P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-3* ISSUE-5* (Part-1) August- 2018
E: ISSN NO.: 2455-0817 Remarking An Analisation

Natural Resources and Their Management
(Soil, Water, Vegetation and Energy)

R. K. Mourya
Associate Professor,
Deptt.of Geography
Govt.Arts College,
Dausa, Rajasthan

Abstract

Manhas been relaying on the natural resources to meet the basic requirements since time immemorial. With the unprecedented increase in the population during the last few decades, clearly mankind faces formidable problem to ensure food and nutritional security for all, considering reduced per capita land, reduced availability of water, depleting biodiversity and need to preserve ecology and environment.

The physical and biological environment of the earth is so rich in its potential that is can support the need of its inhabitants for a long time to come. However, the man's greed rather than his needs is putting enormous pressure in the capacity of the biosphere resulting in over-exploitation of the natural resources, as the demand is not within the paradigm set by ecological constraints.

The natural resource management at most places in the world including India is inappropriate, exploitative and unscientifically planned. Even today, land and water are being exploited without restraint considering them inexhaustible, and wastes are discharged freely into air and water assuming that these have unlimited assimilative and carrying capacities.

As a result, very disturbing trends of natural resource degradation have emerged. Human activities inflict harsh and often irreversible damage on the environment and on the critical natural resources. If not checked, many of our current practices will put, at serious risk, the future that we wish for human Society and the plant and animal kingdom.

Keywords: Natural Resource, Management, Activities, Expoitative, Environment, Assimilative

Introduction

The United Nations Conference on Environment and Development (UNCED) at the earth summit held in Rio-de-Janario, Brazil in 1992 focused attention on the harmful effect of development of the earth's life sustaining capacity. The conference also adopted Agenda 21- a global blue print for environmental action.

It revolves around seven themes, one of which is "Efficient use of natural resources of land, water, energy, forests and biological resources". This is unquestionably the theme for the survival of humanity and for the sustainability of future agriculture.

Aim of the Study

1. To increase and improve provision of goods and services from agriculture, forestry and fisheries in a sustainable manner.
2. To increase the resilience of livelihoods to threats and crises.

Management of Natural Resources

Land Resource

India has only 2.4% of the land resource of the world to meet their basic requirements of 18% of the world's population and over *25%* of the world's livestock. Nearly *57%* of the land resource in India is facing degradation due to water erosion, wind erosion, loss of productivity and chemical and physical degradation.

About *5.3* million ha of topsoil is displaced every year only through water erosion which also accounts for a loss of 8 million tones of plant nutrients. While most of the land resource faces nitrogen deficiency, nearly *50%* and 20% of the land resource is deficient in phosphorus and potassium. Deficiencies of micronutrients have been widely reported. It is assessed that 8.6 million Ha of agricultural land is affected by both the problems of water logging and soil salinity. About *65%* of which is the most productive irrigated land resource.

Added to these the per capita arabic land which was 0.12 1 ha in 1990, 0.176 ha in 1996 and 0.163 ha in 2000 is projected to be 0.121 ha in 2025 and 0.087 ha when the population stabilizes by the year 2050 or later. Therefore, meeting all basic necessities from degrading and low per capita arable land area of 0.087 ha is bound to be major challenge and calls for appropriate soil restoration and conservation technologies.

The best means of improving and maintaining soil quality which determines soil productivity and environmental quality is adoption of alternative agricultural practices such as crop rotation, recycling of crop residues and animal manures, green manures, biofertilizers and intergrated nutrient management for encouraging balanced use of fertilizers and manures, and reduced use of pesticides.

These are some of the components of a strategy for obtaining sustainable high productivity in any farming system. The relationship between the soil degradation processes and soil conservation practices as outlined by Hamick and Parr (1987) is shown.

While the water demand for irrigation to maximize agricultural production with the maximum possible level of irrigation to achieve self sufficiency in food grains.

Thus water is a limiting factor for crop production and scientific water management is the key for sustainable agriculture both irrigated and rain fed farming systems. Growing demand for fresh water supplies by industry, urban & civic uses, low water use efficiency, prohibitive costs of irrigation development, from poor water management makes agriculture a poor competitor for its use. Therefore the available water must be used most efficiently. The efficient use of this resource for crop production consists of:

Water Conservation

it involves two steps (a) reduction of runoff losses and increasing its infiltration in the soil through land shaping, tillage mechanical structures and vegetative barriers to reduce water flow, proper crop rotations, application of soil amendments and mulching (b) reduction of losses through deep drainage (by increasing water storage capacity & soil moisture retentivity), and direct evaporation from soil (by following shallow tillage, straw mulching).

Scheduling of Irrigation to Crops

The timing and amount of irrigation to crops plays a significant role in optimizing crop production with a given amount of water and avoiding effects of either over-irrigation or under irrigation on soil environment.

Approaches to irrigation scheduling vary depending on situations e.g., water is adequate irrigation water is available on demand to secure potential yield and where available supplies fall short of the full irrigation water requirement of crops over the entire command area.

Maximizing the Utilization of Resource by Crop and Maximizing Returns per Unit Resource Used By The Crop

The World Bank (1999) in a working paper on irrigation sector observed that *25%* improvement both in water use efficiency and crop yields (WUE rising from *35* to 43%) would generate an additional food grain production of *85* million tones, which represents an equivalent of 44% increase in food grain production by the year 2025.

This is the latent potential which the country needs to exploit. The ICAR experts feel that irrigation water use from the present level of 40% is possible to increase to 60% with the adoption of water use efficiency technologies. Using technologies such as sprinkler irrigation and drip irrigation in commercial and horticultural crops, a WUE of *85* to *95%* can be obtained.

Conjunctive Use

Conjunctive use of different sources of water for increasing the returns from available water resources and reducing soil- degrading effect. Conjunctive use of saline water and canal water can be effective in avoiding the deleterious effect of saline water on crops. Judging from the present trends it can be surmised that water quality will become most serious constraint in future and agriculture have to use more marginal quality water.

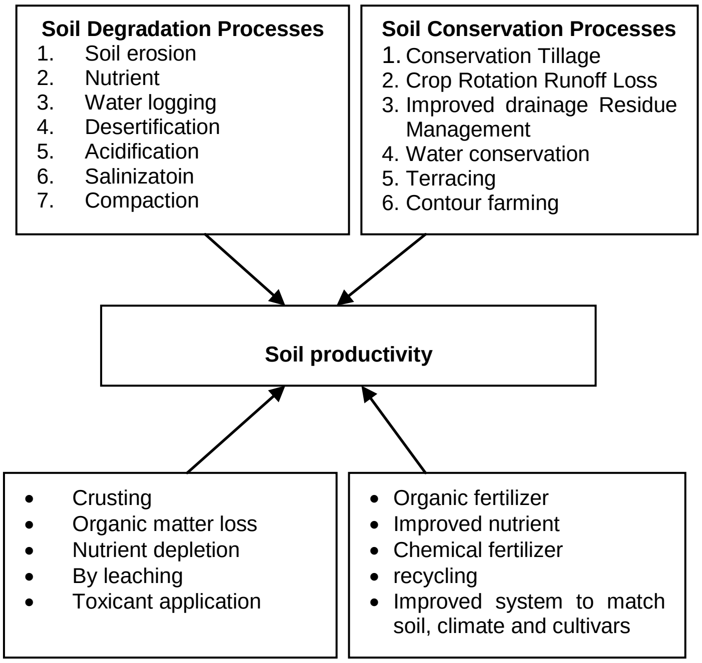
Participatory Irrigation Management

Promoting participatory irrigation management through establishment of Water User's Associations (WUA). The Government of Andhra Pradesh has established 10292 WUA for effective maintenance of irrigation- systems and use of waters.

P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-3* ISSUE-5* (Part-1) August- 2018
E: ISSN NO.: 2455-0817 Remarking An Analisation

For dryland agriculture, increased efficiency of rain-water is essential and it can be achieved in the following ways:-

1. Retain precipitation in situ and minimize the run-off,
2. Reduce evaporation in relation to transpiration,
3. Growing drought tolerant crops that match the rainfall pattern
4. Recycle the run-off drainage water for high value crop adopting life saving irrigation approach
5. Watershed approach for maximization of rainwater harvesting and recycling and
6. Ensure farmers' cooperation by assuring equity in distribution of benefit and maximization of the profitability of cropping system.



Relationship between Soil Degradiation Processes and Soil Conservation Practices Water Resource

Water is one ofthe most important natural resources vital for economic development of a nation. The per capita water availability presently estimated at 2001 m3/annum is projected to come down to a stress level of 1700 m3/annum in the next 2-3 decades.

The ultimate irrigation potential of the country has been estimated at *139.5* million ha comprising of 58.5 million ha from major and medium irrigation Schemes, 15 million ha from minor irrigation schemes and 66 million ha from groundwater exploitation. The present irrigated area in the country is about 53 million ha.

It is estimated that even after achieving full irrigation potential nearly 50% of the total cultivated area will remain rain fed. During 1990 the total utilization of water for all uses, was about 51.8Mha-m or 609 m3/capital year. The projected water demand to meet the requirement of domestic, industrial and irrigation.

Requirement of Water for Various Uses

S.No.	Categrory	Water (Mha-m)		
		2010	**2025**	**2050**
1	Irrigation	55.6	73.4	119.1
2.	Domestic	3.7	7.9	11.6
3	Industires	65.4	88.1	141.6

Water Demand for Irrigation

Year	Low demand		Medium demand		High demand	
2010	249	489	265	536	271	576
2025	322	619	349	688	365	734
2050	469	830	539	1088	605	1191

Vegetation Resource

Vegetation acts as a protective cover to the planet earth. Deforestation and over grazing have been causing tremendous soil erosion and landslides. At present (2000 A.D.), the per capita forest area in India is around 0.07 ha compared to the world's average of about 1 ha. Hardly 4% of the geographical in India is under pastures and grasslands.

With the passing time the stress on vegetative cover in India is increasing with the growing demand for food, fodder, fuel and timber. The quantity of firewood that can be annually removed from forests on a sustainable basis is only 40 million m3 as against the existing demand for firewood in the country is *235* million m3. Similarly, about 90 cattle units graze in the 1'orest while the carrying capacity of forests is estimated only at 3 1 million cattle units.

Measures to conserve and to improve vegetative cover are highly essential to restore ecological balance, maintain biological diversity, conserve soil and water, and to prevent flood havoc. To increase the vegetation in the country, plantation practices such as the following are encouraged:-

Afforestation

Establishment of forest by artificial means on an area from which forest vegetation has always or long been absent

Reforestation

Restocking of felled or otherwise cleared woodland

Social Forestry

Adoption of forestry practices by the society to meet its common requirements such as fuel, fodder etc.

Agro Forestry

Adoption of suitable land use systems that maintains or increases total yield by combining food crops (annuals) with tree crops (perennials)

These interventions reduce erosivity of rainfall/runoff and erodability of soil through dissipation of rainfall energy by canopy, surface litter, obstructing overland flow, root binding and improving physico-chemical conditions, restore ecological balance and reduce the risk of environmental degradation.

Forest (conservation) Act 1980 was enacted with a view to check indiscriminate destruction and diversion of forest-lands to non-forest purposes. The Forest (conservation) Act 1980 was amended in 1988 to incorporate stricter panel punishments against violators. Recent scientific thinking is that the pumped into atmosphere and to reduce or mitigate the effect of increased carbon dioxide content.

Energy and Agriculture

Agriculture has evolved as the largest and most important human enterprise, comprising not only production but also processing, packaging, transport and trade and distribution of food products.

Energy is needed in all stages of agriculture from land preparation, water lifting and pumping to planting and transplanting, weed control, harvesting, transport and processing. Sustainable management of the natural resources like land, water, air and biodiversity is the mantra for sustainable Agriculture.

The ecological; services provided by nature regulate and sustain the stability of production in natural ecosystems. The quality and quantity of energy used are transformed and consumed all of which is vital to food security.

Energy use in agriculture follows two extreme patterns. High external input and highly mechanized factory metal of agriculture of the advanced countries is so times as in energy intensive as traditional agriculture. Very low or nil external input agricultural that is a part of the subsistence agriculture prevalent in many of the stressed ecosystem (LEISA).

A Direct Relationship

Exists between energy consumption and agricultural yield. Traditional agriculture systems depend largely on the metabolic energy of human and animals and solar energy, where as the energy requirement of modern agriculture are almost completely met from fossil fuels mostly petroleum.

Impact of Low Energy Use in Agriculture

Farmers depend on traditional fuels such as wood and agricultural residues for cooking and heating and on human and animal power for primitive agricultural operations. Aquequate and appropriate energy for income-generating opportunities is not available primitive energy sources are used inefficiently and without concern for health hazards, yet have heavy costs in terms of time, money, drudgery and poverty.

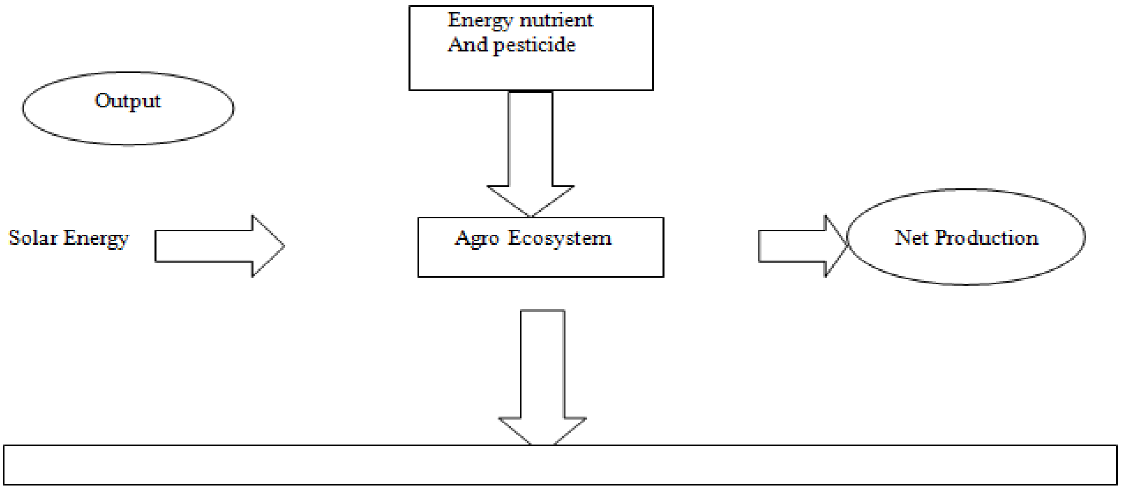
Lack of energy input in agriculture has also led to enormous land degradation in the form of erosion and deputation of soil organic matter and soil fertility, which has further lowed productivity and increased environmental pollution.

Energy and Agricultural Sustainability

Thus, both high external input and low-energy primitive agriculture systems are unsustainable in the long run. The former are flovoured in their overdependence on fossil fuel and because of the ecological, environmental and social stress they create, and the letter because of their inadequate land and labour productivity to sustain food security and livelihoods.

Sustainable Energy Management in High — Input Agriculture

Following the principles of thermodynamics, a key indicator of sustainability is the ratio of energy equivalents of all the outputs and inputs. The higher this ratio the more sustainable the system is Energy budget in crop production on: sustainability = high output to input energy ratio.



The basic way to improve the sustainability of modern agriculture is to decrease both the direct and embodied external energy component by increasing their efficiency of use in all possible agricultural practices. Maintaining high productivity with an acceptable impact on resources, environmental and economics is the key to sustainability the used non-polluting alternative sustainability.

A multipronged approach to achieving better energy efficiency along with resource conservation environmental safety and economic prudence has been adopted in the post decade through technologies that are holistic and make integrated use of natural ecological processes and external inputs. Conservation tillage, integrated pest management, integrated plant nutrient supply, crop rotation, micro irrigation techniques and precision agriculture belong to this category.

Conservation tillage practices were initially introduced to reduce the cost of mechanization but have turned out to offer several ecological and economic benefits such as low soil erosion, reduced runoff, more natural pest control, greater water storage and infiltration, increased cropping intensity and savings on inputs. Conservation tillage has become very popular where farms are large.

Similarly managing water more efficiently using drip and sprinkler irrigation and using mulching to improve water storage and reduce ET are simple ways of improving the productivity of water, which is likely to be the most limiting resource for agriculture in the future.

These practices not only result in energy savings but also attract other bonuses such as lower nutrient loss, higher efficiency of input use, and freedom from waterlogging & salinization. 1PM combines several virtues, including cost Reduction, environmental and human safety, prevention of pesticide resistance and post resurgence, whit a favourable energy balance.

Biodiversity enhancement through polyculture, crop rotation, mixed cropping and strip cropping has been shown to have a variety of positive such as conservation. Efficiency of use of nutrients and water, erosion control, biological pest and disease control and improvement of soil quality. Intergrated technologies are the best way to balance all factors related to the sustainability, stability and productivity of agro ecosystems.

Bio- Mass Energy

Biomass is stored energy that is not subject to seasonal vagaries, it can produce all forms of energy, such as heart, electricity, gas and liquid fuel. These can be harnessed to create small and big industries in rural areas to employment and also to increase the profitability of the agricultural sector.

Conclusion

Energy has been identified as the second most critical factor, next only water, for sustainable development. Attention to the quantity of energy and the efficiency of its use in agriculture is crucial for sustainability. Energy overuse leaves dirty ecological foot prints whereas energy property creates serious impediments to food security, livelihoods and human development. Energy poor systems require energy infusion, preferably of renewable kind such as solar, wind and biomass energy.

Exploiting the food energy nesses by converting agricultural by –products to heat or other forms of energy can create livelihood opportunities in the form of small commercial enterprises and also mitigate climate change, as biomass is a carbon-natural resource.

References

1. *An Assessment of natural resources of the Indian desert, K.K.Singh, madhu Publications, p.no. 37-42, 2004.*
2. *Advances in Resource Management of the Indian desert, Satish Kaushik, Madhu Publication, p.no. 125-151, 2002.*
3. *Water resources through, Farmer and Parliament D.Mani, Prayag Publications, P.No. 69-75, 2007.*
4. *Farming systems and sustainable Agriculture-Annual Report of India, P.No. 120-139, 2012*
5. *Gazetteer of Rajasthan 2012.*
6. *Pratiyogita Darpan, May, P.No. 1898-1909, 2012*
7. *The Hindu Daily News, P.No. 21-22.*