DEN NEWS

(Desert Environment News)
Central Arid Zone Research Institute, Jodhpur.

Vol. 1 **No. 2** **June, 1997**

EDITORIAL

The World Environment Day was celebrated with joy and enthusiasm on 5th June, 1997 by the ENVIS centre on 'Desertification' in Dr. Raheja Library, CAZRI, Jodhpur. On the occasion, Dr. Q. H. Bakri, Director, Zoological Survey of India, was requested to deliver a guest lecture on the main theme 'Life on Desert'. The another guest lecture on 'Desert Wildlife' was delivered by local prominent personality Mr. Liyakatullah Khan, President, Desert Wildlife conservation society 'Godavan'.

The Newsletter in hand is giving information about the recent international symposium on 'Recent Advances in Management of Arid Ecosystem' held at CAZRI, Jodhpur during 3-5 March, 1997. The forty major recommendations emerged from eight themes are being reproduced for the benefit of readers interested in the Arid Ecosystem Managernent.

D. C. Ojha
Editor

IN THIS ISSUE

Dr. N. L. Joshi, Dr. R. B. Singh, Dr. R. S. Paroda and Dr. A. S. Faroda at the inaugural session of the Symposium on RAMAECOS

SYMPOSIUM ON RECENT ADVANCES IN MANAGEMENT OF ARID ECOSYSTEMS (RAMAECOS)

March 3-5, 1997

held at

Central Arid Zone Research Institute, Jodhpur 342003, India

Theme 1 : Natural resources appraisal and desertification

The theme will have papers on state-of-art in natural resources appraisal, desertification markers, dynamics and monitoring, including utilization and replenishment.

Theme 2 : Biodiversity and enviornmental conservation

Presentation on survey and surveillance techniques and their applications to study population variability in flora and fauna, domesticated and wild, their role and conservation. Maintenance and judicious utilization will find a prominent place here.

Theme 3 : Sustainable crop production

Results of studies on crop production and protection technologies in arid and semi-arid zones, physiology of stress and nutrition, allelopathy, crop improvement and integrated technologies for weed and nutrient management would be presented under this theme.

Theme 4 : Alternate land use systems — Integrated farming systems and watershed development, agroforestry and other systems incorporating horticulture, tree and grass components in farmland management, management practices and problems, and such papers those would indicate future potential farming practices shall be included in this theme.

Theme 5 : Water resources and optimal water use — Papers on water harvesting, technologies to efficiently conserve and utilize available surface and ground water shall be included in this theme.

Theme 6 : Livestock production and management — Animal based production system has sustained desert mankind for centuries. The recent advances in livestock production and their management shall figure in this theme.

Theme 7 : Development of alternate energy resources — Alternate and non-conventional energy sources (Solar and wind power), their availability and utilization would be the main focus of this theme.

Theme 8 : Socio-economic constraints and transfer of technology — Translating research into adoption, indigenous traditional knowledge, participatory rural appraisal approaches and experiences shall constitute this theme.

MAJOR RECOMMENDATIONS

BIODIVERSITY AND ENVIRONMENT CONSERVATION

1. Regeneration of natural biodiversity in protected area is poorly understood. A regular monitoring of such areas needs to be initiated in order to know present status and the need to augment and further manage it for sustainable development.
2. Biodiversity changes occurring in the canal command areas should be monitored on a continuous basis and xeric elements should be conserved.
3. More National Parks, Sanctuaries closed areas should be established in the Desert to conserve the endemic fauna and flora involving peoples' participation and through social customs and taboos.
4. Biodiversity prioritization of flora and fauna of arid zone using ITK should be carried out for identifying species needing conservation efforts through biotechnological means.

SUSTAINABLE CROP PRODUCTION

1. Though many technologies were described but there was hardly any information on their adoption. The role of peoples' participation thus needs to be promoted for sustainable crop production.
2. There is need for greater emphasis on multidisciplinary research and development in this important area.
3. Understanding risk management is of paramount value if farmers are to adopt improved practices that will lead to sustainable crop production. Development of better prediction models. recording of weather data, and dissemination of weather predictions at block level, use of GIS, etc. along with the appropriate use of variety and agronomic practices is recommended.
4. Integrated nutrient management needs intensive on-farm and on- station studies. Some of the areas which require more attention are use of enriched FYM, fertilisers, mulches and organic residues etc. individually and in combination.
5. Genetic improvement targeted for early maturing high yielding varieties with better drought tolerance and higher photosynthetic efficiency will be required.
6. Detailed studies are required on-station and on-farm to better understand the interactions of tillage, soil and water conservation and its management.
7. Use of biological control methods and their effect of different disease and pest components of the system require more studies.
8. The integration of crops, trees and livestock in different sub-regions needs to be addressed with multidisciplinary teams using advanced tools such as modelling and GIS.

ALTERNATE LAND USE SYSTEMS

1. In farming systems, the work on integration farming system should be initiated involving all possible components, viz. forest trees, forage and fodder plants, fruit trees, millets, grain and pulses crops. Scientists from all related disciplines should work in an integrated approach. Livestock component should also be included to have comprehensive information at our location. Forest trees/fruit trees based farming systems should be worked out. Economic analysis of technology developed must be carried out.
2. Nursery techniques should aim at fast multiplication methods in a short duration to cope up with ever increasing demand for genuine plant material. As far as possible, vegetative propagation methods should be evolved for forest trees to avoid segregation of characters in the field as most of the tree/woody species are

2. The community participation is rather essential for effective implementation of such programmes.
3. Risk is often encountered by climatic vagaries which is to be looked into rationally for effective transfer of technology.

INDIGENOUS TRADITIONAL KNOWLEDGE AND TRANSFER OF TECHNOLOGY

1. The participatory approach involving farmers and scientists is very essential for technology development and technology transfer. The farmers should be involved even at the planning/diagnostic stage.
2. With a small training of one month village can be made partly self sufficient for treatment of smaller ailment of their animals. Training of rural women for tailoring, food preservation, making products of arid zone fruits and for related agricultural activities is recommended.
3. The ITK must be assessed before accepting or rejecting it.

DESERTIFICATION : ENVIRONMENTAL DEGRADATION HAZARD

D.C. JOSHI
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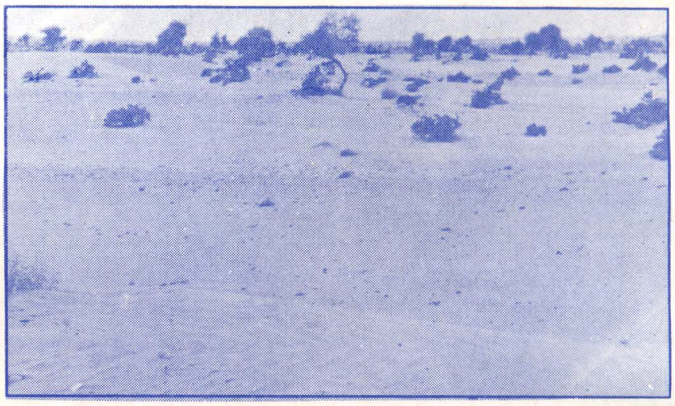
Desertification is one of the serious environmental problem that has attracted the attention of mankind. The term 'Desertification' was first used by Aubreville (1949) to indicate the changes of productive lands into wastelands, as the result of deterioration by man induce soil erosion. The United Nations Conference on desertification (UNCOD, 1977) in Nairobi, Kenya adopted the definition of desertification as the diminution or destruction of biological potential of land and can lead ultimately to desert like conditions. This definition did not mention about the climatic zone and causes of the phenomenon.

The United National Environmental Programme (UNEP) in the year 1990 defined desertification as "Land degradation in arid, semiarid and dry sub humid areas resulting mainly from adverse human impact." This definition omitted hyper arid and humid areas.

The issue was highlighted at the UN Conference on Environment and Development (UNCED, 1992) at Rio. The chapter 12 of the Agenda 21 of this conference was devoted to combating desertification and droughts. The definition of desertification agreed upon is 'Desertification is the land degradation in arid, semiarid and dry sub humid areas resulting from various factors including climatic variations and human activities.' This definition reduces the strong emphasis on anthropogenic factors and also attributes the phenomenon to the climatic variations/aberrations like recurring droughts or flash floods which play role in desertification process.

Concept of land

The term 'land' refers to an area of Earth's surface which encompasses the distinctive assemblage of geology, landform, soils, vegetation, surface and ground water, animal population and human activities and their atmosphere. Land degradation refers to reduction in resource potential of the land attributes.



Thus :

- Desertification is a process of land degradation through out the arid, semi arid and dry sub humid regions.
- Expansion and contraction of desert is the oscillations in vegetation (including crop yields), that occurs at desert fringe because of climatic fluctuations which gives the impression that desert is expanding or contracting.
- Desertification differs from land degradation in humid areas (rainfall more than 900 mm) because it proceeds under very harsh climatic conditions.

Scenario of Desertification in the arid region of Rajasthan

Causes of Desertification

- *Increase in human and animal population :* In the arid region of Rajasthan there was a sharp rise in human population which doubled during 1921 to 1961 and redoubled in less than 30 years. The population growth rate for 1971-81 and 1981-91 were 36.6% and 30.1% respectively, which were apparently higher than that for the country as a whole. Similarly there was sharp rise in the population of cattle, sheep and goats. This lead to cultivation on marginal lands including sand dunes, shallow gravelly uplands and steep slopy

areas, over exploitation of grazing lands and indiscriminate cutting of trees and shrubs. There was marked change in the land use. In the driest districts, the lands which used to be under natural vegetation cover were brought under plow and in better rainfall and ground water potential zones intensification of agriculture increased to a great extent.

- *Adverse Climatic conditions :* The rainfall is sparse and highly variable (150 mm at Jaisalmer to 490 mm at Pali) in space and time. Recurring droughts are the characteristic feature of this region. The temperatures are high and in summer the peak values may be around 45-46°C. From April to June strong wind regime of 60-80 km hr-1 causes dust storms. The annual potential evaporation often exceeds (1500-2399 mm) the precipitation (100- 400 mm).
- *Inherent ecological fragibility of the natural resources :* The soils of arid region are sandy in texture. Dune and interdune cover 30.6% area and sandy plains with sand hummocks and scattered dunes cover another 34.3% area. These sandy soils have 85-90% sand fraction. These are prone to wind erosion and have low available water capacity (50 mm/meter). Surface crusting, high infiltration and low fertility status are another problems associated with these soils. The hard pan soils (5.9% area) have severe root zone limitations because of indurated pan at 30-50 cm depth. Natural salt affected, rocky/gravelly and gypsiferous soils cover 15.7% area. The gray brown loam soils which have good moisture retention capacity occupy only 13.5% area. In nearly 80% situations the ground water is saline/sodic. The vegetation cover is sparse and scanty.

Symptoms of environmental degradation due to desertification

- Reduction in crop yields, biomass production in grazing land and woody biomass in reserve areas.
- Deepening of water in wells, deterioration in the quality of ground water, sedimentation in water bodies, disorganisation of drainage channels, increase in floods.
- Increased manifestation of loose sand, hummocks barchan dunes, increased salinisation and sodification of soils.
- Disruption in life support system like roads, railways, telecommunication installations etc.

Desertification Processes

To meet the growing demand of the increasing human and animal population and also to increase the economic returns from land, there is intensification of agriculture, use of heavy machinery, cultivation on marginal lands and use of brackish water for irrigation. This has resulted in the wide spread land degradation/desertification in the region. The major desertification processes recognised are as under :

Wind erosion/deposition : Under the influence of strong wind regime in the sandy terrain sand transportation takes place. Depending on the land use viz. rainfed, irrigated, grazing lands and wood land, the vulnerability of sandy surfaces vary. It has been observed that rainfed lands cultivated with heavy machineries are highly vulnerable to sand drift whereas well managed grasslands are minimum affected. Removal of surface soil causes deterioration in fertility and exposure of substrata. Deposition of blown sand, on fence line and in cultivated fields, pasture lands and residential areas, in form of hummocks, sheets and barchan dune are Spectacular. Intensity of aeolian hazards is more severe in the region receiving less than 300 mm mean annual rainfall and in the years of droughts. This is the major process of desertification in the arid region of Rajasthan.

Water erosion : In the region receiving rainfall more than 300 mm per year, the water erosion is dominant process. Water erosion is active at the foot hill zone and on uplands where soil loss in the form of sheet, rill and gully erosion is common. At places wind deposition is followed by water erosion particularly at the hill flanks.

Salinisation / Sodification : Natural salt affected soils are common in this region, which occur in scattered patches. The soils and highly saline through out the deeper layers (EC 30-60 dSm^{-1}). Vegetation cover is very scanty and Prosopis juliflora may be seen growing.

Irrigation with saline water causes high salinity in the soil, which can be leached down during subsequent rainy season and there is no permanent damage to soils. The water containing higher concentration of residual sodium carbonate (RSC) when used for irrigation turn the soils highly sodic. After few years of irrigation lands are unfit for cultivation and turn barren.

Waterlogging : In the IGNP command area water table is rising at the rate of 0.43 to 0.83 meter per year. Both the seepage from canal and excessive use of irrigation water are contributing to water logging and salinisation. Such problems have also been encountered near Sardarsamand. Jaswantsagar and Jawai dam.

Vegetation degradation in CPRs : Village gochar and *oran* lands are in highly degraded condition. Because of over grazing, the palatable species have vanished. The bare surfaces have been subjected to wind and water erosion.

Desertification mapping

Desertification processes are site specific and differ in

their kind, intensity and areal coverage. Desertification status refers to current condition of land degradation as compared to what it would be in the absence of the human impact. Some recent methodologies (FAO, 1984, Kharin et al. 1985, Drenge 1991) are available for this purpose. The mapping unit involves the kind of desertification process and severity of degradation viz. slight, moderate, severe and very severe. Dregne et al (1991) have presented assessment of world status of desertification in irrigated, rainfed and range lands. They have reported that world is losing annually about 7-8 million ha. land due to various processes of soil degradation and more than half of this is in the dry lands. In the arid region of Rajasthan (Singh et al). (1992) have reported that wind erosion is the major desertification process (68.3%) followed by water erosion (11.1%) and salinisation/water logging (3.4%).

Monitoring Desertification

Desertification is a dynamic process. Therefore monitoring forms an essential part of the programme for combating desertification. The satellite remote sensing offers synoptic view and repetitive coverage. This tool with limited ground truth provide a good basis for monitoring.

Based on the critical indicators (physical, biological and social) a project on monitoring of desertification is being pursued at CAZRI since 1978. The study has revealed that there is no lateral movement of sand from desert to non desert area (arid to semiarid zone). However within the arid region the inherent vulnerability of land and intense biotic pressure have combined to set in a process of desertification. Various critical desertification indicators are being tested at CAZRI as a part of this programme.

NEWS

TRANSFER OF TECHNOLOGY

COMBATING DESERTIFICATION AND SUSTAINABLE AGRICULTURE : A PROJECT PROPOSAL

A research project under Farm Research and Transfer of technology for two villages has been taken up by the CAZRI scientist. An amount of Rs. 4 lakhs have been spent during 1996-97 for the overall development of these two villages.

In the first phase i.e. 1996-97 one of the major active sand dune which lies from south to west, along the main Osian-Phalaudi road, was taken up for stabilization through vegetation growth.

Further under the project CAZRI will apply its pioneered technologies for rodent management. A separate campaign involving people's participation will be launched in this part of the village Pandit-ji-ki Dhani to control rodent pests at community level.

Further CAZRI's technologies on crop production, arid horticulture, animal nutrition nutritive improvement of dry fodder by non-conventional silage technique, use of on-farm waste, demonstration on solar appliances, water-harvesting and soil moisture conservation, mushroon cultivation, fruit and food preservation will be provided and extended for sand-dune stabilization and socio-economic development of these two villages.

WORLD ENVIRONMENT DAY CELEBRATION AT CAZRI, JODHPUR

This year the World Environment Day (5th June), was celebrated by organizing Quizz Competition. The students of class XI & XII participated in this competition. The twenty five students, two students from each Sr. Higher Secondary School participated in the above Quizz. A Model set of 50 question pertaining to Desert environment was prepared by the scientists of this institute.

An exhibition of non wood products was organized by the World Wild Fund for Nature (WWF) on the occasion. The exhibition attracted not only the scientists and employees of the CAZRI but also their wards, students and local public.

Two guest lectures on the main theme "Desert Environment" were also delivered by Dr. Q. H. Bakri, Director, Zoological Survey of India, Jodhpur and Shri Liyakatullah Khan, President, Desert Wild Life Conservation Society Godawan, Jodhpur.

COMING EVENT

International Workshop on Rangeland Desertification Iceland, 16 to 19 September 1997

Objectives

The workshop will be overview and aims to bring together knowledge in several fields of science, including agronomy, geography, range ecology, soil science and conservation policy. The goal is to put together a strong multidisciplinary workshop with an emphasis on :

- Critical review of rangeland degradation science ;
- Desertification assessment methods ;
- Rangeland conservation policy.

The discussion will not be limited to any particular climatic conditions, but will attempt to include broad perspective

both from arid warm regions and more humid and colder parts of the world.

Workshop sessions will include :

- Rangeland degradation - an overview;
- Degradation and desertification assessment.
- Policy implications - a path to the future ;
- Posters.

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SOME DESERTS OF THE WORLD

THE AUSTRALIAN DESERT

LOCATION : Australian interior.

AREA : 3,300,000 Km^2/1,300,000 Sq. mls, semi-arid lands cover an additional 2,500,000 km^2/1,000,000 sq mls.

ALTITUDE : Varies from 12 m/40 ft below sea level at Lake Eyre to more than 1,220 m/4,000 ft in the Macdonnell Range (Northern Territory), averaging up to about 300-450 m/1,000-1,500 ft.

CLIMATE : Dry continental and subtropical, characterized by warm or hot summers and mild winters.

Rainfall is influenced by two separate systems: the Antarctic System from the south in the winter, and the Monsoonal System from the north in the summer, and varies from less than 125 mm/5 in a year at Lake Eyre in south Australia to more than 760mm/30 in in the Kimberley region of northern western Australia. Daily temperatures at Alice Springs in January (the hottest month) range from a maximum of 35°C/95°F to a minimum of 20°C/68°F. The absolute extremes are 47°C/117°F and 5°C/23°F. The absolute extremes are 47°C/117°F and –5°C/23°F Fluctuations between day and night temperatures are very wide.

THE TURKESTAN DESERT

LOCATION : Central Asia, extending from the Caspian Sea in the west to Dzungaria in the east, and from about 48° N to the borders of Iran and Afghanistan in the south, reaching to the foothills of the mountain ranges of Kyrgyzstan and Tajikistan in the southeast.

AREA : 1,800,000 km^2/700,000 sq mls.

ALTITUDE : From 26m/85ft below sea level in the vicinity of the Caspian to about 360 m/1,200 ft in the east.

CLIMATE : Continental. Summers torrid ; winters vary from cold with severe frosts in the north to moist and camparatively warm in the south. Mean annual precipitation 160-170 mm/6-7 in at Kyzylkum, and 75mm/3 in along the lower reaches of the Amu Darya, Turkestan is the hottest part of the former Soviet Union. Mean monthly temperature for July at Repetek 32°C/89°F. Winter temperatures in the south may fall to –26°C/–14.8°F (Ashkabad) and to –42°C/43.6°F (Northern Aral). A characteristic feature of these deserts in the exceptionally wide variation between maximum and minimum daily temperatures, which can fluctuate as much as 21°C/70°F during a 24-hour period. In places exposed to the sun, temperatures may reach 79.4°C/175°F by day and drop to 21°C/70°F at night, a variation of about 38°C/100°F in a few hours.

THE AFRICAN DESERT

LOCATION : Northeastern Africa, at the entrance to the Red Sea. Extending from Somalia's narrow coastal plain (the Guban), inland to the foothills of the Ethiopian Highlands, merging into the Danakil Desert in the north and the Northern Frontier Region of Kenya southwards to the Tana River.

AREA : 1,300,000 km^2/500,000 sq mls, of which 637,000 km^2/246,000 sq mls lie within the political boundaries of Somalia.

ALTITUDE : From sea level to about 1,220 m/4,000 ft.

CLIMATE : Tropical. Hot and humid on the coast; hot and dry inland. Under monsonal influence, the long rains are in April- June and the short rains in October-December. Mean annual rainfall ranges from 100 mm/4 in in the northwest, 200-300 mm/8-12 in on the central plateau, increasing to 500-600 mm/20-24 in in the northwestern and southwestern parts of Somalia. Instead of being evenly spread, the little rain that falls is concentrated in a few downpours of high intensity.

THE NAMIB DESERT

LOCATION : Centred on Namibia, extending for 2,800 km/1,750 mls from south of the Orange River to the Kunene River and into Angola, varying in width from about 25 km/15mls to 140 km/85 mls.

AREA : 135,000 km^2/52,000 sq mls.

ALTITUDE : Rising from sea level to about 900 m/3,000 ft on the inland escarpment. with occasional isolated massifs such as the Brandberg (2,579 m/8,462 ft).

CLIMATE : Oceanic. Mean annual rainfall 23 mm/0.9 in, varying from 5 mm/0.25 in or less along the coastal strip (where precipitation is more than doubled by condensed fog water), increasing to 100 mm/4 in inland. Mean daily temperature 16/18°C/60-64°F; maximum summer temperature 35°C/95°F.

DESERTIFICATION POEM

O do not fall my little one
we'll rest at this dead tree
I'll lie you on this broken scree
where lizards used to run
And you must surely perish here
at the mercy of the sun.
You must die my little one
as children always do
Who live beyond the watermark
of the floodplain and the dew.

O urchin with your limbs so thin
O misbegotten clay
You must lie there with the carrion
I shall mourn you for a day
I would carry you to the Pearly Gates
as I've led you here through hell
I would cool you in those caves of ice
I would have you drink your fill
Of the crystal springs of Paradise
if I only had my will.

(Source – UNEP)

BOOK POST

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