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BETTER MANAGEMENT OF NATURAL RESOURCES IN DHARMAVARAM MANDAL BY USING GEO INFORMATICS & IT TECHNIQUES

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ABSTRACT

Natural resources influence socio-economic status of the inhabitants in any area. Because of the growing population, economic development and industrialization, the pressure is increasing on natural resources to meet the present demand and community livelihood options are also changing day by day. In this situation, conservation and management of the natural resources in a sustainable way and searching for the better livelihood options for people to improve their socio-economic conditions are essential. Application of information technology viz., Remote Sensing and Geographical Information System (GIS) in the areas of planning, Natural resource management and socioeconomic analysis will enable us to perform better and to take actions in time. The present study deals with utilization of the available Information and Communications Technology for better management of natural resources and good governance of Dharmavaram Mandal, situated in Anantapur District of Andhra Pradesh state. It conceived through the integration of management of natural resources and good governance using information and communication technology.

KEYWORDS: Remote Sensing, Geographical Information System (GIS)

INTRODUCTION

Natural resources are the components of the environment, which can be drawn upon for supporting life. Population growth, industrialization, infrastructure development and local as well as global environmental changes increasing pressure on natural resources. The decreasing resources, economic development and changing lifestyles brought changes in livelihood systems. The interrelationship between human factors and natural resources management is a complex aspect of the development process. Because of the growing population and increasing pressure on resources the arguments about 'limits to growth' were raised. Warnings about the world's exhaustible resources such as forests, minerals, etc., and the need for regulating their exploitation to avert future crises, gave rise to conservationist movements. Natural resource management (NRM) entails the careful manipulation of complex systems. It relates to the human impact on the natural environment, the productivity of land and water bodies and its impact on ecosystem services and qualities such as water allocation, soil loss, biodiversity but also indirectly with health issues as related to pollution, fire, or dust storms.

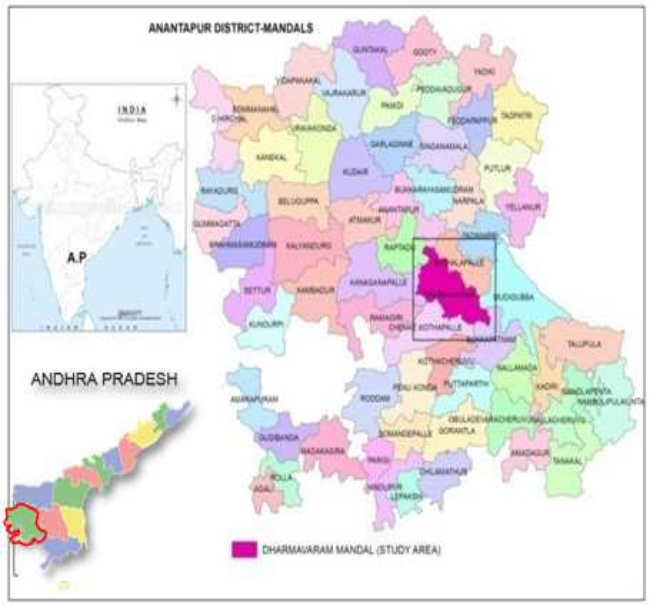

Figure 1: Location Map of the Study Area

STUDY AREA

Dharmavaram Mandal is located13º 40' and 15 º 15' north latitude and 76 º 50' and 78 º 30' east longitude. It is located in the middle of the peninsular region and is confined to the southwestern part of Andhra Pradesh, India. It is bounded by Bathalapalli, Anantapur, Raptadu, Kanaganapalli, Chennekothapalle, Bukkapatnam, Mudigubba mandals of Ananthapur district. The total geographical extent of the study area is 368.33 Sq Km. The municipality is divided into40 wards. According to 2011 census, the total population is 1, 72, 654 of which urban population is 121824 which is 70.6% of the study area, with literacy rate of 68.46% and sex ratio of total population is 958.

NATURAL RESOURCES MANAGEMENT

NRM play an important role in the infrastructure for sustainable development. In this context, sustainable development means development that effectively incorporates economic, social, political, conservation and resource management factors in decision-making for development. The pivotal tension of sustainable development is between the environment and the pressures of human activity. It is evident that the system of recognizing, controlling and mediating rights, restrictions and responsibilities over natural resources is the fulcrum to ensure decentralization of natural resources. Decentralizing natural resource management and using local decision-making powers is critical to improve the revenue-generating ability of citizens and local authorities. Local representative bodies need power over the resources that affect rural sustainable livelihoods in order to become legitimate actors around which civic organizations and citizens rally for justice, sustainable livelihoods and economic improvement. The challenge of balancing these competing tensions in sophisticated decision-making requires access to accurate and relevant information in a readily interactive form. In delivering this objective, information technology, spatial data infrastructures, multi-purpose cadastral systems and natural resources information business systems will play a critically important role. Unfortunately, modern societies still have some way to go before they will have the combination of legal, institutional, information technology and business system

infrastructures required to support natural resource management for sustainable development[1]

The increasing importance of NRM is paralleled with increasing complexity. NRM issues are increasingly difficult to address because historic influences carry through into the future in an ever increasing intensity and complexity. Past human actions influence the ecosystem states and require continuing adaptation of management (Argent, 2004). Management relies on continuously improved and updated information, but is also highly dependent on the dynamic nature of environmental conditions, most importantly; climate change, water allocation, soil loss and biodiversity loss, with substantial interactions between these environmental issues. Management issues generally involve interactions between economic, social, ecological and agricultural systems. Management goals and objectives, on the other hand, are often conflicting and non-overlapping. This brings issues such as trade-offs, capacities and constraints, and spatial and temporal considerations.

OBJECTIVES

- To appraise and analysis the natural resources such as land, Agricultural, water. Mineral and forest resources of the study area

METHODOLOGY

- To analyze the existing Secondary data along with field visit and environmental status of Dharmavaram Mandal
- To evaluate the existing Natural resources and their appropriateness with the utilization of present natural resources in the Study area.

FINDINGS & ANALYSIS

As most of the study area was under semi-arid type, management of resources is a crucial task. This chapter mainly focused on following resources and getting best results & practices.

- Land and Agricultural resources
- Water resources
- Mineral and Forest resources

Land and Agricultural Resources

Land is a finite and valuable resource upon which we depend for basic amenities of life. Soil, especially the topsoil, is classified as a renewable resource because it is continuously regenerated by natural process through at a very slow rate.

Land Capability

Soils suitable for agriculture is grouped under classes 1 to IV soils not suitable for agriculture are grouped under classes. V-VIII for pasture/forestry /wild life/ recreation. Class 111 followed by class VIII lands are extensive in study area.

[1] *(World Bank, 2001).*

Table1: Land Capability Classes in the Study Area[2]

	Land capability class	Area	Percentage
1	IIIes	12865.9	34.1
2	IIIws	8640.2	22.9
3	IIIes -IVes	8866.6	23.5
4	Vies -VIII	3056.1	8.1
5	VIII - VIIes	3282.5	8.7
5	Water body	1018.7	2.7
Total		**37730.0**	**100.0**

Source: Agriculture department of the A.P

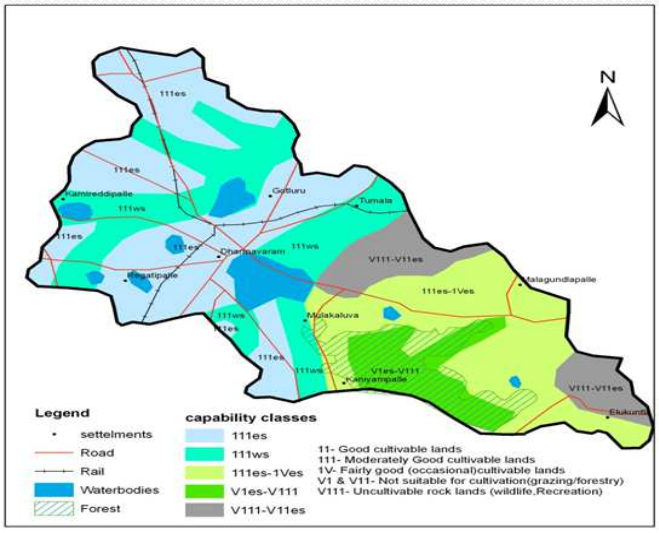

Figure 2: Land Capability Classes in the Study Area

Land Irrigability

Land irritability classification is the grouping of soil map units in soil irrigability classes based on the degree of limitation for sustained use under irrigation. Lands suitable for irrigation are grouped under classes I- 4 according to the limitations such as soil factors, drainage, and topography. Lands not suitable for irrigation are grouped under class 5 and 6. Class 3 lands followed by class 6 are dominant in the study area.

Table2: Land Irrigability Classes in the Study Area

	Land Irrigability Class	Area	Percentage
1	3ds	8640.2	22.9
2	3s-4st	21732.5	57.6
3	6st-(R)	3056.1	8.1
4	(R) – 6st	3282.5	8.7
5	Water body	1018.7	2.7
Total		**37730.0**	**100.0**

Source: Agriculture department of the A.P

[2] Source: Agriculture department of the A.P

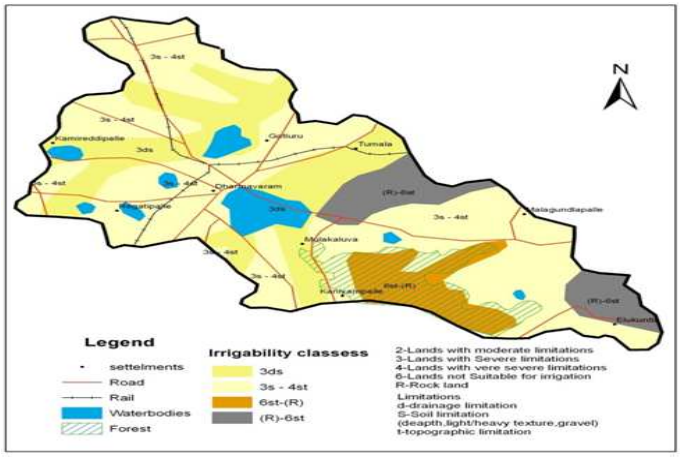

Figure 3*:* Land Irritability in the Study Area

Agriculture

The study area was a drought prone area because of the low distribution of rainfall varies considerably from year to year and season to season. Over the years the process of desertification has taken place in large tracts of the entire district of the study area, because of soil erosion, sand casting, mono-cropping, Chemicalisation, deforestation, excess use of ground water etc. along with low rainfall.

Table 3: Distribution of Farmer's Type in the Study Area

Farmers type	Farmers	Farmers percentage	Land in acres	Land percentage
Marginal Farmers (< 2.47 acres)	5066	36.2%	6325.75	10.14%
Small Farmers (2.47 to 4.93 acres)	4446	31.8%	16220.14	26%
Semi-Medium (4.94 to 9.87 acres)	3303	23.6%	20858.64	33.4%
Medium (9.88 to 24.7 acres)	1017	7.2%	14353.23	23%
Large (>24.71 acres)	127	0.9%	4577.36	7.3%
Total	13959	100%	62335.12	100%

Source: Agriculture department of the A.P

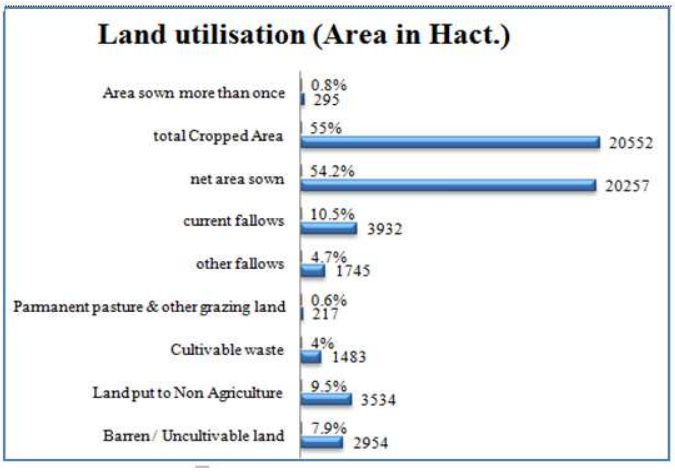

Chart 1: Land Utilization in the Study Area

WATER RESOURCES

Hydro-Geomorphology

Hydro-geomorphology theme provides the information on landform features, underground geological formations and ground water potential existing in the area.

Available Water Capacity

The soil AWC indicates the amount of soil moisture retained between 33 kpa and 1500kpa within the soil depth of 100 cm or entire solum if the soil is shallower. Low moisture retentive soils followed by medium retentive soils are extensive in the study area.

Table 4: Available Water Capacity Classes in the Study Area

	Available Water Capacity Class	Area	Percentage
1	1	21732.5	57.6
2	1-(R)	3056.1	8.1
3	3	8640.1	22.9
4	(R)- 1	3282.5	8.1
5	Water body	1018.7	2.7
Total		**37730.0**	**100.0**

Source: Agriculture department of the A.P

Table 5: Hydro-Geomorphology Classes in the Study Area

	Hydro-Geomorphology Class	Area	Percentage
1	Flood plain	226.4	0.6
2	inselbergs	150.9	0.4
3	Moderately weathered pediplain	17016.2	45.1
4	Others	830.1	2.2
5	Pediment insulberg complex	6263.2	16.6
6	Residual hills	5395.4	14.3
7	Settlements	37.7	0.1
8	Shallow weathered pediplain	7281.9	19.3
9	Water body	528.2	1.4
Total		**37730.0**	**100.0**

Source: Agriculture department of the A.P

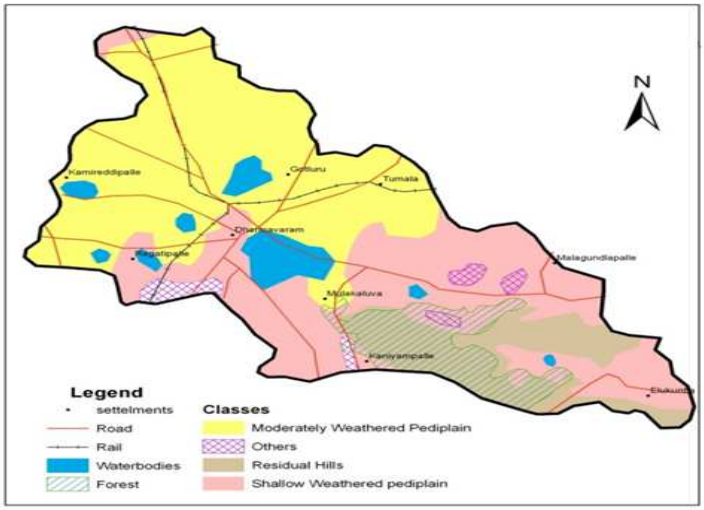

Figure 4: Hydro-Geomorphology of the Study Area

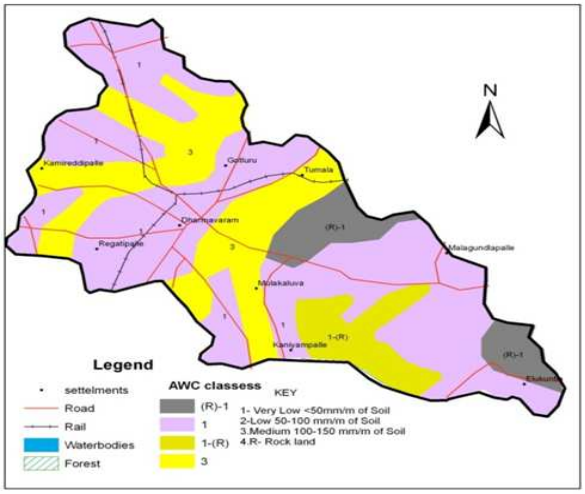

Figure 5: Water Capacity of the Study Area

Mineral and Forest Resources

Minerals are naturally occurring, inorganic, crystalline solids having a definite chemical composition and characteristic physical properties. Minerals are found use in a large number of ways in everyday use in domestic, agricultural, industrial and commercial sectors and thus form a very important part of any nation's economy.

The study area was covered by schists, gneisses, migmatites, younger granites, pegmatites, quartz veins and basic dykes that have been metamorphosed and recrystallised (except basic dykes).

The study of the land forms and related processes is vital for Environmental management. A major portion of the area forms a pediplain ranging in elevation from 600m to 300m from south to north with hill ranges of relatively small relief scattered especially in the SW and SE portions.

Chitravati River was mostly dry except during floods. The Groundwater reserves have been indicated to be of the order of 1, 76,343 hectare meters in the district. Ground water in the granitic terrain is fracture controlled and basal part of the massive limestone forms a good aquifer.

The Achaean crystallines possess medium to high bearing capacity, good to very good compressive strength and low permeability. The District is seismically least active, as the area form a part of the stable peninsular shield.

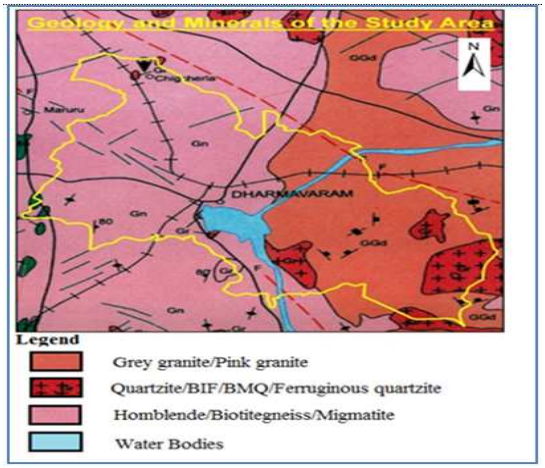

Figure 6: Geology and Minerals of the Study Area

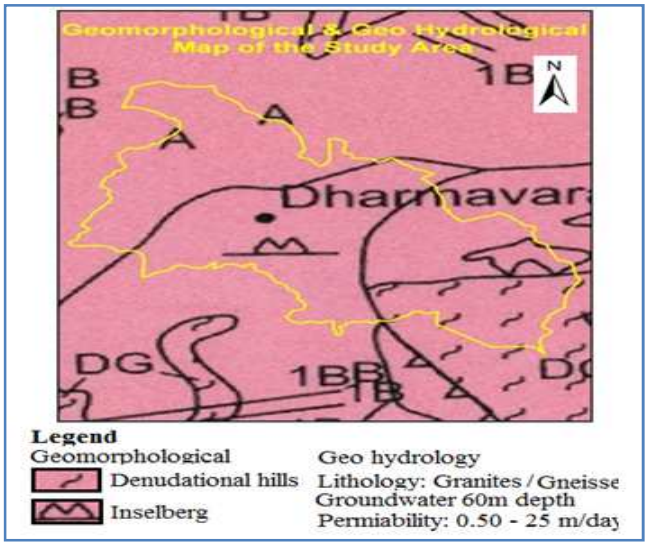

Figure 7: Geomorphology & Geo-Hydrology

Forest Resources

Forests are one of the most important natural resources on this earth. Covering the earth like a green blanket these forests not only produce innumerable material goods, but also provide several environmental services which are essential for life. Forests cover only about 4.54 % of the total area of the study area and mainly comprise of deciduous forest category. As the study area was having very less area under forest cover, moreover dry climate and drought conditions, there was a need to protect the reserved forest and also develop the forest cover by means of social forestry, horticulture, joint forest management etc.

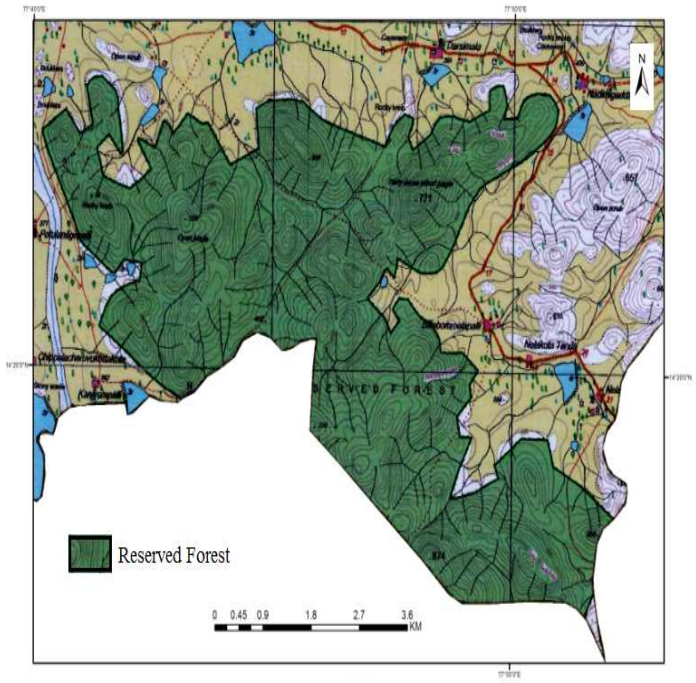

Figure 8: Reserved forest

Figure 9*:* Forest of the Study Area

RECOMMENDATIONS

- For efficient management of natural resources sound management options which were successful in other areas should be adopted and also new option should be planned based on the local situation.
- Land/soils in the study area were not supporting the agriculture only because of water scarcity. So to improve the irrigation facilities, groundwater level methods/techniques like drip irrigation, sprinkler system, watershed management, rainwater harvesting etc. should be identified and implement strictly.
- For improving agricultural production, crop diversification, Rain guns, mixed cropping, farm mechanization should be practiced.
- Qualified people should have to choose agriculture as a profession or give support to farmers to improve the agriculture production by utilizing modern techniques.
- Vegetation cover in the study area was very less even in the reserve forest area. So the forest area should be improved by forestation and reforestation programs. In villages and urban areas social forestry and plantations should be improved with horticulture, floriculture, avenue plantations etc.

CONCLUSIONS

Different researchers have been assessed the Natural Resources of Dharmavaram mandal. With all these previous studies carried out in the area natural resource potential questions still persists with the needed for the better description of different natural resources for the inhabitants of Dharmavaram mandal. As the inhabitants solely depend upon the available natural resources for their life subsistence the utilization and consumption pattern of natural resources and their impact on the Dharmavaram mandal socio-economic environment has great importance for the analysis and assessment.

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