DEN NEWS

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

Vol. 4 | No. 3 | Sept 2000

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EDITORIAL

Desertification leads to vegetation destruction and disappearance of many dryland plants and animal species. Crops-such as wheat, barley, sorghum, millet etc. and fodder plants which form the backbone of world agriculture and animal husbandry, are at risk. Wild plant species that are source of valuable medical materials native to drylands become endangered. Loss of those plants through desertification represents loss of valuable and irreplaceable genetic material.

Desertification also affects and is affected by climate. Deprived of their natural vegetation, degraded dryland areas modify the energy balance in the lower atmospheric layers, through radiation absorption change, reflection and emission properties. Similarly, fluctuations in evaporation rates and rainfall retention, potential affects the water balance of areas suffering from desertification. Increased dust emissions from uncovered soil can modify the scattering and absorption of solar radiation in the atmosphere. Extensive areas of low or nil vegetation will provide little or no capacity for absorption of carbondioxide – the most important "green house gas". The enormous extent of the drylands affected by land degradation indicates the impact that desertification processes have on global climate change mechanisms.

Vegetation loss in watersheds brings about erosion and situation resulting in pollution of inland waterways and of sensitive mangrove habitats and coral reefs in coastal areas. Without improved management of watershed lands, a continuous cycle of mutual degradation will be perpetuated. Unsustainable management practices that lead to desertification need to be arrested.

D.C. Ojha
P.I. / Editor

THE UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION

The Convention to Combat Desertification (CCD) is a UNCED convention. Unlike the Convention on Biological Diversity and the Framework Convention on Climate Change, the CCD is still low on the political agenda. Its potential and importance for sustainable development is generally underestimated.

The term 'desertification' falsely evokes the image of advancing deserts. While a desert is a unique ecosystem, desertified areas are not: they are disrupted ecosystems. Desertification means land degradation, loss of soil fertility and structure as well as the erosion of biodiversity in drought prone areas.

When the negotiations for the CCD started in May 1993, little was known about the dynamics of desertification and the social, political and economic aspects of desertification were poorly understood. Major causes of desertification are unsuitable, poverty-induced agricultural practices; monocultures; the use of agrochemicals; the neglect of traditional knowledge; overgrazing; deforestation; over-pumping; salinisation and climate change, resulting from the greenhouse effect. Land degradation in dryland areas results in increasing amounts of unproductive land. At the socioeconomic level social and cultural structures deteriorate, food security is lost, migration becomes prevalent as income prove increasingly inadequate and debts grow. All these factors undermine a community's capacity to exert self-determination and control over its own resources.

The CCD came into force in December 1996 and has been ratified by more than 150 states. Considerable research, awareness raising, monitoring, lobbying and finance will be needed before it is possible to implement it.

Some strong characteristics of the CCD are:

- Participatory, bottom-up approach
- Integrated approach and gender sensitiveness
- Addressing global dimension of desertification
- Linking environment and development
- Partnership building between stakeholders
- Linking to other conventions and relevant agreements to create synergy.

National Action Programmes

Those taking part in the CCD are obliged to make a National Action Programme (NAP) along the lines laid down in the Convention. In November 1999, the third conference of participants took place in Recife, Brazil. African countries reported on their progress in developing and implementing NAPs. Although all African parties had started on NAPs, only 10 had reached the implementation stage. Donor countries also reported on their activities in support of NAP at the conference. Their reports showed the difficulties of putting the concepts and policies of the CCD into practice. Major bottlenecks to the participation of local communities in the NAP process were shown to be inappropriate and unfavourable laws and regulations at state level, a lack of funding, experience, expertise and the necessary political will. Monitoring progress provides countries with the opportunity to correct the way NAPs are developing.

Argentina is a good example of how raising awareness on gender issues has influenced the NAP. A few years ago, the NAP process in Argentina was not gender sensitive. Today, Argentina strongly supports the incorporation of gender issues into the NAP.

The International NGO Network RIOD

NGOs have been taking part in the negotiation process that lead to the CCD and have contributed positively and strongly to the text and content of the convention. In November 1994, NGOs established RIOD (a French acronym for the international NGO network to combat desertification), a network to enable the international exchange of information, the raising of awareness and to encourage learning from experience as well as North-South cooperation and joint activities. NGOs have been instrumental in initiating and setting up consultative structures at country and (sub-) regional levels. They have helped raise awareness, involve local communities and create links with local and national authorities, institutions and donors. Many NGOs have contributed research and capacity building to participatory methods.

In August 1999, five years after it had been set up, the first RIOD general meeting was held to review the objectives and structure of the network. One of the conclusions of this review was that as the constraints to implementing the CCD became more visible, it was necessary to emphasis lobbying, campaigns, the creation of synergy and international political action to compel the creation of more favourable environment for combating desertification.

Structurally changes are being made to improve efficiency at regional level. In the past, RIOD had national, sub-regional, regional and global focal points. In the new structure there will be more emphasis on focal points at the national level. Fifteen regional representatives will form a Global Coordination Committee (GCC) for international coordination.

The NGOs in RIOD have recognised that although activities to combat desertification are not new, the CCD approach has great potential. By putting the people of affected areas at the centre of process and pushing for an enabling environment at the national and (sub-) regional levels, it may be possible to boost those development processes that create more sustainability in environmental, social, economic and political terms.

However, there are many pitfalls. The dangers that the CCD will become just another time-bound document slowly moving from the desk to the bookshelf or that it will turn into a talking circus are very real. There is also the problem of hidden agendas. It is therefore necessary to mobilise and join forces and take action when necessary. There is too much at stake to allow this opportunity to slip by.

Source: LEISA, March 2000. 16(1) p. 6 ■

THE GREENHOUSE THAT IS THE HOPE OF THE DESERT

Michael Boyd, LPS Special Correspondent

People living in the world's arid regions could enjoy fresh water courtesy of a British engineer and his revolutionary Seawater Greenhouse.

The pioneering building that has won a prestigious Design Sense architectural award of the Design Museum in London, uses sunlight to turn salt water into fresh water for drinking and growing vegetables.

The concept is based on the fact that two processes conflict in plant growth. These are photosynthesis and transpiration. Plant growth is driven by sunlight in that the more light that is available; the more growth is obtained. But higher temperatures inhibit growth, forcing plants to transpire more water than necessary and thus end up wasting energy.

Plants use only a small fraction of solar radiation. The Seawater Greenhouse takes the heat out of the air and the light, allowing the plants to grow in cool, yet high light conditions, and uses the surplus energy to distil fresh water.

Today, such an approach is becoming of paramount importance because increasing areas of the world are becoming "water stressed", according to a recent United Nations report and there are fears that areas in Africa, the Middle East and Asia are running dangerously short.

In answer to this, engineer Charles Paton has developed a new horticultural system which takes the earth's natural resources of cold, deep sea water, cool air and sunlight and combines them with an innovative condensing process. Designed for arid coastal conditions, this process enables communities to grow their own crops and even produce a surplus for sale.

"The Seawater Greenhouse is a truly new idea which has the potential to impact on the lives of millions of people living in coastal, water-starved areas around the world," said Design Sense judge Marco Goldschmied, President of the Royal Institute of British Architects (RIBA).

Mr. Paton intends to use the $ 40,000 prize money to produce "starter packs" which will allow other of his greenhouses to be built around the world.

The building, which was originally simulated in a thermodynamic model, includes a number of processes such as forced ventilation, assisted by prevailing wind; evaporative cooling; transpiration; solar heating; heat transfer through walls and roof, and condensation.

All of these have been characterized using formulae from academic and commercial sources. As well as this, laboratory experiments were carried out on scale models and specific components. At the beginning of the project an important question mark hung over the aerodynamic performance.

How much of the approaching air would be forced through the greenhouse? The question was answered by wind tunnel experiments and computer modelling. The results of these experiments had implications for the shape, structure and optimisation of its components.

At the heart of the design is a steel-framed greenhouse with evaporators at each end made from corrugated cardboard. This creates a huge surface area, allowing salt water to evaporate leaving the salts behind. These strengthen the cardboard, so that it should last indefinitely.

The roof lets in light in the red and blue spectrums which are needed for photosynthesis. Infrared and ultraviolet are used to heat air in a roof cavity to help drive the evaporation process.

Mr. Paton, whose Light Works company is based in London, said that his basic concept was to provide a building that would allow the cultivation of crops in hot countries that would otherwise be difficult or even impossible to grow.

Because of the temperature involved in such places the crops could wilt and die if the greenhouse becomes too

warm. The first evaporation unit not only produces humid air, but also helps to cool it, to create optimum growing conditions.

After the air has blown through the building it arrives at a second cardboard evaporation unit which is close to cold salt water being pumped by. The fresh water in the air condenses and is collected for irrigating the crops.

This ingenious building operates at a fraction of the cost of traditional desalination plants, costing 21 pence to make 1,000 litres of distilled water (there are 100 pence in $1).

The first Seawater Greenhouse has been built on Tenerife, partly with European Commission funds. The land and facilities were provided by the *Instituto Technologias y Energias Renovables* (ITER).

A second building is under development in Oman and there are plans for many others. The results from the first pilot have completely validated the concept and demonstrated the potential for other arid areas. The cool and humid conditions allowed for the cultivation of a range of temperate crops that could not otherwise be grown in this location, such as lettuce, beans, herbs and ornamental plants.

The crop production, in terms of quality and quantity, has been outstanding. Yields were consistently higher than expected and produced in short growing periods, yet this site is one of the most arid and hostile regions in Europe and suffered from continuous drought throughout the project.

The greenhouse was found to be supplying in excess of the water required for irrigation . The water demand of the crops was around 80 per cent less than normally expected in this climate. The irrigation rate was between 1/2 to 1 litre per square meter per day where the farmers would use 4 to 8 litres per square meter per day.

Electrical power is only required for the control, pumps and fan where grid power is not available, this may be provided by photovoltaic panels and/or a wind generator. The process is suitable for remote applications as the modest electricity requirement is related to solar radiation, thus eliminating the need for batteries and/or a standby generator.

The award was given to Mr Paton by Design Sense, which is the UK's first sustainable design award. It has been created to encourage and reward sustainability in product design and architecture. It is endorsed by RIBA, and the Centre for Sustainable Design of the Surrey Institute of Art and Design. It is also supported by the Rufford Foundation and has made it the UK's largest design or arts prize, being even greater that the Turner of Booker prizes.

For more information, contact: Charles Paton, Light Works Limited, 2a Greenwood Road, London, E8 1AB, United Kingdom. Tel.: 207 249 3627. Fax.: 207 254 0306.

Source: 'Spectrum' Mar-Apr 2000, p. 9

WATER, FIRST STEP TOWARDS COMBATTING DESERTIFICATION

JA Soccal

Access to water is an essential condition for human development in semi-arid zone and for combating desertification. Civil society in Brazil has successfully promoted some very inexpensive but effective technologies for water management. These are now beginning to be included in the federal public policies for the semi-arid northeast of the country. This article presents three of these technologies.

The Brazilian semi-arid zone

Brazil has a land surface of more than 8 million km2, 980,000 of which are susceptible to desertification. Most of these areas are in the northeast of the country. Many of the rivers in this region are seasonal, groundwater reserves are scarce and water salinity is high. The climate is characterized by a short rainy season and total rainfall is less than 800 mm. There is a period of drought every year that lasts from 7 to 9 months. Average annual temperatures vary from 23 to 27° C and insolation is very high (2800 hours/-year). Since 1900 there have been fourteen serious droughts, each of which has lasted for several years. The consequences for the local population are extremely serious and many have left for the cities in search of work. Of the approximately 17 million inhabitants in the semi-arid zone, more than 10 million live in the rural area. The north-east has the largest rural population in the country and it is one of the most densely populated semi-arid regions in the world.

Causes of desertification

Approximately 180,000 km2 of Brazil are already seriously affected by desertification which has been caused by deforestation (for building, domestic and industrial fuel and agriculture), overgrazing and mining. The main causes of desertification, however, are structural. These include the concentration of lands, natural resources and income in the hands of a few people and the absence of development policy that focus on small producers and their working conditions. Behind these unfavourable structural conditions lurks a political elite, established in colonial times, that profits from the fact that the population is dependent on them particularly in dry periods. This structure, which has undermined the feasibility of any development in the region, is known as the drought industry. Traditionally, during times of drought, local political *honchos*, distribute water in trucks. This is an extreme *assistentialist* approach that can survive because of strong feeling of gratitude so ingrained in the Brazilian people.

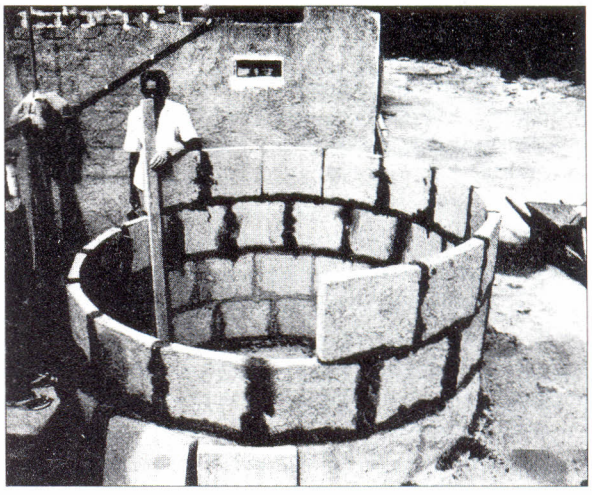
Technologies that work

Determined to break the chains that have held the strong and creative people of the northeast in dependence and underdevelopment for so long, the NGOs, CBOs (Community-Based Organizations) and Work Cooperatives active in the region developed simple, inexpensive and efficient technologies to address the problems of the area. These technologies the plate cistern, the underground dam, and the pile driver well – have lead to the sustainable development of several communities and are beginning to be included in federal public policies for the region.

Plate cistern

This is a technology that can be used by a household to harvest rainwater for human consumption. It differs from traditional cisterns because it is relatively cheap. The model that is being spread throughout the northeast by civil society organizations has a capacity of 10,000 to 20,000 litres and costs less than US$150.00. It is easy to build because it is made of large cement plates, local sand and water rather than bricks.

The beneficiaries provide their own labour and materials are inexpensive. Some organizations such as PATAC (Programme for Applying Technologies Appropriate to the Community) and MOC (Community Organization Movement) support a rotating credit system as a way of multiplying the number of these cisterns in the northeast at minimal cost.



A plate cistern being built in Pedra Lavrada county, Paraiba, Brazil.

These cisterns can ensure the supply of water for human consumption during the annual drought. The quality of the water is far superior to that provided by the water trucks. Trucked water is usually dirty because it often comes from weirs used by animals and is full of pesticide residues from plantations in the vicinity.

If we consider that a person uses an average of 4 litres of water a day for personal hygiene, cooking and drinking, a family of 6 people would use 11.000 litres in 10 months. Cistern technology has made a great difference to women who traditionally fetch water and it has proved to be an excellent way of dealing with the dry periods.

Underground dam

The underground dam is a technology that is more than 2000 years old. The idea is to build a semi-permeable wall, below and across the seasonal river bed or on the drainage lines. This allows ground water to be retained or accumulated closer to the surface. In this way it is made more available to plants and humans. Agricultural fields are created in the river bed or on the river margins and the dams are extremely useful for agricultural production- and even pasturing- during drought periods because it becomes possible to grow crops all year round.

On a smaller scale underground dams are used to provide water for human and animal comsumption. Tubular pipes are inserted on the side of the dam. The NGO CAATINGA has considerable experience with dissemination of this technology and has developed a type of underground dam using local material and labour that, on average, costs just US$250.00. Compacted clay and stones are used to build a wall of about 2 meters (to the substratum), since the soils of the region are mostly shallow.

Pile driver well

This technology is not as widely disseminated as the cistern and dam already mentioned, but it has been very successfully implemented. Its use has spread throughout the municipalities of Sub-Mid Sao Francisco, and the states of Bahia and Pernambuco. Its has a basic premise: to simplify modern systems for drilling wells, replacing motors by animal and/or human traction. With a simple system of pulleys and pipes with perforating blades to dig and remove the earth, wells are opened without the need to hire companies or spend money on machines and fuel. The communities of the region have an important asset when it comes to identifying the best location for drilling. The rural producer, Manoel dos Santos, director of the Syndicate Center (Po;lo sindical) of Sub-Mid Sao Francisco was trained as a water diviner (hydrostesys with aluminum rods) and has already successfully identified appropriate sites for opening more than 100 wells some of which have reached a depth of more than 100 meters. Mr. Santos also mobilises, organizes and trains communities in well drilling.

In 1996, when the pile driver well activity first began, the wells were opened and water removed by the system of pulleys and human or animal traction. Today, the system has been perfected and uses solar energy to remove the water. A pulley system operated by a stationary bicycle is used to reduce the effort needed to drill the well. It is an ideal system for arenite terrain (it cannot be used in granite areas) with good quality groundwater.

Reduced dependence

The *in situ* technologies for catching and using water described above represent a significant landmark in the history of Brazil's semi-arid communities because they break away from the traditional relationships. They should not be seen as isolated event, but as part of a set of technologies developed and disseminated by organization of civil society. These technologies include traditional, modern or alternative technologies for agriculture, ranching and agroindustry as well as approaches to management, capacity building and conquering markets.

Providing local communities with water without making them politically dependent is the key to developing technologies and approaches that promote local sustainable development. These technologies also promote the development of citizenship because the producer becomes responsible for the management of scarce asset (water) and has greater responsibility for the development of his community because of such collective instruments as rotating credit, joint community actions and capacity building.

Plate cisterns have become particularly important because they have been incorporated into some federal and state public policies. They form a precedent for a more systematic implementation of other proposals put forward by civil society. This is decisive for the survival and development of the third sector in the semi-arid zone. Up to now its work has been restricted to a few communities and families. As its proposals are transformed into policies, activities may spread to more communities either in partnership with the private sector or government.

Chances for sustainable development

These experiences may also influence an old tendency within the Brazilian administration. Trying to solve regional problems by building enormous works at very high cost. In the semi-arid region, for example, huge weirs, dams and water mains have been built. They may have helped to solve part of

the problem but they have also become a source of corruption and have lead to the concentration of resources in the hands of a privileged elite. They have also had far-reaching and dramatic environmental impacts. At the same time, local works, smaller, less expensive and more accessible to the population have always been under-valued. With the success of the cisterns, the NGOs can expand the implementation of alternative technologies considerably not only in water works but also in sustainable development in general. These have a much greater chance of promoting the human development of the most needy sections of the population.

After an intense mobilisation before and during the Third Session of the Conference of the Parties to the Convention to Combat Desertification – COP3 in Recife, Brazilian civil society handed the Minister of Environment a document entitled "The Semi-Arid Declaration" in which all the proposals that had been discussed since the 1993 drought were brought together.

Source: LEISA, March 2000. 16(1) p. 20-21 ■

Book Review

"DESERTIFICATION: AN INDIAN SCENARIO" by A.V. Rao, B.K. Garg and D.C. Ojha,

Scientific Publishers (India), Jodhpur, 2000. Pages 283, ISBN: 81-7233-230-0.

Nearly one third of the land area of the world and about 12% geographical area of India is characterized by arid climate where desertification is the major land degradation process. The arid regions are endowed with scarce natural resources and their slight mismanagement leads to degradation. With increasing human and animal population, irrational and excessive exploitation of natural resources accentuates desertification. Cultivation on marginal lands, over grazing of pastures, excessive felling of trees and shrubs and irrational use of ground water for irrigation have lead to desertification. The attention of international community was drawn to the deteriorating condition of arid lands and research institutes centres were established for monitoring the desertification process and to develop technologies for sustainable management of arid lands. In India, the Central Arid Zone Research Institute (CAZRI) was established fifty years back at Jodhpur. The scientists working at CAZRI and also the researchers and scientists of different universities and other research institutes located in Rajasthan and other parts of the country have carried out significant researches and have developed technologies to combat desertification viz. drought tolerant species and cultivars, short cycle annual crops and specific tillage practices for soil and moisture conservation and techniques for pasture and silvicultural development. The results of researches are scattered in different journals, monographs, reports and magazines.

The compendium is the outcome of exhaustive efforts of the authors who have collected 932 research articles on Indian arid zone from different sources, systematically annotated and well set under five chapters. The chapter-1 on history and status includes 148 abstracts mostly on the status of natural resources of Indian arid region. Chapter-2 on monitoring desertification includes 41 abstracts of the papers mostly on mapping the desertification / land degradation using remote sensing techniques. The research work carried out by the scientists to identify causes of desertification viz. climatic, hydrological, and anthropogenic have been included as 66 abstracts in chapter-3. In chapter-4, total 173 abstracts of the research work carried out to asses consequences of desertification have been presented. They have further classified the abstracts on consequences of desertification under sub head land degradation, land forms, salinity and alkalinity, degradation of vegetation resources, climatic changes, crop productivity and socio-economic conditions. The last chapter-5 on combating desertification is the largest one comprising of 504 abstracts. This is quite obvious because lot of efforts have gone for development of technologies for mitigating the effects of aridity and arrest of desertification by adopting multidisciplinary approach. This chapter has further been subdivided including abstracts on soil conservation and sand dune stabilization, water conservation and water harvesting, dryland agriculture, salinity management, integrated pest management, agro-forestry and silvi-pasture system, afforestation and wasteland management, livestock production and management, energy management and wildlife management.

All the facets of desertification have been covered in this book. The authors have put in great deal of efforts in preparing the author index, key word index and source index, which have helped in locating the abstracts quick and easy.

The paper quality and printing are good. This should be a source book for researchers, teachers, students, planners and administrators and all those who are interested in the scenario of desertification in arid zone.

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SYMPOSIUM
ON
IMPACT OF HUMAN ACTIVITIES ON THAR DESERT ENVIRONMENT
February 15-17, 2001

The symposium on "Impact of Human Activities on Thar Desert Environment" is being organized by Arid Zone Research Association of India in collaboration with ENVIS Centre on Desertification. The said symposium is to be held during February 15-17, 2001. The various themes for the symposium are:

- Climate Change
- Land Degradation
- Farming Systems
- Watershed Management
- Land Resources Utilization
- Biodiversity changes
- Livestock and Range Management
- Socio-economic Changes

CALL FOR PAPERS

Research and case study-based papers are invited on all aspects of the Impact of Human Activities on the Desert's Environment. The analytical studies on the processes involved and field-tested solutions to the problems will be preferred. Participants are requested to submit short abstracts of their papers in about 300 words. It should be typed in single side of a paper with double spacing, and should include the name of the authors and their affiliation.

Please send the abstract in duplicate to the "Organizing Secretary, Symposium on Impact of Human Activities on Thar Desert Environment, Arid Zone Research Association of India, CAZRI Campus, Jodhpur" by Oct. 31, 2000. The abstracts seen through electronic media should conform to MS-Word format. Full Papers of accepted abstracts should reach the organizers by Dec. 31, 2000. Selected papers, after peer review, will be published in the post-symposium proceedings.

REGISTRATION

- Fee (India) before Oct. 31, 2000 Rs. 1000
  Up to Jan. 31, 2001 Rs. 1250
- Fee (Abroad) US$ 150

Registration fee should be paid through crossed Demand Draft in favour of "Organizing Secretary, Symposium on Impact of Human Activities on Thar Desert Environment", and payable at State Bank of India, Jodhpur (Code No. 3528).

VENUE

The Symposium will be held at Central Arid Zone Research Institute (CAZRI), Jodhpur. For more information mail at: skathju@cazri.raj.nic.in

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