

# INDIGENOUS KNOWLEDGE ON BIO RESOURCES MANAGEMENT FOR LIVELIHOOD OF THE PEOPLE OF KODIKULAM VILLAGE, MADURAI EAST, TAMILNADU, INDIA

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**ABSTRACT:-** Natural resources management is a vital part of the Indian society. Such managerial practices has evolved from communities that are closely associated with environment, giving rise to recurring practices for the better utilization and conservation of the bioresources. This field based study conducted at Kodikulam village, Madurai, Tamilnadu (2014-2016) highlights the importance of traditional knowledge in self-administration of resources ownership, maintenance, management and protection. Even in limited land availability Kodikulam village is self-sufficient in food production, by its higher level productivity and other supplementary activities. The people of Kodikulam are rich in indigenous knowledge and are capable of obtaining all necessary requirements from available resources. The present study focuses on a community that is able to contribute significantly to natural landscapes, with sustainable development that enhances the livelihood security and ensures the quality of life.

## INTRODUCTION:-

Climate change has direct impact on food production and security, globally and locally. Key factors rainfall and temperature are gradually altering and anticipates changes predominantly on nature and resources leading to unsustainability. Especially developing countries are severely affected by varying climatic conditions.

India is one such developing nation that is highly vulnerable to Climate change due to its geography, rainfall, low wages and income sources, over dependency on agriculture, narrowed access to alternative livelihoods, inadequate resources and etc. It is evidently depicted by Mishra (2010) as India, faces drought conditions at least once every three years over the last few decades and is considered to be most vulnerable and drought prone countries in the world.

By understanding the fact, that erratic climatic conditions leads to other complications such as agrarian suicides, migration, rapid urbanization, a study on impacts of climate change and coping mechanisms of rural communities is a pre requisite. As rural communities are considered to be the production source of food and feed to urban, such communities are always ready and capable to mitigate the continuous climatic variations and their impacts. Through inherited complex resources management systems, they fulfil their needs and also satisfy the growing demands of urban and semi urban regions.

This study conducted at Kodikulam village has identified a living traditional community that utilizes and conserves bioresources for their present and future generations. In order to depict the accumulated knowledge and dynamicity of the local community landscape mapping is done. As suggested by Chetan et al mapping of landscapes helps in Identifying and assessing the likely effects of changes in an ecosystem structure and function on human communities and society in response to global climate change, finds and evaluates potential policy options for rural and urban livelihood in order to mitigate and adapt to the effects of global climate change and also recognizes and values possible rural and urban resources management activities in order to integrate risks associated with global climate change.

Miguel (2008) has concludes his study on farms and farm management as local knowledge systems and their agricultural practices and techniques adopted by the local people in their location remains to be the dominant form of coping mechanism to climate change. It is expected that this village level field based study conducted at Kodikulam with sources conserving livelihood that ensures resilience in the environment and also contributes an idea for food security in local, state, regional and national level.

**METHODOLOGY:-**

The study was conducted at Kodikulam panchayat of five villages namely, Malayalathanpatti, Nelliendhalpatti, Kodikulam, Vavvalhottam and Agricultural College (TNAU). Overall area of the panchayat is 222.35 Hec, (wetlands of 1999.49 Hectares and dry land of 22.85 Hectares). In total the population of the whole panchayat is 2405(Male: 1149, Female 1256).since Kodikulam village was acknowledged as one of the most dynamic population in the panchayat, it was chosen as sampling population. Using electoral documents 670 respondents were selected using random sampling method. Questionnaires, surveys and informal group discussions were conducted to identify the heterogeneity in the village. Average sample size for each household was 5. Actual field checks, data and reports from different institutes and government departments were used as primary sources. Detailed information such as population, settlement area and other local community details were collected from Panchayat office and revenue department, Madurai east, Tamilnadu. Elderly people and other elected representatives of the village were able to provide the primary data and they were verified from the village institution records.

Secondary data was collected from the Government records and was digitized. Village layout was created and maps were created using the primary database. Further it was analyzed and thematic maps were developed. Software such as ARC GIS, Google earth, Geo server, Geo explorer and Database were utilized.

**RESULTS AND DISCUSSIONS:-**

The study area lies in Madurai east, Tamilnadu. The settlements in the village together has 146 households and 750 individuals. The general profile of the village is explained in table 1

Table 1 representing Profile of the Kodikulam village

Name of the study area	Kodikulam village
Altitude range	139 m above sea level
Distance from Madurai Headquarters	13 kilometers
Name of the block	Madurai-East
Name of the Taluk	Madurai-North
District and state	Madurai- Tamilnadu
Crops	Paddy, Maize, Millets, Gram varieties, Sugarcane, Banana, Groundnut etc.
Total area	42 acres
Agricultural lands	20.11 acres
Soil types	Clay loam(Vandal, Cheval)
Latitude	9.931818191
Longitude	78.1231785
TNAU(Border sharing)	154.14 hectares
Kodikulam population status	750 in total, Males:364, Females:386

Average family size was estimated as 5 individuals per household. As primary data was collected through survey, three different classifications of occupations were observed. Such occupations are practiced by the residents using the available resources from the village. Those inhabitants using these resources are called as user groups. User groups are broadly classified into Primary occupations, secondary occupations and sundry occupations is depicted in the table 2

Table 2 - List of user groups based on their primary, secondary and sundry occupations (based on the time spend during the year 2014-2016).

Primary Occupations	Secondary Occupations	Sundry Occupations
Farmers (landlords)	Fishing community	Hunters (Game Animals)
Agricultural laborers (landless laborers)	Non Wood Product Contractors	Insect Gatherers (Food and Feed)
Fuel Wood gatherers	Medicinal Plants / Wild fruit Collectors	Cockfight Promoters (Local Breed)
Fodder Cultivators	Medicinal Plant Traders	
Pastoral Families (Smallholders of Livestock)	Honey Gatherers	
Palm Craftsmen	Mushroom Gatherers	
Carpenters	Compost and Manure Producers	
Small Scale Gardeners		

Primary occupations are constant income providing sources that is done all along the year. These occupations have profound impact on the livelihood of the local community. More number of people in the village are directly involved in primary occupations for their daily wages. Like other villages in Tamilnadu agriculture is the most predominant occupation with 70% of local population, followed by fuel wood collection and fodder collection. Though fuel wood and fodder are not sold, they are obtained mainly for self-usage. Pastoral families in the village are 52% with 2 or 3 cattle each family. Similarly fodder collection, palm craftsmen, carpenters, small scale gardeners earn constant income throughout the year by extracting the resources available.

Secondary occupations are also called as seasonal occupations. These tributary activities such as fishing, tamarind tree contracting, medicinal plants collection, honey gathering, mushroom collecting and manure preparing are preferred by the local community during particular seasons in which the resources required are highly found. More or less, primary occupational laborers are skilled in doing seasonal works too. Such periodic employments are also equally income providing to that of constant income sources. In order to avoid resources over exploitation and conflicts among people common property management is maintained with extraordinary care.

Sundry occupations are usually preferred by very small user groups and their percentage of population is insignificant. The demand for these sources are not as much as primary and secondary occupational needs. Hunting game animals for food and feed involves 7 % of the community. Similarly insect collecting and eating community are of 5% and cock fight promoters are 3% actively take part in the sundry occupations.

Table 3 explains the landscape preference and required resources available distance

User groups	Percentage of People actively involved	Average distance from human settlement.
Farmers (landlords)	3%	600 meters
Agricultural laborers (landless laborers)	70%	200 meters
Fuel Wood gatherers	75%	400 meters
Fodder Cultivators	62%	400 meters
Pastoral Families (Smallholders of Livestock)	52%	Less than 100 meters
Palm Craftsmen	59%	600 meters
Carpenters	15%	800 meters
Small Scale Gardeners	34%	200 meters

Fishing community	85%	800 meters
Non Wood Product Contractors	34%	Less than 100 meters
Medicinal Plants / Wild fruit Collectors	62%	400 meters
Medicinal Plant Traders	22%	100 meters
Honey Gathers	45%	600 meters
Mushroom Gathers	23%	200 meters
Compost and Manure Producers	45%	Less than 100 meters
Hunters (Game Animals)	7%	600 meters
Insect Gathers (Food and Feed)	5%	400 meters
Cockfight Promoters (Local Breed)	3%	Less than 100 meters

As already discussed by Padmavathy et al (2017), analyzing the primary and secondary data it is understood that there is a group dynamics in the village. Many groups are working together with the harmony since time immemorial. Every single landscape is identified with a variety of user groups with common interest on them. The following table 4 depicts the Classification of Landscapes based on area and local resource management options.

Table 4 depicts the Classification of Landscapes based on local resource management options.

S. no	Landscape	Area (in Hectares)	Available Local Resources	User Groups Preference
1.	Agricultural Land	48.69	Medicinal plants Fodder Mushrooms	Farmers (landlords) Agricultural laborers (landless laborers) Mushroom Gathers
2.	Settlement area	9.36	Tamarind trees Livestock	Cockfight Promoters(Local Breed) Non Wood Product Contractors Compost and Manure Producers Small scale gardeners Medicinal Plant Traders
3.	Fallow land	42.5	Palm trees Fodder Fuel wood trees Insects Medicinal plants	Palm Craftsmen Fodder Cultivators Fuel Wood gatherers Medicinal Plants collectors Insect Gathers (Food and Feed)
4.	Mountain area	8.46	Medicinal plants Honey combs Small birds and animals Wild fruits	Medicinal Plants / Wild fruit Collectors Honey Gathers Hunters (Game Animals)
5.	Pond	5.94	Fishes Mushrooms Insects	Fishing community Mushroom Gathers Insect Gathers (Food and Feed)

6.	Woods	8.71	Palm trees Fodder Fuel wood trees Insects Medicinal plants Small birds and animals Wild fruits	Fuel Wood gatherers Fodder Cultivators Carpenters Palm Craftsmen Hunters(Game Animals) Insect Gathers (Food and Feed) Medicinal Plants / Wild fruit Collectors
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As primary occupations are commonly seen in villages and panchayats of South India, secondary and sundry occupations were unique and location specified, that is confined to Kodikulam. Considering rainfall as a parameter, secondary and sundry occupations and landscape utilization of Kodikulam were studied from 2014-2016.

During 2014-2015, the average rainfall of the village was 230 mm. Activities other than tamarind contracting ie non wood products contracting all other activities had high resources. Those were utilized and helped in enhancement of the livelihood of the local community. 2015-2016 with deficit rainfall (147mm), gradually decreased the income of the habitants in the village, due to insufficient resources. Total number of pastoral families involved in livestock maintenance and animal husbandry during 2014 were decreased due to reduced resources and insufficient economic conditions to maintain the cattle. Similarly demand for fuel wood and fodder had increased. Local community who were using LPG (Liquid Petroleum Gas) started shifting to fuel wood due to its free availability and easy accessibility. NSSO(2012) reports in its survey during 2009-2010 that 22.5%of the urban population use traditional fuels such as firewood, chips, dung cake and other locally available biomass. Palm craftsmen and honey gatherers are paid more than that of 2014 in 2015, due to its increasing need. Natural honey also gained more income than earlier period.

While studying the energy equality between urban and the rural areas Aditya et.al (2013) used Gini coefficient and concluded that Urban areas utilize more energy synthesized artificially than the rural areas. It is identified that rural communities consume lesser energy than that of urban. Similarly Kodikulam enjoys more benefits out of limited resources and landscapes by using its traditional management systems.

The forthcoming table 5 indicates the Relationship between secondary occupation, sundry occupation and local resources availability and utilization pattern during 2014 – 16 with Average Rainfall as a parameter.

(#-indicates reduced resource availability and ## indicates high availability of the resources)  
(Alphabets on the header indicates the English months from January to December)

Relationship between secondary occupation and local resources utilization pattern during 2014 – 16(Average Rainfall-230 mm)												
secondary Occupations of local community												
	J	F	M	A	Ma	Ju	Jul	Au	S	O	N	D
Fishing community			##	##	##							
Non Wood Product Contractors				#	#	#	#					
Medicinal Plants / Wild fruit Collectors	##							##	##	##	##	##
Medicinal Plant Traders	##							##	##	##	##	##
Honey Gathers							##	##		##		##
Mushroom Gathers	##								##	##	##	##
Compost and Manure Producers	##	##	##	##	##	##	##	##	##	##	##	##
Sundry Occupations of the local community												
Hunters (Game Animals)		#		#	##			##	##			
Insect Gathers (Food and Feed)									##	##	##	

Cockfight Promoters (Local Breed)	##			##			##		##		##	
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Relationship between secondary occupation and local resources utilization pattern during 2015 - 16 (Average Rainfall-147 mm)												
Secondary Occupations of local community												
	J	F	M	A	Ma	Ju	Jul	Au	S	O	N	D
Fishing community			#	#	#							
Non Wood Product Contractors				##	##	##	##					
Medicinal Plants / Wild fruit Collectors	##							#	#	#	#	#
Medicinal Plant Traders	#							#	#	#	#	#
Honey Gathers							#	#		#		#
Mushroom Gathers	#								#	#	#	#
Compost and Manure Producers	##	#	##	#	##	##	##	#	##	#	#	##
Sundry Occupations of the local community												
Hunters (Game Animals)		#	##	#	##			##	##	##		
Insect Gathers (Food and Feed)									#	#	#	
Cockfight Promoters (Local Breed)	##			##			##		##		##	

The area of land use and land cover during both the seasons is shown in the table 6and depicted in figures. The landscape area during 2014-2016 and the percentage of change in landscape after utilization of the resources is indicated in the Figures (map) 2 and 3.The increasing demand for organic and natural food, feed and other necessities from rural to urban eventually leads to over usage of resources that indirectly affects the livelihood of the local community who are already utilizing them.

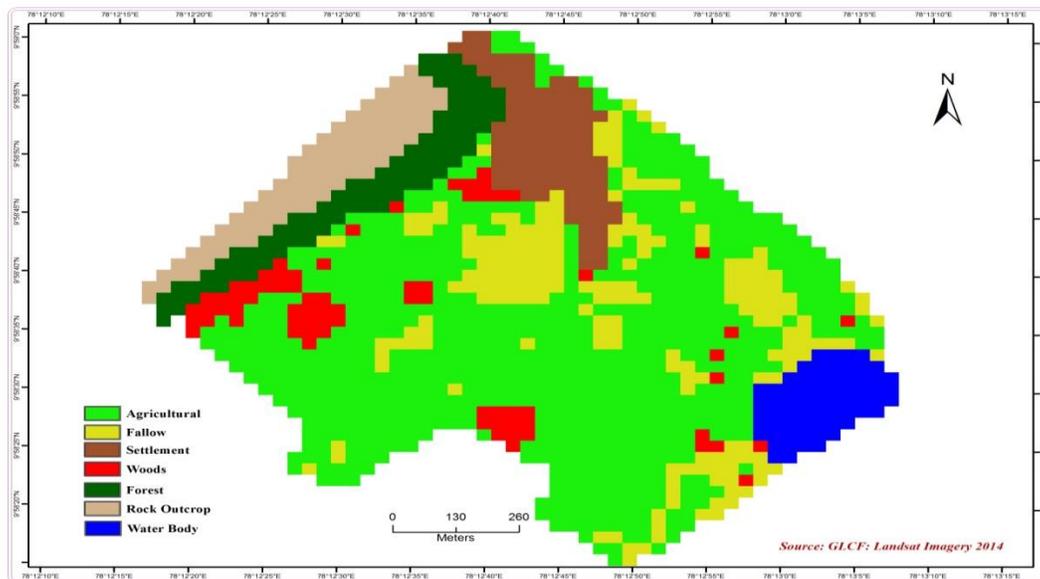


Figure.2: Landuse and Landcover for 2014

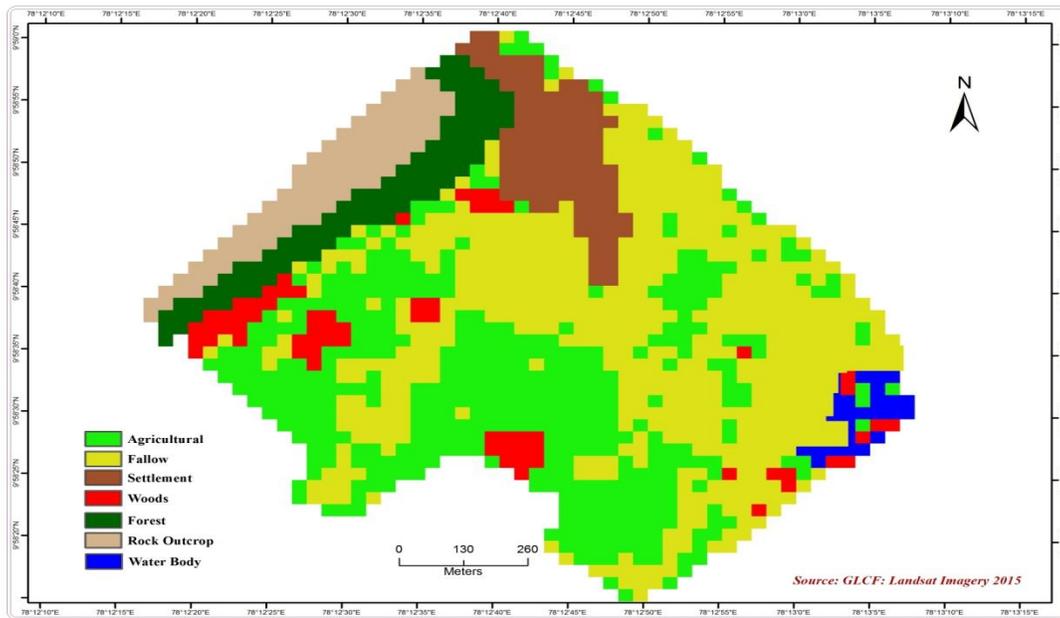


Figure.3: Landuse and Landcover for 2015

Table 6 represents the Area of Land use and land cover

Classification	Area in Hectare(also includes landscape outside village boundary)			
	Landscape 2014-2015	% of landscape change	Landscape 2015-2016	% of landscape change
Agriculture	48.69	39.37409	73.99	59.83342
Fallow	42.5	34.36843	20.61	16.66667
Settlement	9.36	7.5691412	9.36	7.569141
woods	0.70	0.56606825	0.63	0.50946143
Forest	8.01	6.477438137	8.01	6.477438137
Rock Outcrop	8.46	6.8413392	8.46	6.841339
Water Body	5.94	4.8034934	2.6	2.102539
	123.66	100	123.66	100

**CONCLUSION:-**

Government proposes many offers for rural based living people. But as far as their expenditures are concerned their dependency on resources are high than the other deals of the government (for instance, one kg of LPG(rs.450) is equivalent to 7 Kilograms of fuel wood(free)). Similar study conducted by Udmale (2014) in Maharashtra state recommended the government to give special attention to local people’s perception while designing and formulating policies for increasing community resilience towards the future varying climatic events.Over generations the local community of Kodikulam had developed locally adapted, location specific traditional and indigenous practices that paves way for self-administration, community livelihood, food security and conservation of natural resources.

Using low technology and with limited landscape, strategies and coping mechanism using alternate occupations, Kodikulam stands as an example of great significance for economic stability, ecological resiliency, managerial skills even in extreme weather and climatic conditions. Ostrom(1996) defines the theory of co-production mentioning that there is no remark of village governance or local governance, which is the only governance that has an impact directly on the lives of most people. Hence establishing local level research and effective employment of traditional knowledge would act as a basement for self-reliant development that would enhance the national food security in the face of climatic variability.

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