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## HUMAN ECOLOGICAL STUDIES IN A SEMI-ARID VILLAGE ECOSYSTEM

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**Abstract:** Human ecology is the study of relationships between humans and nature, all intimately connected in a web of interactions. It explores not only the influence of humans on their environment but also the influence of environment on human behavior, and their adaptive strategies as they come to understand those influences better. The work focuses on human ecological studies of Michaelpatnam, a small village in Ramanathapuram which is a drought-prone district in southern Tamilnadu. Based on the food consumption pattern, domestic consumption and occupation the entire village reveals that many of them were under poverty and agriculture is their main source. Due to groundwater depletion their livelihood security is a major threat. Prosopis plays an important role in their livelihood, which absorbs a thousand kiloliter of water to convert it into one Kg of fuel wood, thus reduced the groundwater table.

**Keywords:** Prosopis, PRA, RRA, Semi-arid.

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**Introduction:** Ecology refers to the study of our home (Fox, 1992). The term ecology was coined by Ernst Haeckel in 1866 and defined by direct reference to the economy of nature. It became a distinct field of study in the 1970s. This marked the first recognition that humans, who had colonized all of the earth's continents, were a major ecological factor. Humans greatly modify the environment through the development of the habitat (in particular urban planning), by intensive fishing and through agricultural and industrial activities. Human ecology began in the 1920s. The philosophy and study of human ecology has a diffuse history with advancements in geography, sociology, psychology, anthropology, zoology, and epidemiology, public health, home economics, and natural ecology, among others. The roots of ecology as a broader discipline can be traced to the Greeks and a lengthy list of developments in natural history science. Traditional knowledge, as it is called, includes the human propensity for intuitive knowledge, intelligent relations, understanding, and for passing on information about the natural world and the human experience. Human ecology is an interdisciplinary and multidisciplinary study of the relationship between humans and their natural, social, and built environments. In the human ecology discipline, we see humans as part of ecosystems-not as actors having an effect on the environment 'out there', but each one of us part of the environment of every other species.

Human ecology explores not only the influence of humans on their environment but also the influence of the environment on human behavior and their adaptive strategies as they come to understand those influences better.

It is disputed if human ecology is a sub-discipline of sociology, or if it is a sub-discipline of ecology. A point that strengthens the latter position is the

methodological approach of human ecology that is orientation rather along the lines of natural science then along the lines of social sciences. Increased incidences of drought, intensive pressure of people on the land, and improper land use practices are leading to a deterioration of these lands and their biodiversity. Land degradation in developing countries is usually marked by poverty and human suffering, making it difficult to conserve Biodiversity without alleviating human suffering. Despite the basic resilience of these ecosystems, once key thresholds are passed, recovery becomes almost impossible. Arid and semi arid lands have suffered some of the worst forms of degradation, due to their fragility and increased pressure from growing and partially sedentarized populations. Projects in the conservation of ecosystems and integrated land use will also naturally alleviate the problems of land degradation. However, there will be areas which have been degraded to the extent that they will need special measures within the projects to address the issues of rehabilitation and their future rational management. Components addressing these specific issues will be developed within both types of GEF activity: conservation and sustainable use.

Dry lands are conventionally defined in terms of water stress, as areas where the mean annual ratio of participation (P) to potential evapotranspiration (PET=Potential evaporation from soil plus transpiration by plants) is significantly less than one. 83 per cent of the classifiable dry lands are arid, semi-arid and dry sub-humid areas. Some characterized by rainfall which, except in more arid areas, tend to be seasonal with more or less marked annual variation. Arid regions, for instance, are estimated by (UNEP, 2002), and are collectively termed 'Susceptible dry lands' because of their vulnerability to degradation.

**Semi-arid ecosystems are characterized by the**

**following:**

- Erratic rainfall.
- Acute scarcity of water
- A major fraction of the local communities are poorer. Hence their dependence on locally available resource is meeting their daily requirements for fire wood and fodders are higher.
- Increasing demand for firewood and fodder leading to over exploitation of the soil, vegetal cover.
- Higher wind speeds and reduced vegetal cover leads to accelerated rates of soil erosion.
- Acute drought leads to lowering of water table.
- Absence of all their employment opportunity for the landless pushes them to migrate.

**Rationale:** Semi –arid ecosystems in the tropics are subjected to climatic stress and water shortages. Hence human population in such ecosystems has to evolve specific coping strategies to adopt themselves to the dynamic landscapes. Though there are many publications on semi-arid ecosystems, very few of them are focusing on human ecological issues.

Ramnad district located in south Tamil Nadu region experiences erratic rainfall and declining water tables. Hence the present study was undertaken to investigate the human ecological aspects of Michael patnam a small village in Ramanathapuram district has emerged as a social laboratory for innovative experimentation in rainwater harvesting which has been selected as a finalist in the World Bank's development market place global competition.

Ramanathapuram is a drought –prone district in southern India. Only one fourth of the cultivable land is used for agriculture (a major source of livelihood) because of acute water scarcity and low rainwater penetration in to the ground. As a result nearly a third of the rural population in the area lives under poverty line. It is a semi-arid region. It experiences hot climate in most of the months.

The following reasons made me to select Michael Patnam.

- Construction of lavatories in every household.
- It was selected as one among the twenty successful case studies for RWH World Bank.
- The village is made up of people from various economic and social strategies.
- Maintaining sanitation

**Objectives:**

The broad objectives are

- To investigate the food consumption patterns at house hold level.
- To estimate the domestic fuel consumption pattern.
- To suggest the ecological sustainable, socially acceptable and economically feasible strategies for

meeting food and energy requirements for long – term sustainable development of the village ecosystem.

**Methodology:**

The following are the major phases in the research methodology for the present study.

- A pre-RRA/PRA phase with secondary data collection, Key-informant/focus group interviews and parallel visit to the sites.
- The rapport building phase with the insiders (Breaking the ice).
- Naturalistic inquiry as an exploratory cum explanatory process.
- Detailed sessions of PRA and RRA.
- A continued exploratory phase of contacts with the local stakeholders.

The data were collected both from primary and secondary sources. Primary sources include field survey, interviews, and discussion and triangulation sessions with farmers and personal discussions with Government officials. Secondary data have been collected principally from statistical abstracts, Irrigation department (PWD and Department of Agriculture), TWAD Board, DRDA, Municipality, unpublished reports from various sources.

**Results And Discussion:**

**Location:** Michaelpatnam is a village in Ramanathapuram district, which is 12kms from paramakudi and is 13km from mudukulathur, which is a taluk head quarter.

**Demography:** The total population of the village is 2550 in which males are of 1004 and the remaining females. the educational status was 1003(males 390and females 384),which is of 33.2%.

**Soil Quality:** Hydro geologically the district can be classified as omtofoir zones. The soil texture is sandy clay. The soil of the district can be assorted into clay, coastal alluvium, sandy loam, alluvium sandy and red soil clay. Calcium carbonate concretions of various sizes and snaps are present in the majority of the black soil, constituted 46% of the total soil. There are vast stretches of saline and alkaline soils found in the coastal blocks. Rameswaram Island contains mainly sandy soil. The fertility status shows that nitrogen is low in all blocks and phosphorus status of soil is also low in all blocks. The potash content of the soil is high in all blocks. The mineral resources of the soil include gypsum, limestone and magnesium.

**Water quality:** In most places ground water is available at a depth beyond 6to 7m is saline. The fresh water available within 6to 7m depths dries up quickly within 2to3 months after monsoon. There is a acute drinking water shortage felt in most part of the year. The water which is used for irrigation contains much sodium chloride. The major crops cultivated in this village are cotton, chilies, gingili, paddy, cowpea

and coriander. The yields of paddy are meager.

The water in India is more valuable than gold in Australia. This comes true in their life. The people in this village walk 2-5km to get water during summer. They use to buy water at a cost of Rs.0.50-1.50(volume of one pot is 9-10lit) depends upon the availability of water condition. The reason for this is almost (728.7Ha) of prosopis is found. According to the forest officer Prosopis juliflora plantations cover about 40% of their village area. Water contributes 80% of the total weight of the tree. The tree uses about 1000Kg of water to produce 1Kg of firewood.

**History Of Prosopis:** This came to India by 1950's by the department of agriculture to fence the croplands and meet the poorest basic needs. Its roots grow deeper in to the

ground level is 6 to 7m depth it also grows beyond and absorbs water. Only 3% of the intake water is used for its own growth, remaining 97% goes through transpiration. This area has a huge population of this species.

**Food Consumption Pattern:** We eat various food items which differ in nutrient value. To meet adequate nutritive requirements we need optimum quantities of various types of food. In this village cereals alone constitute 65% of the total calories consumed. Rice is their main food. Ragi and wheat is also taken sometimes. Their daily per capita consumption figures for food indicate that though they consume adequate calories, their protein consumption is less.

Food intake	Consumption	Recommended
Food	0.5J	0.6J
Protein	38.1gm	60gm

**Domestic Fuel Consumption:** A survey was conducted in this area to assess their energy consumption for domestic sector especially for firewood. It was found that prosopis meets a major fraction of their firewood demand. The country wood species used by them includes tamarind, pongamia, and neem. The people who are below in poverty line uses crop residues (36.5%) and collects crop residues, from paddy, cotton, chilies, etc. LPG contributes an amount of 0.4 % ( 5.8GJ) while kerosene account for 3.2 % ( 43.8GJ).

HHs were categorized into 5 groups based on their economic status. A process of wealth ranking based on the following criteria ascertained economic status:

- Very Rich
- Rich
- Medium
- Poor

- Very Poor

For each category 5 households were randomly selected (stratified random samples) for detailed investigations on domestic fuel consumption pattern, I restricted myself only to very poor category in the village a major fraction of the village HH living below a poverty line. Besides it will be interesting to investigate how the poorest of the poor are using and consuming resources that are difficult to obtain in this parse climate. The fuel consumption was converted into joules for comparison and nutrient/calorific value of the food items consumed was estimated. The difficulties faced by the poorer households for ensuring their food and fuel consumption were analyzed.

S.No	Fuel	Amount used (Kg/Year)	Energy Equivalent (GJ)	%
1.	Prosopis	59733.15	937.8	68.2
2.	Cropresidue	32811.75	358.9	26.1
3.	Dung Cakes	4927.5	28.7	2.1
4.	Kerosene	1168(lt)	43.8	3.2
5.	LPG	120.5	5.8	0.4
	<b>Total</b>		<b>1375</b>	<b>100</b>

**Lively Hood Security:** The people in this village earn money through prosopis they produce of carbon and transported to other places. Migration of the people and livestock due to drought is very common here.

Water and fodder are extremely scarce resources locally; as a result people are forced to sell their cattle in Kerala for slaughter. The people from this area migrate to other places for employment.

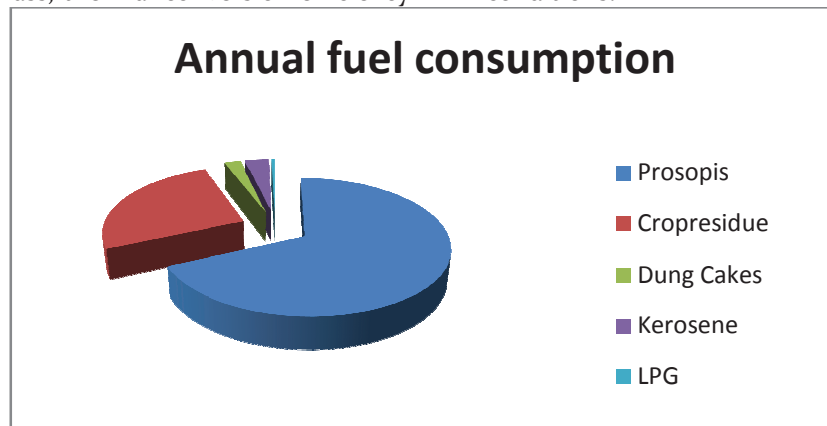
**Conclusion:** Suggestions For Long Term Sustainable Development Of The Village

**Water Harvesting:** Conservation and preservation of runoff water during active monsoon periods would sometime help in mitigating the intensity of the drought particularly in the succeeding drought year.

**Energy Conservation At The Domestic Sector:** Domestic sector was the most energy consuming sector. The traditional Chullahs, which are used by this people, are infact family heir looms. All HH are burning solid biomass, thermal conversion efficiency

ranges from 5 to 10%. These stove do not have any smoke elimination systems leads to respiratory problems, heart diseases, eye and lung infections. They can go for recently designed and field tested by the CFRI mud chullahs. Because of the following reasons

- ❖ Ideal for the mixture of biomass fuels
- ❖ No chimney, simple design and lesser cost
- ❖ Higher efficiency
- ❖ Lesser smoke emission thus, improve health conditions.



**Livelihood Security:** Securing livelihood especially for the poorer HH is looming large as a major issue in the semi arid tract. As it has been discussed elsewhere, prosopis provides livelihood security. if it is removed What will happen to the degraded land with holes and pits?

Who will be responsible for managing the land?

If it is worthwhile to explore the potentials and constraints for growing/cultivating selected dry land

species (especially medicinal plants) and establish cottage level industries for processing to add value additum on a cooperative basis. It also the responsibility of the local community leader can be closed to involve and be infact given the responsibilities for evolving sustainable management strategies for the village eco system in consultation with the relevant stake holders.

#### References:

1. Becker, C.D.; Ostrom, E., "Human Ecology and Resource Sustainability: The Importance of Institutional Diversity", *Annual Review of Ecology and Systematics*, 1995, pp. 113-133.
2. Bestelmeyer, B. T., "Threshold concepts and their use in rangeland management and restoration": The good, the bad, and the insidious. *Restoration Ecology*, 2006 pp. 325-329.
3. Burkart, A., "A monograph of the genus Prosopis (Leguminosae sub-fam. Mimosoideae)", *Catalogue of the recognized species of Prosopis. Journal of the Arnold Arboretum*, 1996, 57, pp. 219-249.
4. Davis, A.; Wagner, J. R., "Who knows? On the importance of identifying "experts" when researching local ecological knowledge". *Human Ecology*, 2003, 31 (3), pp. 463-489.
5. Felker, P. and Clark, P.R., "Rooting of mesquite (Prosopis) cuttings". *Journal of Range Management*, 1981, 34, pp. 466-468.
6. Huntington, H. P., "Using traditional ecological knowledge in science, Methods and applications". *Ecological Applications*, 2005, 10 (5), pp. 1270-1274.
7. Turner, N. J.; Ignace, M. B.; Ignace, R., "Traditional ecological knowledge and wisdom of aboriginal peoples in British Columbia". *Ecological Applications*, 2006, 10, pp. 1275-1287.
8. McDonnell, M. J.; Pickett, S. T. A., "Ecosystem structure and function along urban-rural gradients: An unexploited opportunity for ecology". *Ecology* 71, 1991 pp. 1232-1237.

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