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Land Suitability and Cropping Pattern Analysis for Optimal Land Use Planning in Bijnor District UP

Dr. Vimal Kumar*

Assistant Professor, Department of Geography, Sai Meer Degree College, Uttar Pradesh

Abstract – Farming gives food just as gives unrefined material to the amassing adventures (Sajjad et. al. 2016). It is the huge wellspring of occupation and helps in accelerating monetary advancement of most of the non-mechanical countries (Sajjad et. al. 2014). Notwithstanding the way that segment of agribusiness and related zones in India has declined to 13.9 percent of the Gross Domestic Product in 2014-15 (The Economic Survey 2014-15), it is at this point the greatest monetary region addressing about 54.6 percent of outright work and accepting an enormous part in the all-around monetary progression of the country (Census of India 2011). It is essential to pick the proper season for harvests to get the best advantages. The pre and post season is basic to consider. Extended altering configuration is the huge component of Indian cultivating system and relies upon precipitation which addresses around 92 million hectare setting up 65% of a managed area. There exists a grouping of managing systems in rainfed agribusiness. Farmers' are pushed towards intercropping as there is a dependence of gigantic people on agribusiness..

Keywords – Social Sciences, Geography, Land Sustainability

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INTRODUCTION

Land evaluation is the underlying move towards ideal agrarian land use organizing. In land sensibility appraisal two critical examples can be spread out: emotional and quantitative. The differentiation between the two techniques lies in the level of detail in the particular frameworks embraced for real land appraisal for instance it very well may be direct or clear. Abstract approach evaluates land on a more broad scale unexpected by and large upon farmers' experience and natural data. Quantitative philosophy on the other hand incorporates more point by point specific procedures wherein arithmetical or parametric techniques including genuine examination are applied (Rosa and Diepen 2002; Lanen et al. 1992). The coordination of abstract and quantitative strategies of land appraisal has improved the precision/steady quality similarly as the congruity of the models.

Eventually, both FAO rules and real land appraisal strategies are being used for land sensibility assessment (FAO 1976 &1985; Sys et al. 1991). Land fittingness implies the level of effeciency of a land for unequivocal utilizationeither in the current condition or after change. It might be assessed either with the current conditions (real land suitabilityor ensuing to improving its ascribes (potential land sensibility. As shown by the FAO method (1976), the determinant factors like breaking down, water openness, and flood risk, etc which can't be assessed are gotten from land characteristics like slope, precipitation and soil surface which can be evaluated or assessed. As per the principles of FAO (1976), land fittingness gathering can be arranged as solicitation, class, sub-class and unit with each class holding its genuine importance in different game plans. Each characterization is suitable to land use of different classes.

Four special classes with decreasing hypothesis have been recommended: Land Suitability Orders: Various combinations of land as per propriety are reflected. Land Suitability Classes: In which sensibility inside orders is reflected. Land Suitability Subclasses: Among which various types of limitations are reflected or essential kinds of measures ought to be upgraded inside the classes. Land Suitability Units: In which little assortments for indispensable organization inside subclasses are reflected. Sensibility or non-suitability of the land under express use is investigated by means of land fittingness orders. Sensible and non-suitable solicitations are alloted by phenomenal pictures S and N independently. For different reasons, the land named not proper for a particular given use which can be really ridiculous like improvement on steep inclinations, water arrangement of steep unpleasant, etc

Regardless, the most concluding components are monetary benefits. The money related benefits give a comparative examination of data costs and yield productivity and along these lines, organizing land as 'not fitting'. Land use orchestrating and the board can be reasonably finished by planning Geographic Information System (GIS) and multi-models decision assessment (Malczewski 2006; Kalogirou 2002). Land suitability evaluation in a GIS environment incorporates three phases, at first picking huge parts which effects land sensibility. Other than the characteristics of isolated objections are taken a gander at subject to appealing measures and consequently relating propriety examinations for all of the components are made ultimately solidified sensibility map reliant upon all out assessments of individual parts is created to survey agrarian land suitability (Jafari and Zaredar 2010).

A couple investigates aground sensibility have been done from one side of the planet to the other using unequivocal methodological procedure. “Burrough (1989) suggested that selection of yields can be capably done by melding the cushioned procedure in land suitability appraisal. Ahamed et al. (2000) applied GIS-based soft investment model to take apart cropland sensibility in which most prominent area was found to be possibly suitable for creating ground nut. Malczewski (2002) joined the possibility of fleecy screening over the conventional assessing methodology for land sensibility assessment. Joss et al. (2007) drove land fittingness for cream poplar in which they found 28% of the land base sensible for afforestation. Rasheed and Venugopal (2009) investigated cropland sensibility subject to agro-organic depiction. Their result showed that the created domain was not actually the locale suitable for advancement. Shearer and Xiang (2009) reviewed land propriety in North Carolina. They recognized sensible territories for park land-banking program. Qiu et al. (2014) used cushioned appraisal strategy for taking apart land sensibility/capacity and showed its feasibility in conveying suitability maps. Zhang et al. (2015) studied land sensibility for tobacco creation using AHP and feathery set and zeroed in on the efficiency of soft and AHP to register the heaps of various segments. The primary development in land appraisal is to choose the weightage of models factor. The heaps of these guidelines segments could be settled using a couple of strategies, for instance, ideal vector approach, parametric system, feathery reasoning, logical movement measure (AHP), quantitative and real estimation. AHP given by Saaty (1980) has been by and large used for land suitability examination (Akinc et al. 2013; Kazemi et al. 2015; Bozdag et al. 2016; Yalew et al. 2016; Cengiz and Akbulak 2009: Nazeri et al. 2014). Regardless, AHP has limitations of dealing with weakness present in multi rules evaluation (Deng 1999; Elsheikh et al. 2013; Malczewski 1999; Munda 1995)”. These limitations could be crushed through cushioned logical levels of leadership measure (FAHP) as it uses an extent of critical worth instead of a new worth to intertwine boss' weakness.

STUDY AREA

Bijnor is one of the agronomically prosperous locales of Uttar Pradesh state in India. “It is arranged between 29o 2' and 29o 57' North degree and 77o 59' and 78o 56' East longitude in the upper Ganga plain. The district has five legitimate sub-zones and neighborhood blocks (Figure I). Stream Ganga detaches Bijnor from abutting region and is the essential stream of the space. The total people of the district is 3.6 million with a general population thickness of 808 tenants/km2 . Practically 76% people of the region lives in towns. There has been 17.6 percent advancement in people during 2001-2011 (Census of India 2011). Agribusiness addresses the most imperative proposal in the economy of the examination domain. Sugarcane, wheat and rice are the huge harvests filled around there”.

OBJECTIVES

1. To survey land use land cover changes in the investigation region

2. To analyze the trimming design and editing power in the investigation region

3. To assess land for crop reasonableness and propose ideal land use.

REVIEW OF LITERATURE

McRae and Burnham (1981) in their examination "land appraisal (monograph on soil survey) saw that there exist assortments in geology, climate, geography, soil and vegetation cover in this way it is major to have a sensible data on the odds and limitation presented by these unending components in plant land use. These odds and limitations are overviewed through land appraisal and the resultant information can be used by the accomplices and rustic coordinators.

FAO (1993) laid complement at work of land use masterminding in its guidelines. As per FAO land use model can be fruitful in achieving the natural and monetary targets. Land use is an essential contraption to propose the board courses of action for land improvement. Understanding territory use is critical as the activities related to land will clearly influence the social and monetary development.

Bill (1996) in his book "Land appraisal for possible land use organizing and the heads" endeavored to review the piece of GIS in land utilization. He arrive at the outcome that Geographical Information System (GIS) has become a critical device for land appraisal and technique plan. GIS helps in hoarding

the data base and gives capability in data taking care of which was unreasonable previously.

Donald (1992) in his book named "The appraisal of land resources" broke down various methods used for land evaluation. Different information can be gotten from land evaluation to plan the land resources reasonably anyway the information can't clearly be applied as a result of fluctuating tendencies of neighborhood people and accomplices, inadequacy in informationpreparing and top to down based land appraisal approach. He further communicated that approach, information, appointments and credit, etc are also determinants in land evaluation.

Bronsveld et. al. (1994) in their assessment "Improving region appraisal and land use organizing," prescribed assessed to improve the land evaluation measure. They recommended that local neighborhood approach in the land evaluation measure with accomplices to characterize methodologies and thusly, decline the objectives between them. Versatile strategies wind up being gainful for data planning. Furthermore, ideal utilization of data can be refined using distant distinguishing and data assembled in field.

Paul (1984) in his examination "Rules: Land Evaluation for Rainfed Agriculture" proposed the utility of various leveled approach in land appraisal measure as it directly prompts resource base use where there are leased land prerequisites. In the event that there ought to emerge an event of farming update in like manner resources will provoke achieve the bountiful yield. Manures, improved water framework and extended data rate is in any case, is immaterial than the market factors as accessibility to business areas, capable workforce, better establishment and social components are particularly key.

Rossiter (1996) in a paper discussion "A Theoretical Framework for land appraisal" proposed a widely inclusive design for gathering land evaluation models and approaches. Maker laid complement on picking the methods circumspectly as it impacts the steadfastness of usage. Makers in like manner suggested that land execution assumptions are important until completed and used by technique and pioneers.

Hazra (2001) in his assessment "crop extension in India" raised that the ascents of the green change propels have pushed the farmers towards crop specializationand commercialization of horticulture. These headways have extended the land/work benefit and net farm pay regardless; there have been undesirable outcomes, for instance, decline in readiness and gather unpredictable attributes. Also, crop advancement without keeping in account the physical and substance properties of land can provoke certifiable natural issues, for instance, groundwater utilization, water logging and pungency, etc which in this way lessens as far as possible and improvement capacity of agribusiness as time goes on.

Sharma et. al. (2011) in their examination "Managing system Analysis Using Remote Sensing and GIS: A Block level Study of Kurukshetra District" contemplated that agrarian sensibility has become need all through the planet whether made or making. Viability in agribusiness can be refined through taking apart the managing system. He proposed creating of harvests in transformation so the extravagance of the earth is restored. He moreover accepted that a managing system should cook the necessities of the farmers' just as all the while should be natural sincere.

Karunakara et. al. (2012) in his assessment "reasonable utilization of land and water resource for agribusiness" communicated that land and water are the two most critical resources that need thought to utilize them in a viable manner. Beside these resources different neighborhood and monetary factors choose the collect creation game plan of that region. The fuse of affordable resource use with the creation tasks and pay as focuses of developing thusly, prompts a different objective-masterminding framework.

METHODOLOGY

To perceive the movements in the LULC multi-date satellite pictures were used that included two game plans of Landsat-TM pictures. The legitimate furthest reaches of the assessment domain was illustrated from Survey of India Topographical sheets on the size of 1:250,000. Overseen game plan procedure was applied to get to momentary LULC of Bijnor district. In view of the reflectance, tests pixels were browsed the image. A couple of pixels were wrongly organized on account of the closeness of magnificence regard. These bungles were restricted by the recoding of pixel of such zones dependent on GPS data. Exactness of managed game plan was reviewed by analyzing botch grid.

IRS-P6 LISS III pictures were set up in ERDAS (Earth Resource Data Analysis System). Outline of India (SOI) geological sheet of the scale 1:250 000 was used for decision of GCPs required for georeferencing, and moreover during field check. Using these GCPs and GPS assessments georeferenced pictures were made by second solicitation polynomial with nearest neighbor resampling technique. A multi-arranged independent ISODATA request was used for incidental managing configuration arranging. The pixels that were found as precisely portrayed were hidden and an ensuing game plan was performed for lingering an area until no further development in class noticeability was cultivated. Different classes from the yield ISODATA portrayal were made by pulling together the practically identical pixel

regards. The sensible refinement and undertaking of effective class for the mixed classes was brought out through ground truth insights and neighborhood data. The reap turn map was created using a periodic altering configuration maps. These aides were set up by using the spatial exhibiting mechanical assemblies available in ERDAS Imagine.

Managing system viability can be enlisted by using a couple of records in regards to land use (Palaniappan, 1985). In this assessment, Multiple altering list (MCI), Area assortment record (ADI) and Cultivated land utilization document (CLUI) are used to will land use efficiencies and to suggest suitable managing plan for each individual square.

MCI as given by Dalrymple (1971) measures the managing power. It is the extent of complete domain managed in a year to the land locale open for improvement and is conveyed in rate.

$$MCI = 100 \text{ x } \frac{\sum_{i=1}^{n} ai}{A}$$

Where n = all out number of yields, ai = territory involved of the ith crop planted and reaped inside a year, and A =total developed land region accessible.

ADI estimates the assortment of yields or ranch items which are planted in a solitary year. It was determined by altering Diversity file (Strout, 1975; Wang& Yu, 1975) which is processed as the equal amount of squares of the portion of gross income got from every individual homestead ventures in a solitary year.

$$DI = \frac{1}{\sum_{i=1}^{n}\left(\frac{yi}{\sum_{i=1}^{n} yi}\right)^2}$$

Where n= all out quantities of ventures (yields or ranch items), and yi= net income of the ith undertaking delivered inside the year. We registered ADI following (Panigrahy, 2005) where the region involved by each harvest is considered rather than net income. Thus, the altered variety file, which can be named territory variety list or ADI is utilized, and can be characterized as:

$$ADI = \frac{1}{\sum_{i=1}^{n}\left(\frac{ai}{\sum_{i=1}^{n} ai}\right)^2}$$

Land Suitability Analysis for agricultural crops

Climate, soil and satellite data was assembled and singular models maps were made using Arc GIS and ERDAS. “These norms maps were then renamed on the reason changed FAO land fittingness portrayal. FAHP was used to figure heaps of each norm. The last propriety map was gotten by weighted overlay assessment. Effective aides were prepared for all of the specific measures and rasterised in GIS environment. Grade layer was prepared using Cartosat-1 modernized ascent model (DEM) data of 2.5m spatial objective available on Bhuvan (India Geo-Platform of Indian Space Research Organization, ISRO). Soil characteristics, for instance, soil significance, soil surface and pH were made using soil testing lab data (Ministry of Agriculture and Farmers Welfare 2015). Spatial closeness to huge roads, nearest town and the leakage thickness maps were created in ArcMap environment using Survey of India (SOI) toposheet of the scale 1:50,000. Precipitation guidelines map was gotten by digitizing IMD precipitation map (IMD, 2013). Deterioration peril and risk of flooding norms maps were delivered by digitizing aides of National Bureau of Soil Survey and Land Use Planning (NBSS and Department of Agriculture 2004)”. Standardization of models layers is fundamental for executing weighted overlay assessment for land sensibility; as such, the actions vector layers were changed over to raster plan in GIS environment.

CONCLUSION

FAO land evaluation methodology and geospatial techniques have been instrumental in suggesting managing plans and ideal land use organizing in the assessment domain. There has been a critical change in farming, forest land and created region. The locale under agribusiness extended from 81.84 percent in 2000 to 84.68 percent in 2015 and thus, selected a development of 3%. Forest domain has reduced from 12.97 percent in 2000 to 9.95 percent in 2015. The created district extended 1.58 percent in 2000 to 1.97 percent in 2015 in this manner selecting an addition of 23.64 percent. It is seen that some piece of forlorn land and disregarded land an area was changed into created locale. Tehsil shrewd assessment shows that the extension in created land was generally vital in Dhampur (29per penny) followed by Bijnor (25%), Najibabad (24%), Chandpur (23%) and Nagina (20%). There was a melancholy change close by under agribusiness in Dhampur, Chandpur and Bijnor tehsil, in any case noticeable change was seen in Najibabad (9%) and Nagina (5%) tehsil.

It was found that forest area land in these two tehsils was cleared for cultivating rehearses. There was an immense lessening close by under forest area in Nagina (28%) and Najibabad (24%) tehsil. District under various trees and backwoods included basically the mango estates and eucalyptus trees. There was a discernible decay close by under different trees and woods. Chandpur tehsil has experienced most limit rot (19%) in domain under accidental trees and timberlands followed by Bijnor (15%), Dhampur (8per penny), Najibabad (3%) and Nagina (2%). Speedy urbanization and people addition were found to be the central purposes for the change of LULC of Bijnor area. As such, the hypothesis arranged earlier that the quick

advancement of people has an affected area under horticulture, forest area and created is recognized.

Subsequently, the farmers use wide water framework workplaces. Pulses and oilseed are occupied in those spaces where water framework workplaces are confined. Oilseeds and pulses included 9,586.00 ha of land involving 2% of the total country area. Simply 0.29 percent district was bedraggled. Different managing power (MCI), domain assortment record (ADI) and created land use list (CLUI) examinations uncovered that engaged energy and moderate development of farming in the assessment district.

The reap land fittingness was studied for critical cops (sugarcane, wheat, paddy, oil seeds and pulses) using FAO structure and various guidelines dynamic approach (MCDA). The substantialness of guidelines maps was resolved through soft consistent chain of significance measure (FAHP) in conclusion land sensibility examination for each collect was reviewed through weighted overlay assessment (WOA). The results an uncovered that the greatest area under astoundingly suitable class was found for paddy improvement (24%) followed by beats (22%), wheat (20%), sugarcane (10%) and oilseeds (3.5 percent). These districts fuse territories having no or insignificant limitations for crop improvement. Greatest domain under unassumingly proper characterization was found for oilseeds (51%) followed by sugarcane (half), wheat (43%), beats (38%) and paddy (36%).

Land in this class has managable requirements which could without a doubt be changed. Shallow soil significance, low degree of slope, almost less breaking down and essential soils were found to be the principal confining factors for moderate yield fittingness. The yields in like manner had tremendous region under fringe suitability class. Greatest locale under this class was found for oilseeds (29%) followed by paddy (28%), sugarcane (25%), beats (24%) and wheat (22%). Steep inclination, decently essential soil reaction, sandy soil surface and soil crumbling were found to be the limiting factors in this class.

REFERENCES

1. Jamil, M., & Sajjad, H. (2016). Deriving cropping system efficiency pattern using remote sensing and GIS: A case study of Bijnor District, India. International Journal of Advancement in Remote Sensing, GIS and Geography, 4(2), pp. 27-40.

2. Jamil, M., Ahmed, R., & Sajjad, H. (2018). Land suitability assessment for sugarcane cultivation in Bijnor district, India using geographic information system and fuzzy analytical hierarchy process. GeoJournal, 83(3), pp. 595-611.

3. Jamil, M., Sahana, M., & Sajjad, H. Crop Suitability Analysis in the Bijnor District, UP, Using Geospatial Tools and Fuzzy Analytical Hierarchy Process. Agricultural Research, pp. 1-17.

4. Chen, J. (2016): An Investigation of Urban Residents Loyalty to Tourism. Journal of Hospitality & Tourism, Vol. 24, No. 1, pp. 5-19.

5. Choudhury, S.D. (1981): Gazetteer of India, India, Assam District, Himalayan Publishers, Itanagar.

6. Chowdhury, J.N. (1979): Arunachal panorama, Department of Research, Govt. of India, Itanagar.

7. Daha, P. (2000): International Tourism Emerging Challenges and Future Prospects, Kanishka Publications Pvt. Ltd. New Delhi.

8. Harrison, D. (1994): Tourism and Prostitution: Sleeping with the Enemy. The case of Swaziland, Tourism Management, Elsevier Science Ltd, Vol. 15 Issue 6, pp. 435-443.

9. Khan, H. (1990): Tourism multiplier effects on Singapore, Annals of Tourism Research, Vol. 17, Issue 3, pp 408-418.

10. Lantana, K. (1995): Tourism and Its Scope, Pacific Books International, Delhi.

11. Rawat, T. (2009): Nature tourism, Discovery Publishing House Pvt. Ltd., New Delhi.

Corresponding Author

Dr. Vimal Kumar*

Assistant Professor, Department of Geography, Sai Meer Degree College, Uttar Pradesh