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AGRICULTURAL REGIONALISATION WITH SPECIAL REFERENCE TO CROPPING INTENSITY USING GEOSPATIAL TECHNIQUE – A CASE STUDY OF BIRBHUM DISTRICT, WEST BENGAL, INDIA

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ABSTRACT: This study presents a Cropping Intensity with related to different physical and socio-economic factors in Birbhum District. The diversified nature of land use pattern, cropping intensity, irrigation intensity and cropping pattern of all blocks have increased the cropping intensity of the land. Cropping Intensity plays an important role in the agricultural development of any region. The study area is characterized by lateritic features and riverine features. The study area observed that Cropping Intensity highest in Nalhati-II block is 229.9195 and lowest in Rajnagar block is 112.3470 in 2015. Irrigation is considered as driven elements that both surface and groundwater sources have almost equal important to the development of Cropping Intensity in this districts.

Key Words: Cropping Intensity, Groundwater, Agricultural Development, Socio-economic factors

INTRODUCTION: Agriculture is the back bone of the Indian Economy. Agricultural productivity is closely influenced by physical , socio-economic , political, institutional and organizational factors. (Saha & Rudra, 2019). Agriculture is an essential occupation for income and employment in developing countries , and particularly for the rural poor, and is widely considered to be the major “ engine” of economic growth in most of the developing countries. Regionalisation is the process of dividing an aryea into territorial units of uniformities and is the result of a set of processes(Chakraborty, 2015).Delimitation or delineation of agricultural region is known as agricultural regionalization. The agricultural regionalization may be done with the help of following methods like – Cropping pattern, Crop combination, Crop Concentration, Cropping Intensity, Agricultural productivity etc(Paul et al., 2020).The major sources of agricultural growth during this period were the spread of mdrn crop.Land degradation due to over cropping, over irrigation, loss of biodiversity, declining agricultural genetic diversity and climate change are some of the challenges that potentiality threatened the future viability ofofagricultural systems.(Priyadharshini, 2014) .

One of the problems remain in planning investment in agriculture is regional disparities micro and macro levels because the policy intervention focuses on sectoral and regional development rather than systematic and integrated development of agriculture as a whole. (Rahaman & Singh, 2020) 2020). The distribution of crops in a region or areal unit may be determined on the basic of a real strength of individual crops. The first, second and third rank crop of an aerial unit may be called as the dominant crops of that unit.(Dayalan & Yogananthamm, 2020). The selection of crops and their combinations help to fight in diverse conditions. So, the study of crop combination regions is essential to make development policy of a particular region, and it is also important for introduction of any crop in that region. (Meena, 2021) . Land use is thus , the result of interaction among morphologic, climatic, and socio-economic parameters in macro, meso and micro levels. (Chakraborty, 2015) .

Groundwater is an extremely valuable resource and pollution of groundwater resources is a matter of serious concern(Jain et al., 2021). Among the major threats to groundwater from which drinking water supplies are obtained are leachates from human and animal waste matter, along with other chemical pollutants(Bisai et al., 2016). Globally , irrigated agriculture is the largest abstractor and predominant consumer of groundwater resources, with important groundwater –dependent agroeconomies having widely evolved. The interactions between agricultural irrigation , surface water and groundwater resources are often very close such that active cross-sector dialogue and integrated vision are also needed to promote sustainable land and water management.(Kumar et al., 2021) The ‘impact’ herein implies the extent to which the availability or unavailability of groundwater irrigation for farming affects the cropping intensity and crop productivity. (Gaur — Tech Asstt S K Kaushal — Tech Asstt Uma Rani — Tech Asstt V M Shobhna — Personal Asstt et al., 2015).For a proper assessment of the potentiality of crop production of a region, it is essential to have an enquiry into the relationship between its irrigation and cropping intensity.(Ganguly, 2016). Scarcity of water is becoming a burning problem in India. This is particularly true especially in the arid and semi-arid regions of the country due to vagaries of monsoon and scarcity of surface water. (K. Nag & Das, 2014)

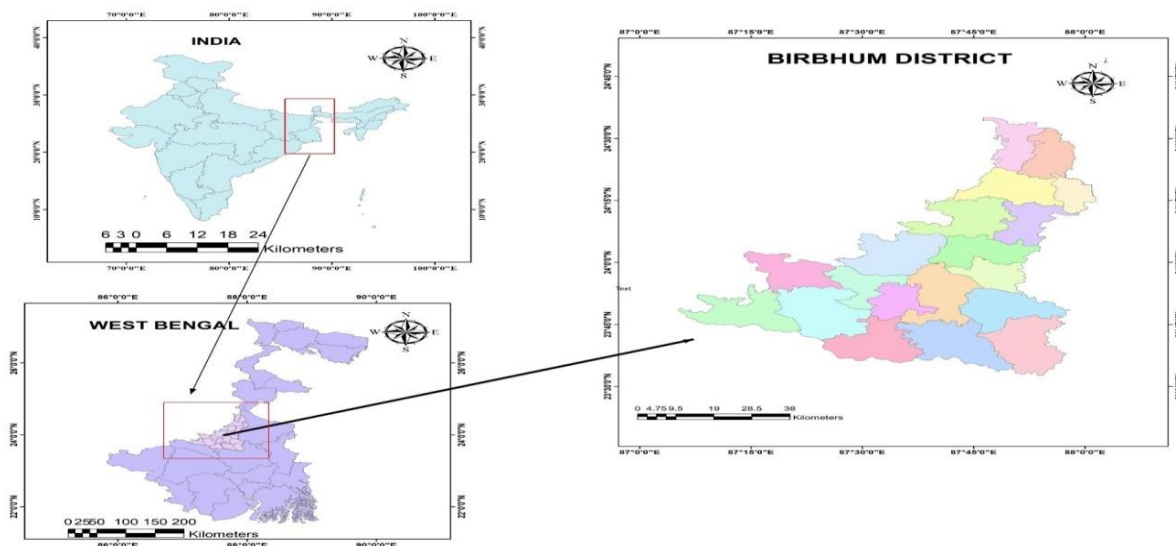
OBJECTIVES: The major objectives of this study are

- i)To find out the nature and magnitude of agricultural regionalization in Birbhum District.
- ii)To study the intensity of crops and degree of diversification of the crops for agriculture land use planning of Birbhum District.
- iii)To find out the nature of change in cropping pattern during the period 2004-05 and 2015-16 in Birbhum District.
- iv)To analyse the groundwater resources sustain a significant and increasing share of irrigated agricultural production.
- v)To identify Irrigation Intensity in Birbhum District
- vi)To find out the relationship between crop diversification and crop concentration to determine whether Birbhum District agriculture is regionally dispersed or not.
- vii)To Study the combination of crops in the Birbhum District.

STUDY AREA:

Birbhum district is situated between 23°32'30" to 24°35'00" N latitude and between 87°05'25"E to 88°01'40" E longitude. Birbhum the northernmost district of the Burdwan division . Extends over 4545 Sq.km. Birbhum is bounded on the north and west by the Santal Parganas of Jharkhand state and on the east by the district of Murshidabad and on the south by Burdwan district, which is separated by the Ajoy river. Administratively , it comprises of three sub-divisions (Suri, Bolpur and Rampurhat) , 19 community development block and 2467 villages. The general slope is from northwest to southeast. Ajay- Myurakshi interfluvies is a part of ancient

Fig: Study area (India, West Bengal, Birbhum District)



“Rarh Bhumi” of Bengal, having favourable agro-environmental condition. The proposed interfluvies is mainly rain fed and intensified by mono-cropped cultivation system, still suffers by inter-regional disparity in agricultural development.

RESEARCH METHODOLOGY:

Pre-field work: At the outset location of the area which is geographically known as the badland topography was identified in the map and the area was demarcated. A literature survey was done from the published works. The study is based on secondary data which have been collected for various crops at 2004-05 and 2015-16 from the District census Handbook in Birbhum District.

Field-work: Identification of various landscape of lateritic patch and door to door survey for socio-cultural and economic condition. Field data recorded during the pre monsoon and post monsoon period. A questionnaire was prepared covering all aspects of agriculture and agricultural production. Understand the influence of groundwater for agricultural development in pre monsoon and post monsoon period.

Post field-work: Addition, alternation of various statistical tools like correlation, regression., ANOVA, time series analysis etc. Various cartographic technique are used for the distribution of cropping intensity, cropping pattern like bar graph, pie diagram, line graph etc. Various statistical analysis on agriculture like Gibbs Martin law, Weaver Crop Combination method, Kendall methods etc are used for agricultural regionalization in Birbhum District. IDW map prepared by ARC GIS 10.3 for showing the groundwater potentiality in Birbhum District. Choropleth map prepared by Arc Gis 10.3 for showing the agricultural regionalization un Birbhum district.

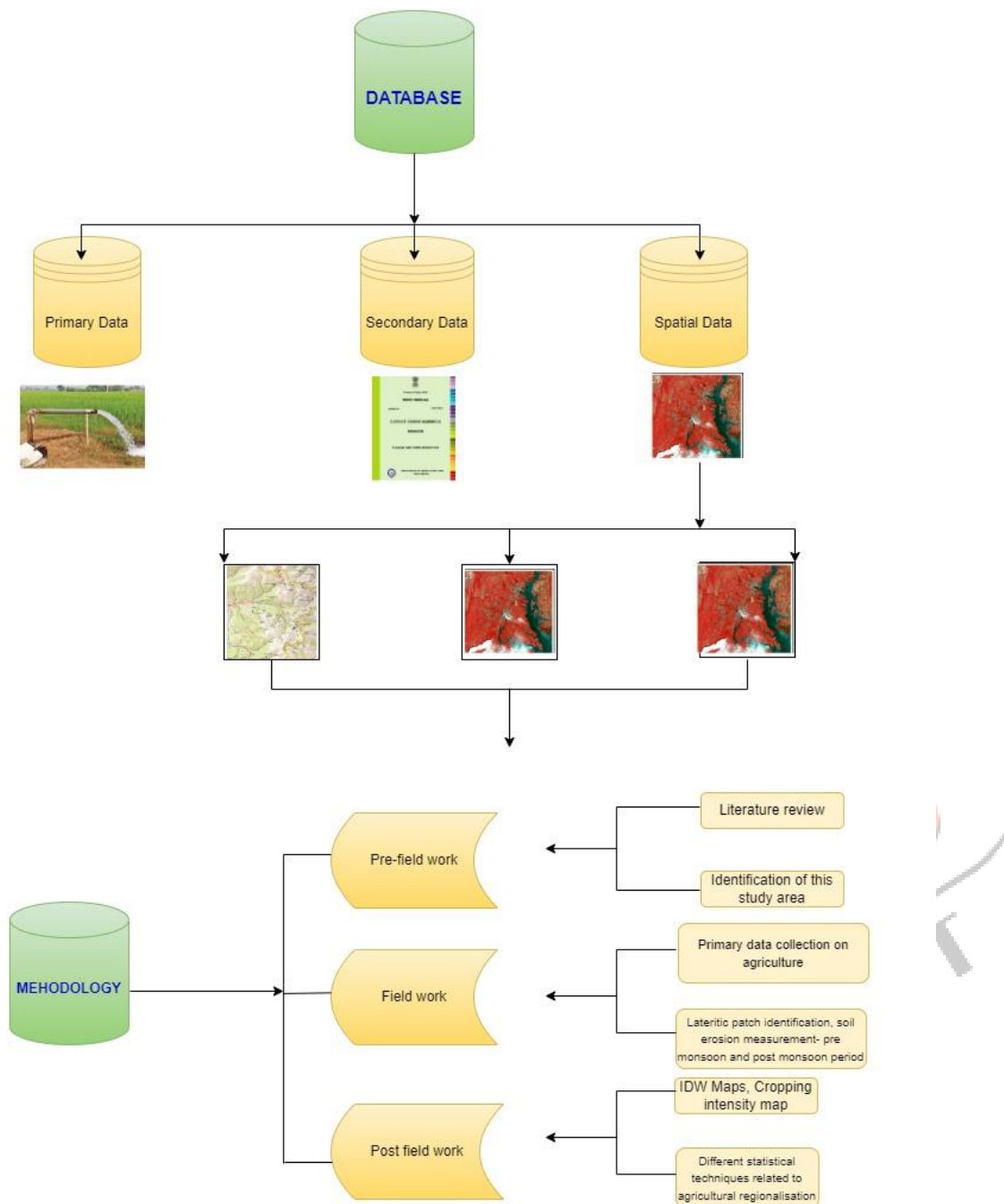


FIG: METHODOLOGY OF THIS STUDY AREA

RESEARCH HYPOTHESIS: The following hypothesis are formulated for the present study
 Relationship between groundwater potentiality and agricultural production in Birbhum District.
 Agro biodiversity is inevitable for the eco-friendly milieu of agriculture.

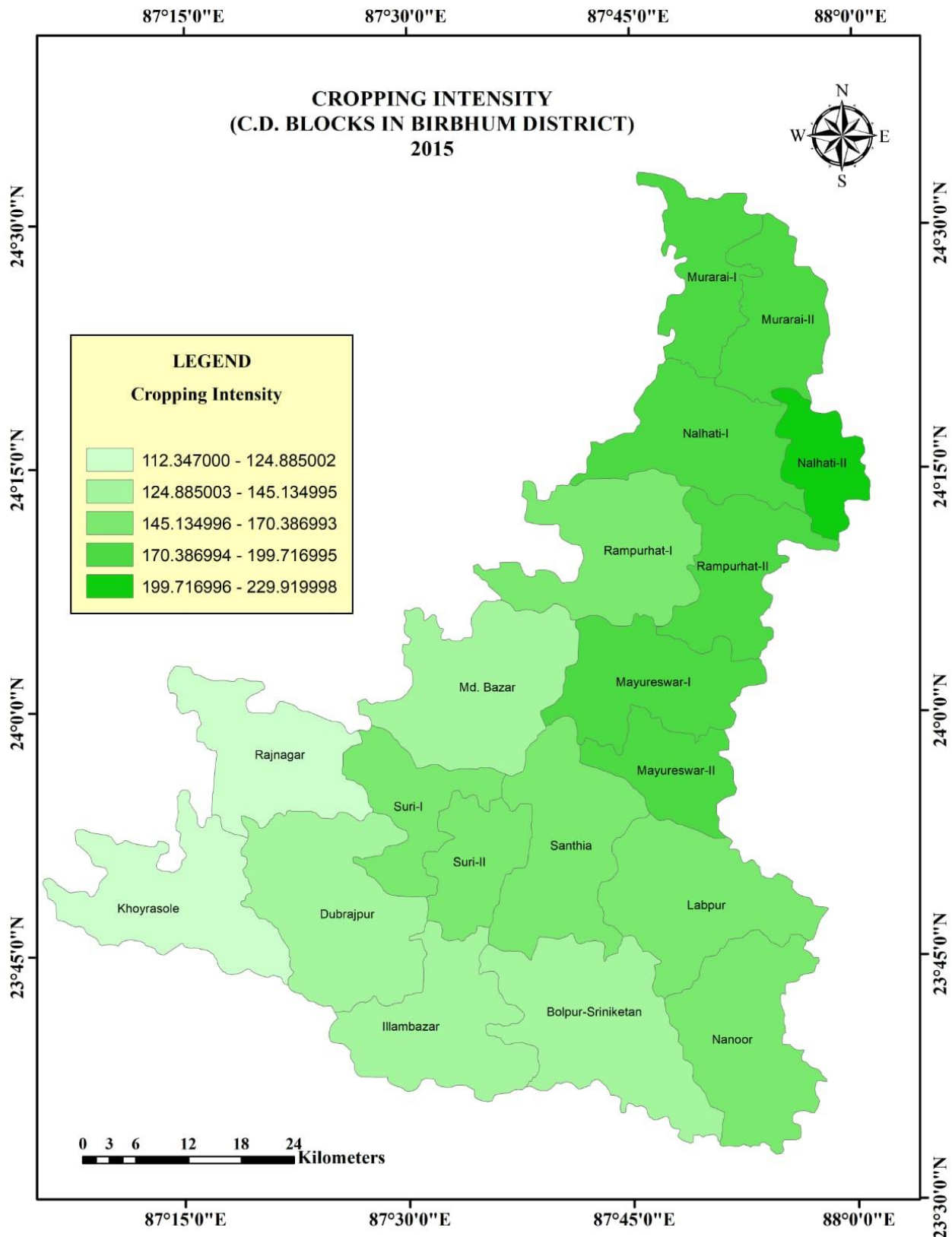
The researcher will used the different farm efficiency index such as, cropping intensity index, irrigation intensity etc...

Cropping intensity is expressed as the ratio of gross cropped area . Agricultural production can be increased either by bringing more and more land under cultivation or by increasing the cropping intensity and productivity of land or combination of both . As the availability of land is fixed, intensive cultivation is more suitable to increase production . Adoption of improved seeds, fertilizer 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 the cultivation or intensifying cropping over existing area

- **Cropping Intensity Index = (Gross Cropped Area / Net Shown Area) x 100**
- **Irrigation Intensity = (Net Irrigation Area / Net Shown Area) x 100**

Sl. No	Name of Block	Gross Area	Cropped Area	Net Cropped Area	Cropping Intensity (C.I)
1	Murarai I	25239	14337	14337	176.0410128
2	Murarai II	26812	14989	14989	178.8778438
3	Nalhati I	33112	18971	18971	174.5400875
4	Nalhati II	19711	8573	8573	229.9195148
5	Rampurhat I	31160	20152	20152	154.6248511
6	Rampurhat II	29520	15819	15819	186.6110374
7	Mayureswar I	30005	16136	16136	185.9506693
8	Mayureswar II	21188	10609	10609	199.7172212
9	Md. Bazar	32395	22409	22409	144.5624526
10	Sainthia	36277	21291	21291	170.3865483
11	Dubrajpur	32865	23223	23223	141.5191836
12	Rajnagar	15423	13728	13728	112.347028
13	Suri I	15939	10245	10245	155.5783309
14	Suri II	15733	9556	9556	164.6400167
15	Khayrasole	23988	19208	19208	124.8854644
16	Bolpur- Sriniketan	31278	21551	21551	145.1347965
17	Labhpur	32824	20721	20721	158.4093432
18	Nanoor	35999	22098	22098	162.9061454
19	Illambazar	24937	17690	17690	140.9666478

TABLE: Cropping Intensity in Block Wise of Birbhum District (Computed by Authors)



RELEVANCE: Greater irrigation access , driven by the expansion of tube wells , has been the primary driver of India’s impressive food production grains over the past 50 years . This expansion has led to India becoming the largest consumer of groundwater worldwide and to serve groundwater depletion in many parts of the country.

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