

COMMUNITY LED MANAGEMENT IN CONSERVING BIODIVERSITY AND MANAGING NATURAL RESOURCES USING TRADITIONAL KNOWLEDGE: A CASE STUDY ON KODIKULAM VILLAGE, MADURAI, TAMILNADU

V.Padmavathy*, D.Winfred Thomas**, K.Chandramohan***

* Department of Botany, The American College, Madurai-625002, Tamilnadu

** : Head (Undergraduate Programs), Department of Botany, The American College, Madurai-625002, Tamilnadu

***School of Geography, Madurai Kamraj University, Madurai, Tamilnadu

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Abstract - Traditional knowledge associated with the conservation of natural resources and livelihood has played an important role in the sustainability and utilization practices of rural communities of India. Documenting such knowledge is highly significant during the recent climate change scenarios and rapid urbanization. This Village level field study highlighted the system of landscape ownership, management and conservation using traditional and indigenous knowledge that commonly prevails among the villages of India, especially South India. The present study conducted in Kodikulam panchayat at Madurai, Tamilnadu focuses on community role in utilization of bioresources in their livelihood. It is expected that the study will be helpful in understanding the differential pattern, spatial perception and analytical skills of village level management of bio resources.

In this study, the current use of GIS and remote sensing technology to monitor rural landscape and land use change research analysis, which for the bio resources management, climate smart practices, sustainable development of the environment and provides scientific basis for decision making.

Key words: Kodikulam Village, Traditional knowledge, bioresources, livelihood, Climate smart population

1. INTRODUCTION

The soul of India lives in its villages. 60 percent of the population lives in villages of India that varies in culture, tradition, life style according to region. Hence making sustainable environment in a living reality of a village area needs several inputs. First is to make an integrated assessment of the current conditions prevailing in the village and identifying best possible solutions with their own customary laws, perceptions, convictions, preferences, and concerns. Secondly understanding the socio economic status and social constraints which is preventing them from the long term planning and third is to identify all the gaps that is between the affordable traditional innovations and government.

Similar to cities, villages also constitute hidden economy of social and natural complex eco systems. Through Traditional

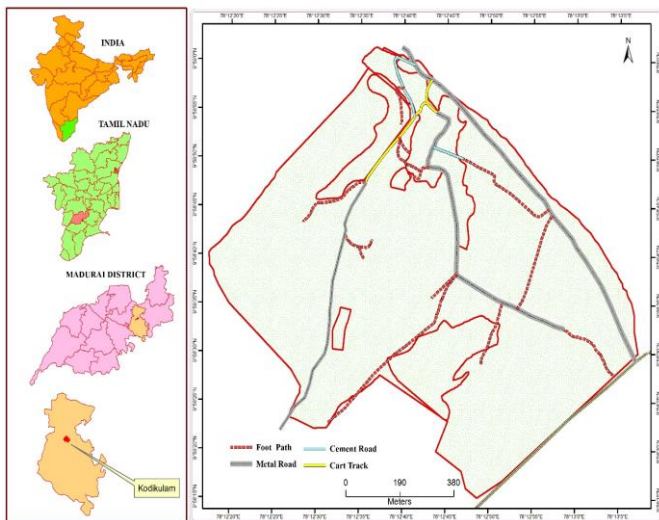
and indigenous knowledge people are capable of managing the bioresources, that are available in their particular village. This ultimately provides a livelihood according to the existing time and space. It is identified as a hope for the future generation who are expected to be more climate smart than present sample population.

As explained by Chengfan (2010) and Li (2009) et al Remote sensing technology and GIS technology as a direct contact in case of not on target for remote observation can be coherent, efficient, well planned, comprehensive, real-time understanding of the changes in rural development, and timely grasp of the new, specific, subtle change information, the rational planning, building, guidance and management. In similar way GIS and RS techniques were used to mark the land use and landscape changes at Kodikulam village.

According to Winfred et al (2003) a system that uses conservation for livelihood strategies and survival strategy has more possibility in moving towards sustainable development. Conservation and creation of economic stake has a significant role to play with it. Kodikulam village is with multifaceted population that makes progress in both utilization and conservation of the resources.

The concept of 'sustainable livelihoods' is increasingly significant in the terms of development. This paper outlines a framework for analyzing sustainable livelihoods and an attempt to study the perception of the local communities who are able to manage and modify their livelihood according to the available resources. In conclusion, the paper briefly considers some of the social, ecological, political, spatial and analytical considerations achieved through access to a range of livelihood resources.

1.1 STUDY AREA



The study was conducted at Kodikulam panchayat, of Madurai district, Tamil Nadu lying between Latitude:9.98396, Longitude:78.20952 and Altitude:348.10.(figure 1)This panchayat constitutes of five villages namely, Malayalathanpatti, Nelliendhalpatti, Kodikulam, Vavvalthottam and Agricultural college(TNAU).Total area of the panchayat is 222.35 Hec, with wetlands of 1999.49 Hectares and dry land of 22.85 Hectares. In total the population of the village is 2405(Male: 1149, Female 1256).Kodikulam village was identified as one of the most dynamic population in the panchayat and it was chosen as sampling population. Total area of the village is 42 acres with agricultural area 20.11 acres. Soil types are vandal and cheval (clay loam). The total population of the village is 750 (Males: 364, Females: 386).The precipitation is high during November and very low during June. Average Temperatures are highest during May and June (34 C) and lowest in December (28 C)

1.2 METHODOLOGY:-

The study was conducted in the backdrop of the participation of community in utilizing and managing, conserving their local bioresources for their livelihood and also for their future generation. Using electoral documents 670 respondents were selected using random and lottery sampling methods. These methods were used to understand the heterogeneity of the village. Questionnaires were used for surveying, followed by informal group discussions. Personal interviews with elder and old people were conducted and sample size was each household was 5. Actual field checks were done to verify the primary data collected from the local community. Various data and reports were collected from different institutes and government departments. The historical data and records were obtained from the regional offices at Kodikulam. Detailed information such as population, settlement area and other local

community details were collected from Panchayat office and revenue department, Madurai. Elderly people and other elected representatives of the village were able to provide the primary data which were verified from the village institution records.

Secondary data was collected from the Government records such as VAO offices, Local administrative bodies such as panchayat board, office etc.

All the map sources were digitized. Village layout was created, designing the maps and plots using the primary database, analysis, Development of thematic maps, Visualization, and Community participation was done. The software used for developing maps in this present study includes ARC GIS, Geo server, Geo explorer and Database.

2. RESULTS AND DISCUSSIONS:-

Bioresources play a significant role in the livelihoods of rural communities in developing countries like India. Even in highly modified or degraded landscapes, bioresources are being efficiently used. In a village like Kodikulam climate uncertainties are frequently seen which would result in crop failures, reduced yield of food grains, horticultural crops, products of livestock, drying of water resources, increased water demand, poor health and etc. There are more chances for agrarian income to get weakened and worsen the financial conditions. This may eventually lead to food scarcity (threatened household food security, limited food preferences, malnutrition, and other health impacts) unemployment, farmer's suicide, migration.

Kodikulam is also a village which experiences the same erratic climatic issues is equipped with various coping strategies to lead their livelihoods by managing their bioresources. Neema (2011), discussed about breaking down of traditional institutions and knowledge in village systems. Contrast to it, Using local calendar and traditional knowledge that has been passed on from generations to generations, they prepare themselves to adapt and perceive the environment better.

A total of 70 households were interviewed. Out of 750 people, around 670 were interviewed. Overall average of the household size of the sampled population is 5. Average age of the respondents was 40 years (range from 15-80 years).The average income of respondents houses are 875 USD (1 USD=66.47 s on May 1st, 2016).It is assumed that the local community's perception of climate change, occupations, adaptations and mitigation measures depends on their local calendar that schedules on bioresources availability and its utilization.

As usual, gender based works are being carried out. Hard works using physical tasks are done by men. Meanwhile women are with tasks that involves Agriculture, fodder, fuel wood collection, kitchen garden, animals care taking etc. Though men and women share equal works, women are

observed to be with high indigenous intellectual skills than men.

Like other villages in Tamilnadu, Agriculture is the mainstay of the population and is accomplished throughout the year, under dry and rain fed conditions. Both traditional and modern practices are performed and mostly hybrids from TNAU (Tamilnadu Agricultural University) are preferred for cultivation. Separate seed banks for traditional varieties are almost seen in the village at every household. Government offers Mahatma Gandhi National Rural Employment and Laboring at Agriculture College (Tamilnadu Agricultural University), 45% and 23% of the population are involved in them respectively is explained in the table 1.

Table 1 indicating the constant income sources of the village

Constant income sources	Average percentage of community involvement	Average income(per month)	Sector
Agriculture	73%	Rs.6000 per month	Landlords/ TNAU (Tamilnadu Agricultural University)
Mahatma Gandhi National Rural Employment	45%	Rs.3,000 per month	State government
Labors for Agriculture college(Tamilnadu Agricultural University)	23%	Rs.10000 per month	Government agency

Besides these constant sources of income, bioresources dependent occupations and activities has profound, standard influence and impact on the livelihood of local marginal community by providing sources for income, economy, and value added products to manage their daily lives. Such bioresources dependent livelihood uses traditional and indigenous knowledge to identify, better utilize and conserve it for future generation. Ecological, managerial, social and economic skills towards their landscapes containing resources of the Kodikulam local people evolves with novel livelihood mechanisms to cope with uncertain climatic conditions.

Seventeen different bioresources dependent occupations are observed in the village. Local community uses a large number of resources for its diverse needs. These resources are freely, abundantly available inside and surroundings of the village. These resources provides vital sources of food, fuel, fodder, manure, medicine and other value added products. There are differences in collection of the resources that mainly depends on season, available distance, climatic

conditions, growing and depletion pattern of the resources, social status, economic conditions, desirable resource and etc are listed in table 2 as perceived by the local community. Every individual in the village are well trained, skilled and engaged in doing one or more activities and hence there is always stability in economy of the household, insignificance in migration rate of the village, low farmers suicide in the village.

Table 2 shows different types of bio resources dependent livelihood strategies in Kodikulam village

Local calendar (period)	Occupation or Resource type	Percentage of local people involved	Resource status	Available distance (average)	Available weight and income (average)	Total area covered	Frequency (average)
Entire year	Fuel wood	75 %	High	440 meters	37.00 kg/2-3 days-Rs500	4 acres	Once in two to three days
Entire year	fodder	62 %	High	400 meters	22 kg/4 days-Rs 100	3.3 acres	Once in four days
Entire year	Palm and coconut leaves	59 %	Medium	200 meters	½ kg-Rs 5	10 acres	Daily
Entire year	Manure	55 %	Medium	-	1 ball-1 kgRs	-	Once in 5 days
Entire year	Live stock	34 %	Medium	-	15 kgs-1 goat Rs 6000	1 acre	Once in 6 months
Entire year	Carpenting	15 %	High	200 meters			
January-March	Small vegetables	34 %	Moderate	100 meters	2 kg/2days-Rs 50	Less than 1 acre	once in 2 days
April-June	Fish-traditional fishing	85 %	High		1 small bag-2 kgs-Rs 12000 per	25.97051 sq. k	daily

	practice				season	m (village pond size)	
April-July	Tamarind tree-contraction	34%	Moderately high		Per bag-400 grams -Rs 300 per tree	Less than 1 acre	Once in 8 days
May-June	Dry Medicinal plants	33%	Moderate	400 meters	1kg-one bag-Rs 1000	3 acres	Once in 5 days
July-November	Wild fruit	30%	High	600 meters	2kg-1 bag-Rs 500 (according to fruit it varies)	10 acres	Once in 15 days
July-December	Honey	45%	High	400 meters in distance and 2000 meters (in height)	Rs 1000 per bottle(2 litre bottle)	12 acres	Once in 30 days
July-January	Wet medicinal plants collection	60%	High	600 meters	1 Kg-1 kg-Rs		
October-December	Edible insects	2%	Medium	100 meters	Consumed as food	-	daily
November-January	Mushrooms	15%	High	400 meters	Rs 30-10 mushrooms per packet - Rs 3000 per season	22 acres	daily

December-February	Hunting	3%	Low	1 Kilometers	Rs 1000-per bird Rs 700 per animal	More than village boundary	daily
December-March	Cock fight promotion	2%	Low	Less than 1 acre	Rs 3000-4000 per bird	Cages	Once in 20 days

High-production > consumption; medium-production = consumption; Low -production < consumption

Certain activities such as fuel wood and fodder collection, manure preparation, are carried out throughout the year where as other activities are seasonal and location specific. Animal husbandry is one of the significant source of income in Kodikulam. Each family maintains at least two cattle. All the cattle are allowed to graze freely in the village and fodder is sometimes collected and provided to them by their owners or the fodder is exported to other villages and districts for market value. Livestock are considered to be a wealth in the agriculture based economy.

Though farming, farm area, cropping pattern and intensity of the village has changed over a period of time, certain traditional occupations such as fishing, honey collection, cock fight promoting, hunting are quite prominent. Other than them, kitchen garden, intercropping, minor vegetable cultivation, medicinal plants cultivation and collection, mushroom collection, tamarind picking and processing are raised, utilized and sold at local markets by the local community.

Manure preparing is also significant. They are applied in the agricultural fields and is exported to Kerala frequently. Local community reports adequate production of resources such as forage and fuel wood. Most of the inhabitants in village depend on these products in particular *Prosopis sp.* This particular tree is used as fuel wood, fodder, carpentering and medicine by Kodikulam people. By rotational basis resources are collected from the tree and is utilized. Few houses in the village are only benefitted out of gas cylinders but others are heavily relied on *Prosopis* for fuel. As cattle rearing is predominant here fodder is also obtained from *Prosopis* only.

The traditional village council maintains customary laws that are according to timespace and needs. Their village level institution maintains the resources, enforces conditions and acts as an invisible administrative body.

The following figures 2 and 3 shows the availability of resources before utilization and the landscape utilization and landscape change after bioresources usage. Ramachandra (2014) identified land use and land cover information of an area has the capability to depict the status

of a landscape in environmental progression and sustainable development. Similarly Kodikulam is perceived using the spatial data of the landscape change (table 3). The total area of land use and land cover indicates, the change in landscape after utilizing the resources, in grass lands before utilization the area of resource was 42.5 hec and after utilization the landscape change percentage has increased to 16% and the resources has decreased in its pattern to 20.61 %, similarly water bodies utilization, agricultural lands vary in landscapes during and after utilization. Settlement areas, mountain areas show minimum changes since resources are also very low near the area.

Table 3 Area of Land use and land cover

Classification	Area in Hectare(also includes landscape outside village boundary)			
	Landscape before resource utilization	% of landscape change	Landscape after resource utilization	% of landscape change
Harvested Land	18.09	14.628821	49.06	39.6733
Grass Land	42.5	34.36843	20.61	16.66667
Cultivated Land	30.6	24.745269	24.93	20.16012
Settlement	9.36	7.5691412	9.36	7.569141
Forest Land	8.71	7.0435064	8.64	6.9869
Hill Rock	8.46	6.8413392	8.46	6.841339
Water Body	5.94	4.8034934	2.6	2.102539
	123.66	100	123.66	100

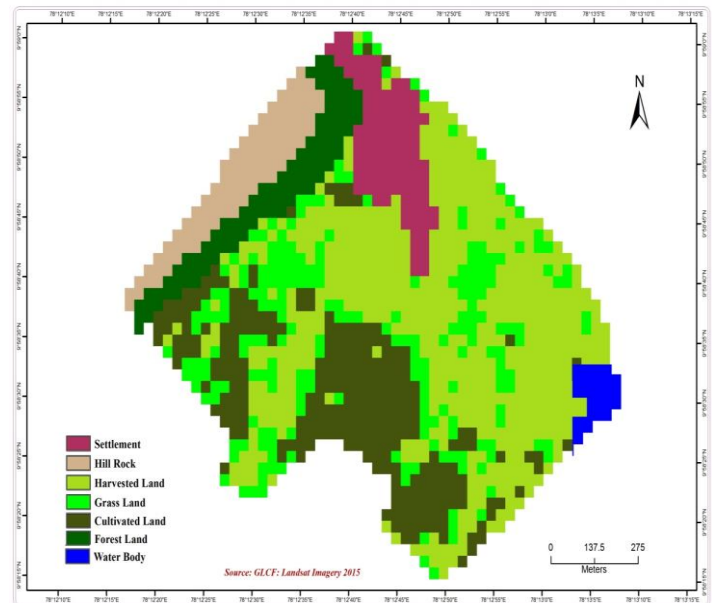


Figure: 3 LULC after utilization of the bioresources

As suggested by Shalini et al (2011) the aim is to maintain biodiversity and ecosystem. It can be achieved only with socially and economically viable systems. Community led management is perceived as utilization, regeneration and the conservation of the resources by the local community. It is considered to be product of culture, tradition, values, norms, practices, beliefs and knowledge of particular community. Sundriyal et al (2000) provides opinion to empower local community with all its stakeholders. It is identified to be as the best possible option to link conservation with sustainable management of natural resources that is to be dealt in an integrated manner. Kodikulam is such as village of sustainable development with enhanced bio based occupations, cashless and profitable economy and self-management. This encourages more beneficiary effects to the region which would contribute to the future.

CONCLUSION:-

The result of the field based study indicates the importance of traditional and indigenous knowledge of a local community for using its available bioresources and coping mechanisms for uncertain climatic conditions. Though reports of Government indicate bioresources depletion, Kodikulam village stands as a typical village, where supply and demand are equal and it is maintained by means of the local bodies. Satellite imagery and LULC imagery depicts the increased pressure on resources and reveals the subsistent sustainable system existing in the village. Balanced ecosystem, stable economy, reduced migration, better social welfare are observed in the village emerges as a new hope for the forthcoming generation.

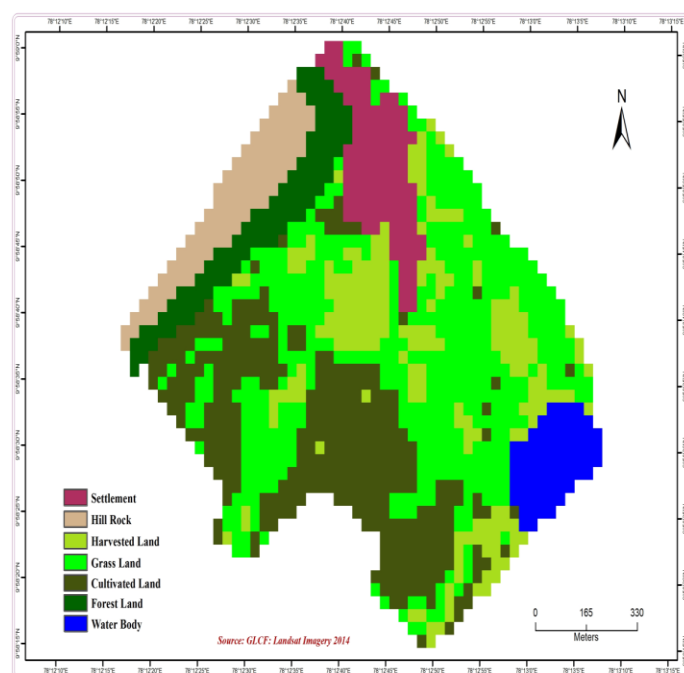


Figure: 2 Landscape before utilization of the bio resources

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