pick up barrage across river Dauk at Chopra in Uttar Dinajpur district is found. Mahananda main canal and Nagar – Tangon main canal passing through a little bit portion of the district. Dauk Nagar Main Canal (DNMC) of 80.20 km length to provide annual irrigation of 14,590 ha over a CCA of 94750 ha. Total no. of distributaries =18.



Cropping intensity regions

This district is predominantly agro based and agriculture is the main stay. Majority of the rural population is engaged in agriculture and multiple cropping is practiced. The cropping intensity is not same in all the districts. The percentage of irrigated area is high in Hemtabad district, here the percentage of gross cropped area records low. compared to the other blocks shows a positive relationship between the irrigated area and cropping intensity. Overall this in the general scenario of the district.



Percentage of Irrigated Area, Uttar Dinajpur District - 2009

1) < 60 = Islampur, Goalpokher – I

2) 60 – 80 = Chopra, Goalpokher – II, Raiganj, Karandighi, Itahar

3) > 80 = Hemtabad

Fig-4 : block level cropping intensity in uttar dinajpur district, 2009.

Cropping Intensity	Value in percentage	Number of blocks	Name of the Blocks
Low	<120	3	Goalpokher – II, Hemtabad , Itahar
Moderate	120 - 160	5	Islampur, Goalpokher – I, Karandighi ,Raiganj, Kaliaganj
High	>160	1	Chopra

Source :- C-DAP UTTAR DINAJPUR

The annual rainfall amount is not same all over the district. Hemtabad gets minimum rainfall, so the percentage irrigated area is high in Hemtabad but the cropping intensity shows low. But in Chopra block the annual rainfall is very high, percentage of irrigated area are moderate but cropping intensity shows very high here.

Regression line of two variables and their analysis

In this part of analysis percentage irrigated area and cropping intensity have been assessed as independent (x) and dependent variables (y) respectively (Fig no. 5). From the arrangement of dots and orientation of best fit line (Yc = a + bx), it is clear that both the variables are correlated positively. After getting the calculated value by using Pearson's product moment correlation coefficient (0.15) for the district and block, it indicate that the relation between two variables is insignificant .Though the districts received good annual rainfall and the ground water table is so good here but the irrigation facilities sufficiently used by different blocks. In this district the sources of irrigation are govt. canals, tank , HDTW , MDTW , RLI etc. It is important to improve the irrigation facilities all over the districts so that the cropping intensity in the various blocks improves. The increase in cropping intensity will increase the agriculture production also.

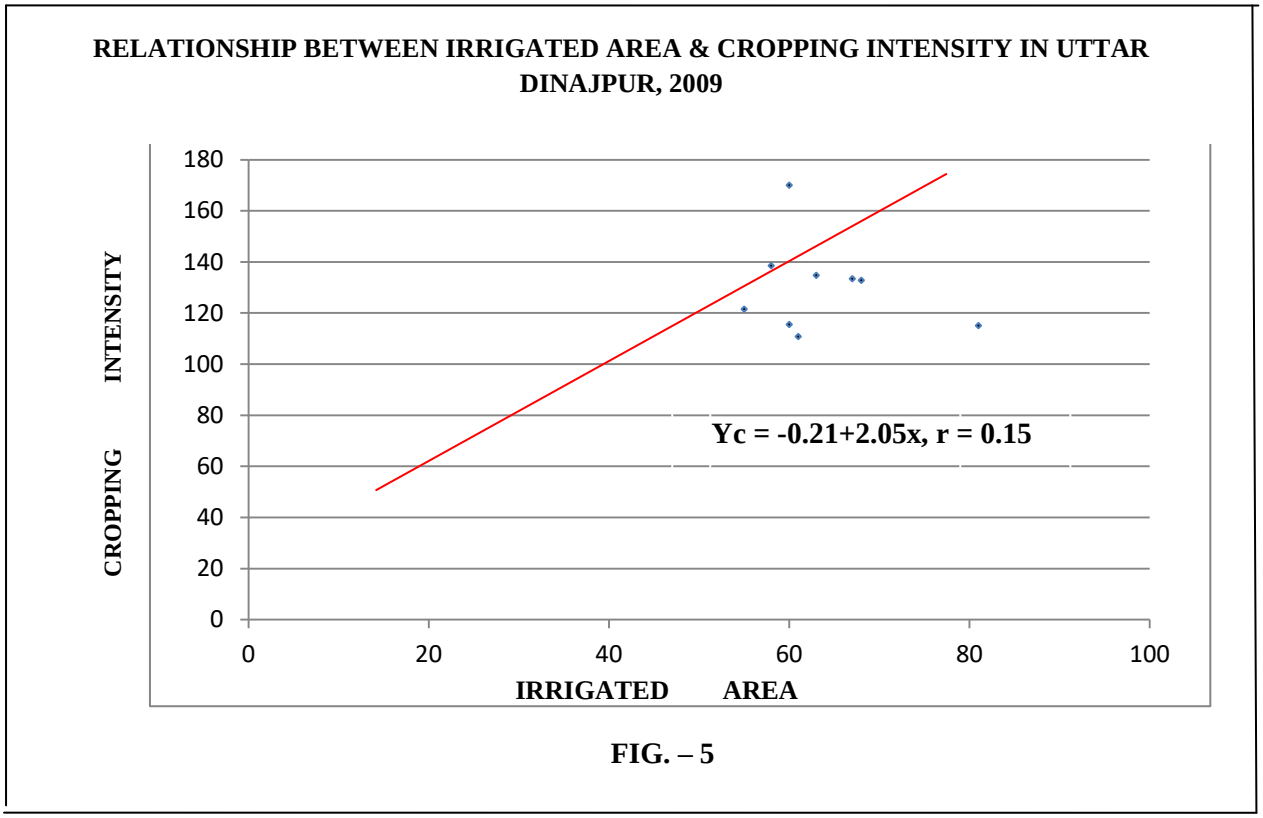


FIG. – 5

Suggested remedial measures:- It is important to improve the land utilization of the various crops so that the cropping area in the various blocks improve. The cropping intensity is not same in all the districts so first step is to have a uniform cropping intensity in all the area. The increase in cropping intensity will increase the agriculture production also. With proper water harvesting measures cropping intensity can be increased. By effective water management practices & with the use of suitable agricultural inputs gross cropped area can be increased. Little effort has been made so far towards surface water irrigation through harvesting of rainwater, so the farmers should utilised that irrigation system widely.

Conclusion:- Improvement in agriculture of a country mainly depends on ground water utilization and cropping pattern of that region. Irrigation is needed in those area where ground water facilities are lacking. Irrigation potential ranges from 25 to 40 percent in different blocks of the district so there should be given special attention to the use of ground water. But today increasing occupation avenues and lack of interest among young farmers in the agricultural and allied activities is found. Little knowledge about surface water conservation and management, low irrigation efficiency (57.49%) are responsible for

reducing ground water potential. So, therefore in this district, there needs a efficient and scientific, modern technique of irrigation system and other surface water irrigation facilities for increase in the ground water table for future use as well as increase in agriculture productivity.

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