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Landuse Changes in Thanagazi for Sustainable Development

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Abstract

The world today faces varied problems of population-explosion, ecological disequilibrium and pollution, water and energy crisis, increasing trend of urbanization, rapid industrialization consequently rising regional disparities and excessive exploitation of natural resources and created environmental imbalance. Development is at the cost of degradation of land, particularly agricultural producing area. The study aims to investigate rationally and objectively the dynamic nature of agricultural land and other land-use pattern and queries to make useful suggestions for sustainable development strategies and planning for utilizing the land areas through forestation, pasture and agricultural development. The change in land-use pattern is the best indicator of socio-economic and cultural development.

Keywords: Natural resources, Environmental imbalance, Sustainable Development, Land-use pattern, Degradation of land

Introduction

The world today faces varied problems of population explosion, ecological disequilibrium and pollution, water and energy and crisis, increasing trend of urbanization, rapid industrialization consequently rising regional disparities and excessive exploitation or natural resources in developing economics has created environmental imbalance. Their cumulative impact on the agricultural activities including its use types, system, specialization, variations in areas of concentration and diversification has created various universal implications. Our present day dilemma, relates to available limited agricultural land, exploding population and intensification of scientific and technological researches and innovations to mobilize, intensify and manage the land resources to the advantage of few and the consequent rise to “islands of affluence” amidst “oceanic all round poverty”.

In a way intensifying urbanization, industrialization coupled with the multiple and mounting demands of our exploding population has not only accelerated the race of environmental deterioration but has put land to the brink of exhaustion. The related influences of not only population growth and food production from land but also physical, ecological and even climatic mandate together interact and react in complex ways providing dynamism to these relationships further.

In India, due to increasing pressure of population on land and ever-growing demand of food and raw materials, there is an urgent need to use every piece of land properly because the analysis of 2011 census reveals that the man land ratio is still increasing at a rapid rate [census of India, 2011, 121.01 Crores people]. Therefore, the significance of the utilization of such lands requires utmost consideration in India. Transforming developing countries from an agricultural to an industrial economy has been the focus of planners, underpinned by goals of stimulating growth and reducing poverty.

Objectives of the Study

To trace the evolution and growth of the agricultural land use pattern during last decade as Villages-wise, Plantation including horticulture and floriculture, pasture development etc. for sustainable use and ecological balance.

1. To study, evaluate and analyze the impact of changing land-use on socio-economic and environmental aspect of the study area.
2. To suggestions for sustainable development strategies and planning for utilizing the land areas through afforestation, pasture and agricultural development.

Thus, this presentation may provide a base for better management of land for sustainable development of the administrator economist, social reformers and policy makers and researchers

Review of Literature

The recent trend in research efforts of land use pattern and sustainable development in India, to point out the geographic analysis of socio-economic indicators such as agricultural growth and productivity and diffusion of new farm technology and the food systems. The works of K. Balasubramani 'Physical resources assessment in a semi-arid watershed: An integrated methodology for sustainable land use planning'– (ISPRS Journal of Photogrammetry and Remote Sensing 2018) - on land productivity, groundwater quality and existing land use and land cover patterns of the area, also the models were incorporated in a micro-watershed scale and resource utilisation pattern was studied. JS Singh, RK Chaturvedi (2018) –'Tropical Dry Deciduous Forest' highlights that the deciduous forest in India has been reported to be a mosaic of many factors such Biotic or management-related factors, land-use pattern etc.

In 'Space and Culture, India' (2018) U Panja, B Mistri have analysed that land use change is one of the important indicators of environmental change that affects ecological balance, which directly or indirectly influences on habitats, vegetation and cropping pattern. RS Meena, T Mitran, S Kumar (2018) have worked on Soil and Land Resources Assessment Division, Land use Mapping and all described in 'Application of remote sensing for sustainable agriculture and forest management'.

S Kundu, D Khare, A Mondal (2017) have conducted a study on 'Landuse change impact on actual Evapotranspiration'. In this study involves generation of monthly, seasonal and annual spatial actual ET and an assessment of future changes in actual ET due to changes in landuse using Surface Energy Balance Algorithm for Land (SEBAL) model for a portion of the Narmada river basin in Central India.

Weakening of Indian summer monsoon rainfall (ISMR) is traditionally linked with large-scale perturbations and circulations. However, the impacts of local changes in land use and land cover on ISMR have yet to be explored by S Paul, S Ghosh - Scientific Reports - Nature Aug 24, 2016.

PD Wagner, SM Bhallamudi, B Narasimhan - Science of the Total Environment (2016) – explained that the objective of their study is to dynamically integrate land use model projections with a hydrologic model to analyze potential future impacts of land use change on the water resources of a rapidly developing catchment upstream of India. Also very valuable finding by PS Roy, A Roy, PK Joshi- Remote Sensing, (2015) in 'Development of Decadal land-use and land cover Database for India' asIndia has experienced significant Land-Use and Land-Cover Change (LULCC) over the past few decades. In this context, careful observation and mapping of LULCC using satellite data of high to medium spatial resolution is crucial for understanding the long-term usage patterns of natural resources and facilitating sustainable management to plan, monitor and evaluate development. The present study utilizes the satellite images to generate national level LULC maps at decadal intervals using onscreen visual interpretation techniques with minimum mapping unit of 2.5 hectares. These maps follow the classification scheme of the International Geosphere Biosphere Programme (IGBP) to ensure compatibility with other global/regional LULC datasets for comparison and integration. Our LULC maps with more than 90% overall accuracy highlight the changes prominent at regional level, i.e., loss of forest cover in central and northeast India, increase of cropland area in Western India, growth of peri-urban area, and relative increase in plantations. We also found spatial correlation between the cropping area and precipitation, which in turn confirms the monsoon dependent agriculture system in the country.

According to research study by N Varghese, NP Singh - Land Use Policy, 2016 (Linkage between Land use changes, Desertification and human development in the Thar Desert Region of India) Planning Commission of India has identified 15 Agro-eco regions (AEZs) for efficient resource management. Among the various regions, the Western Dry Region covers nine districts of the state of Rajasthan. Huge portion of Rajasthan is desiccated and houses the biggest Indian desert—the Thar Desert. The forest cover in all the nine districts of this zone has shown a declining trend owing to the land being diverted to cultivation. Besides forests, the area under other land uses is also being diverted to cultivation. This can have serious implications on sustainability of the livelihoods and extent of poverty of the people in this region. In this paper, the authors have used Markov Chain analysis to see the direction of change in the land use pattern in the districts covered under the Western Dry Region. The authors have also examined the linkages between various human development indicators of these districts in light of the changing land use pattern in the districts and suggested policy prescriptions for arresting desertification in state of Rajasthan.

Hypotheses and Research Questions

1. Physical terrain and human interference plays vital role in determining the nature and merit of land utilization in early stage of land use development in the tehsil too.
2. The water resource has influenced the agricultural pattern and practice.
3. The impact of land-use for socio-economic development is uniform in the study region.

In view of the nature and objectives of the problem discussed above, the following research questions are also proposed to be answered and suggestion, if any, to be point out:

1. In the rural part of the tehsil socio-cultural and economic condition of the people has changed.
2. Over and unscientific use of underground water has accelerated depletion of underground water resulting drought like situation every time.

3. If water, environmental and social issues are not focused in overall planning, it can lead to agrarian chaos and social collapse in future.
4. It is necessary to define sustainable development and take pro-active steps in order to stabilize the system, so that socio-economic-environmental balance can be restored, in a time bound manner.

Methodology

The analysis of the present research work has been comprehended with the help of suitable descriptive, deductive and computer cartographic techniques various diagrams, graphs and maps other illustrations have been prepared at different levels and scales to elucidate variety of geographic aspects. The enumeration unit of the study is Villages. The study area has been undertaken as an independent research unit in village's wise study oriented towards the consideration of land components, particularly agricultural pattern, growth and density of population and land-man relationship.

Location and Administrative Division of the Study Area

The study tehsil, Thanagazi encompasses the 157 villages and this region is typical and conspicuous in terms of its physiographic characteristics, economic, socio cultural and historical elements, ethnological composition and over all geographical settings.Thanagazi tehsil is located between $27^0$7' to $27^0$37' North latitude and $76^0$7' to $76^0$25' East longitude. Thanagazi is located at South-West Alwar Tehsil and 42 km. far from tehsil headquarter. It embraces an area of 1060.33 sq. km. and 35 Graham-Panchayats, 157 total villages are according to census 1991, which has 1.44 Lakh population and population density was 136 persons/Km.^{2} and in 2001 there is 1.90 Lakh population recorded and density is 179 persons/Km.^{2} There is 2.33 Lakh population recorded and density is 284 persons/Km.^{2} (in 2011 census).

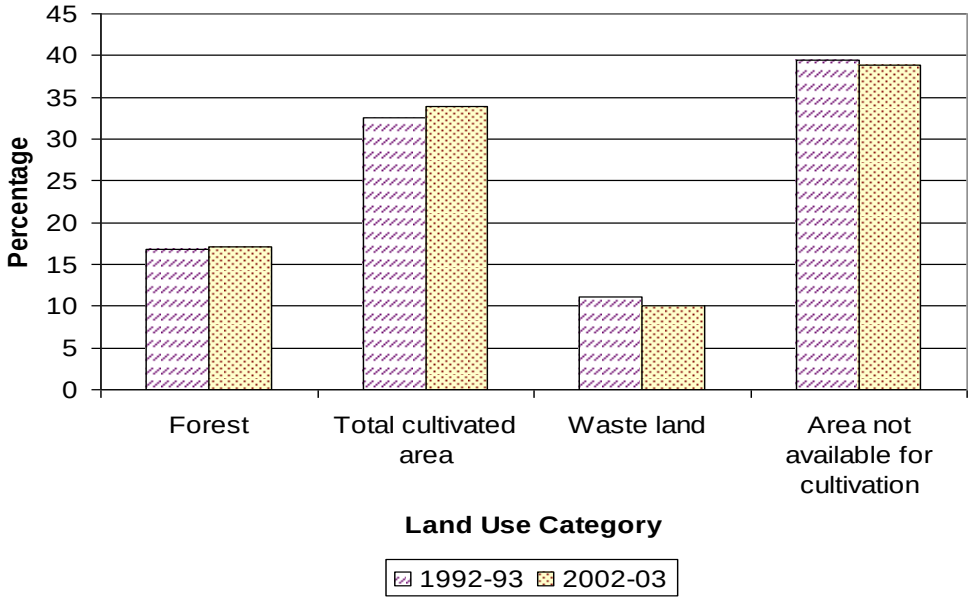
Land use has fundamental role into the historic process of human evolutionary efforts towards his road to not only survival but developmental and welfare planning for better and efficient life. Land has its various uses, such as cultivation, grazing, forest, settlements and road etc. patterns of land utilization also show variation from one area to another. In the dynamic scenario, keeping in view the natural endowments and the recent advances in technology, the overall interests of a region may dictate a certain modification of or change in the existing land use pattern.

Land Classification

The total tehsil area can be divided into two major classes and tehsil further into 4 sub categories, which are:

1. Non-arable land
2. The arable land

Land- Classication



All such lands, which are declared as forests, barren and uncultivated lands and land put to non-agricultural uses, are included in the first category. The second category includes the land, which actually cultivated i.e. net sown area cultivable wasteland and the land under permanent pasture and grazing grounds. The land classification of the tehsil has been divided into four categories viz. forests, Total cultivated area, area not available for cultivation, cultivable waste land, net sown area and land under groves permanent pastures and grazing land.

Nearly 33.89% of the total area is under cultivation, which is much higher than the percentage of Rajasthan state (49.45%). Surprisingly only 17.15% of the total area of the tehsil is under forest, which is confined almost to the mountainous patches of its south-western part. The cultivable waste land, which is less than the state average. On reality these are marginal lands, suffering either from general salinity or water logging soil erosion or infertility. The area not available for cultivation shares 38.86% to the tehsil total area which includes settlements road, Canals, water bodies etc.

Land Classifications

Category of Land use	Categorized Area in percentage of the total area.		
	1992-93	2002-03	Change
Forest	16.82	17.15	0.33
Total cultivated area	32.59	33.89	1.30
Waste land undulating Permanent pasture & grazing land	11.15	10.10	-1.05
Area not available for cultivation	39.44	38.86	-0.58
Total	100	100	

Source: Land record office alwar

Forest Land

Area under forest includes all lands classed as forest under any legal enactments dealing with forest or administrated as forests, whether state owned or private and whether wooded or maintained as potential forest land. The share of forest area to total reported area 17.15% is higher in the district compared with district average (9%). There is increase in forest cover from 16.82% in 1992-93 to 17.15% in 2002-03 due to massive a forestation programmed. The satellite imagery and studies conducted by NRSA (National Remote Sensing Agency) reveals that there was dense forest during 1980's accounting about 24% of the total geographical area in the tehsil but forest cover deleted rapidly due to ruthless cutting down of trees for fire wood, grazing and mining. The dense forest confined to around Sariska, Ajabgarh, Lothawas and Sili Bawadi, Lalpura, Pachpadi, Rundh Jhiri, Kundalka, Ganeshpura, Bairawas, Reh ka mala.

The hills of Aravalli of support dense to sparse vegetation with a number of reserved forests still dense concentration of forest cover find in the east central and west southern part of the tehsil.

The remarkable increase in forest cover is visible in Manawas, Duhar mala; Tola was Bhakatpura, Chosla and Sanwatsar tehsil. In the tehsil few patches survive in steep and inaccessible hills holds. In recent past the forest have depleted rapidly, particularly in south-western hilly region namely Reh ka mala, Gowari, Narhat, Pratapgarh, Nitata, Kaled Samra and Kundala. Recent efforts of reforestation, afforestation and watershed management programmes including grants from World Bank, Japan, UNDP and other agencies around hilly region are heartening development.

Thanagazi Tehsil: Forest Area [Village]

Class interval	No. of Villages	
	1992-93	2002-03
Above 75	13	14
50-75	7	7
25-50	12	11
Below 25	125	125
Total	157	157

Volume of Change

Change	No. Villages	Percentage of Village
Positive (increase)	16	10.19
Negative (decrease)	11	7.0
No Change	130	82.80

Tarun Bharat Sangh has constructed numerous anicut etc. watersheds like johad in the central part of area. The plantation development work had led into increasing forest area. Johad (a small water harvesting structure) and anicut water in the region raised the water table in the entire catchment area of the river. Forests and scrubs helped to retired the run-offs of monsoon works. This way in a decade, the river Aravari comes to life from a dried up dead watercourse.

Areas Not Available For Cultivation

Under this category barren and uncultivable lands which are generally rocky, hilly, stony and inaccessible in nature and land which cannot be brought under cultivation unless at a very high cost. Such land is called as uncultivable land also, whether such land is in isolated blocks or within cultivated holdings. This category has 39.44% in 1992-93 and 38.86% in 2002-03 of the total area. The table reveals that the south-western to north-eastern direction maximum percentage of area not available for cultivation lies, which is marks as stony wastes and hill eroded region of the tehsil. The maximum percentage of this group lies in the village of Kishori, Kharkhadi, Kala-lanka, Nagal Shyampura, Chaha ka Bas, Pratap Garh, Gowadi and Jhakri where it ranges above 60% of the respective total areas and Thanagazi, Narayanpur, Kho, Hamirpur, Kanpura, Dera Gurha, Angari, Kyara, Bandrol etc.

Area Not Available For Cultivation: Volume Of Change

Change	No. Villages	Percentage of Village
Positive (increase)	37	23.56
Negative (decrease)	35	22.29
No Change	85	54.14

The slight increase in this category is observed in Malutana, Nitata, Nagel, Samra watershed. Whereas the decline in area of this category is found in Kharkhadi, Manawas, Bandrol, Biharisar and Jaitpur villages. Increase of area under not available land for cultivation category causes- new settlements, new schools, roads, brick-factory and shops etc. cultural land features. These structures are developed almost all over tehsil, whereas this category percentage is increase.

Waste Land Including Permanent Pasture and Grazing Land

The Waste Lands are those lands, which are available for cultivation but have not been taken up for cultivation for various reasons. This category includes permanent pasture and grazing lands, land under miscellaneous tree and groves and the land, which can be brought under cultivation but which has not been cultivated for more than five years. This category also includes all lands under fruit tress, casuarinas trees, grass, bamboo, bushes and other groves for fuel etc. Among cultivable wasteland is the most important category. These include all lands available for cultivation whether not taken up for cultivation or taken up for cultivation once, but not cultivated during current year and last five year more in succession such lands may be either fallow or covered with shrubs and jungles which are not put to any use.

Wasteland shares only 11.15% in 1992-93 and 10.10% in 2002-03 respectively in the area. The low concentration of pasture, grazing land and wasteland is in spread all over the parts of Thanagazi tehsil. While highest percentage of this category is lays in the Ajabgarh, Dera, Chandpura, Gurjar ka Guada, Balluwas and Jaitpur Brahman. In Thanagazi tehsil the percentage of wasteland category is high due to rugged mountainous hypsography and alkalinity hazards are (ph 7.5 to 8.5 and E.C. 2.5 to 4.0). Further in some parts of the tehsil contained high percentage of pebbles and fewer amounts of clay particles.

Wasteland Including Permanent Pasture and Grazing Land

Category	Volume- Change Vill.	Percentage of Village
Positive (increase)	29	18.47
Negative (decrease)	94	53.5
No Change	44	28.02

In some villages, there are increase the percentage of wasteland category due to gain good crop of mustard and wheat. In some villages spend more money of wheat crop, so farmer sown vegetable to earn money. Percentage of cultivable wasteland increase in southern and top northern area in 2002-03, due to this reason wheat crop is also increase. From the above discussed analysis comparatively higher percentage of this category has declined and it can be concluded that impact of watershed on pasture and grazing land is positive.

Cultivated Land

In this category it is the net cultivated area of the region which is put to actual crop production during the current year. Aspects of agricultural nature such as cropping pattern, crop associations and combinations seasonal and double cropping facts, density of irrigation and cropping, agricultural efficiency have their interplay and basis over the net sown area. This is the most important land which provides food for mankind and animals and provides different jobs to rural population. During the last ten years a regular increase in percentage of land under cultivation is well-marked.

This represents the area sown with crops and orchards counting areas sown more than once in the same year. The tehsil has 33.89% net sown area to the total geographical area and net sown area has increased from 32.59% in 1992-93 to 33.89% 2002-03(1.30%). The proportion of net sown area varies from village to village's area. In the hilly parts of Thanagazi, tehsil where rough terrain, rocky surfaces are typical, the proportion of net sown area is very low.

The highest cultivated area found in Kharrika and Todi Nijran that is 100% of the total area, due to irrigated facility and fertile soil in these villages. It is interesting to note that the highest proportion exceeding even 80% in found in semi arid areas of northern and south-eastern Village. There are Village where the pattern and intensity of showing follows the quantum and pattern of rainfall. The proportion of net sown area is also equally high in those Villages where rainfall is adequate, irrigational facilities from canals, tube wells and wells developed and land is flat. The lowest concentration of cultivated land has found in eastern area of tehsil, which is covered over natural vegetation (Sariska reserved forest).

Thanagazi mid central, southern & north-eastern area a lot of new settlement has taken place in recent years following the development of Canal, Johads, Anicut and Tube Well. The proportion of cultivated average is also equally high in those areas where rainfall is adequate, irrigational facilities from canal tube well, and wells are well developed, and the land is flat and free from hindrances so that returns from cultivation are certain. In the mid north-eastern and south-western extending belt of Thanagazi tehsil

there has been an impressive increase in the cultivated area during 2002-03.

Cultivated Land: Volume of Change

Category	Change No. of Villages	Percentage of Village
Positive (increase)	81	51.59
Negative (Decrease)	35	22.29
No Change	41	26.11

There are scattered patches of land where the net shown area suffered decrease during the last decade due either to encroachment on agricultural land by non-agricultural uses such as expansion of settlement, roads, canals etc. or to water logging.

From the above discussed analysis it can be concluded that change in net sown area is positive and more land has brought to cultivation whereas in some of area have sown no impact particularly on agricultural pattern.

Conclusion

The various use of land delineated in the study area (i.e. Thanagazi tehsil)- built up land, agricultural land, Forestland, Wasteland, water bodies and others are various land use categories identified.

Built Up Land

It is defined as an area of human habitation developed due to non-agricultural use and that which has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands

Agricultural Land

This is the most predominant category of land use of the tehsil. It is defined as the land primarily used for farming and for production of food, fiber, and other commercial and horticultural crops. It includes under crops (irrigated and also un irrigated), Fallow, plantation etc. The agricultural land is 37851 hector area which is 33.81% to the total geographical area of the tehsil. The maximum concentration lies in south-eastern direction and north direction of the tehsil.

Forest Land

The area under forest of moderate density located along the Thanagazi hills of Aravalli ranges, was 17.15% of the tehsil area, these was an increase in forest area marginally due to afforestation work taken under Aravalli hill plantation programme. The highest density of forest is confined to around Sariska project in Thanagazi tehsil.

Wasteland

After agriculture land use category it is next dominant land use class. According to data about 10.10% area in the tehsil is laying waste in form of barren land with or without scrub and gullied or ravenous land, barren rocky and salt affected land.

Water Bodies

It is an area of impounded water area in extent and often with a regulated flow of water. It includes man-made reservoirs, lakes, tanks and canals besides natural lakes, rivers and streams. Some ponds and dams are found in southern part of Thanagazi tehsil in scattered pattern. There are other important streams in the tehsil out of which Ruparel and Aravalli and other are seasonal with stream flow mainly during monsoons.

Various other organizations, the more purposeful and scientific long term developmental cropping pattern planning needs to be propagated and executed under strict government control and monitoring on the one hand and people's co-operation on the other. A plan needs to be oriented with specific objectives and development strategies for future gainful agricultural pattern. Perhaps, the direction and pace of the pace of the agricultural land use dynamism in the tehsil during last decade, analyzed so far, need to be accelerated to match with the growing rate of population for achieving a more balanced, systematic, conservation oriented and dynamic pattern of crop land use. Thus policies and decisions related to change cropping pattern will play a determining role in process desired.

The study results of the watershed development programmers in the tehsil strongly suggest the importance and technical, economical, social and environmental viability for sustainable development through people's participation, followings a "bottom up" approach with a blend of "top down" input.

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