

DEN NEWS

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EDITORIAL

The great Indian 'Thar Desert' is qualitatively different than that of other deserts located in other parts of the world. The sand dunes and interdunal plains cover a significant part of the desert. The western part of the 'Thar' (Barmer, Jaisalmer and Bikaner) is covered with thick active dunes followed by the east-west zone (Barmere, Jodhpur, Nagaur, Bikaner, Churu, Jhunjhunu), where the dunes are generally stabilised and are in little flat positions. Many active dunes have also been formed in this zone. The inherent climatic, geological and geomorphological conditions are the basis of the aridity and desertification. The extremely high temperature in these areas results into fragmentation and accumulation of detrital sands which later turns into raging winds. High evaporation and low precipitation causes salinisation and increases the frequency of dust storms.

India, during last 20 years has become more seious and is now deeply concerned with the need to conserve its land and water resources and is trying to ensure a balanced utilization of other resources such as forests, grazing land, wildlife and equatic life. The pollution of air, water, earth and oceans and even poisoning of soil by polluting industries is leading to dreadful consequences in some part of the world. The matter has been discussed in many seminars/ conferences and meetings held at UN, Rio, Bulgaria and India and the authorities have appealed to the environmentalists and ecologists in all countries to continue their efforts toward solving this problem in a peaceful manner.

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P.I. / Editor

Saraswati River in the Thar Desert of Rajasthan

Amal Kar

Central Arid Zone Research Institute, Jodhpur

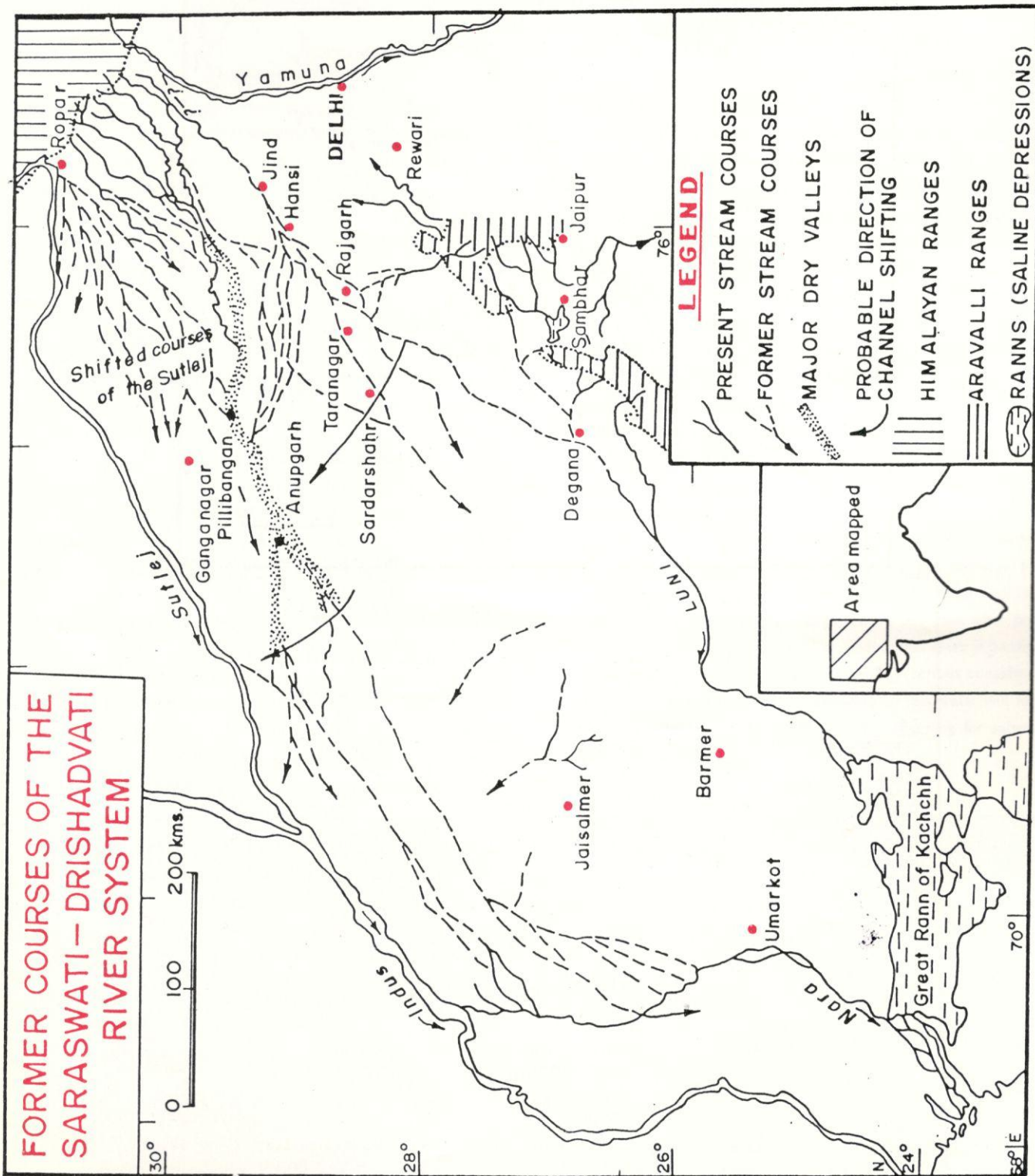
The Saraswati river, which is mentioned in the ancient Indian scriptures like the Rig Veda and the Mahabharata as a mighty stream, has been identified by many scholars during the last one hundred years as the present dry bed of the Ghaggar along the northern margin of the Thar desert in Haryana and Rajasthan. The Raini, the Wahinda and the Nara in Pakistan have also been identified as some of the old courses of that river. A dry stream bed of the Chautang between Hisar, Nohar and Bhadra was identified as the course of the Drishadvati, which is mentioned in ancient literature as a major tributary of the Saraswati. Both the streams originate in the lesser Himalayas. Studies carried out for the last two decades at the Central Arid Zone Research Institute (CAZRI), Jodhpur, especially with the help of satellite remote sensing, now reveal a number of early courses of this Himalayan river system through the desert in Rajasthan (Fig. 1).

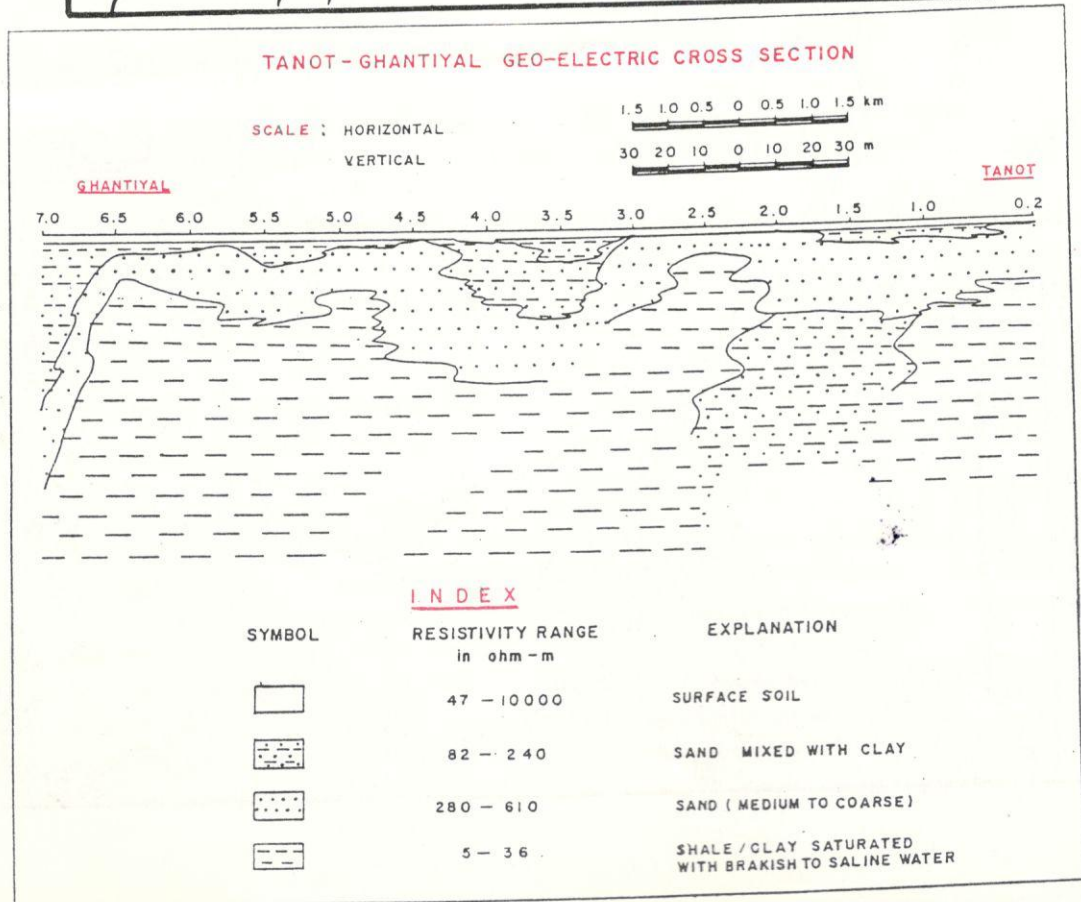
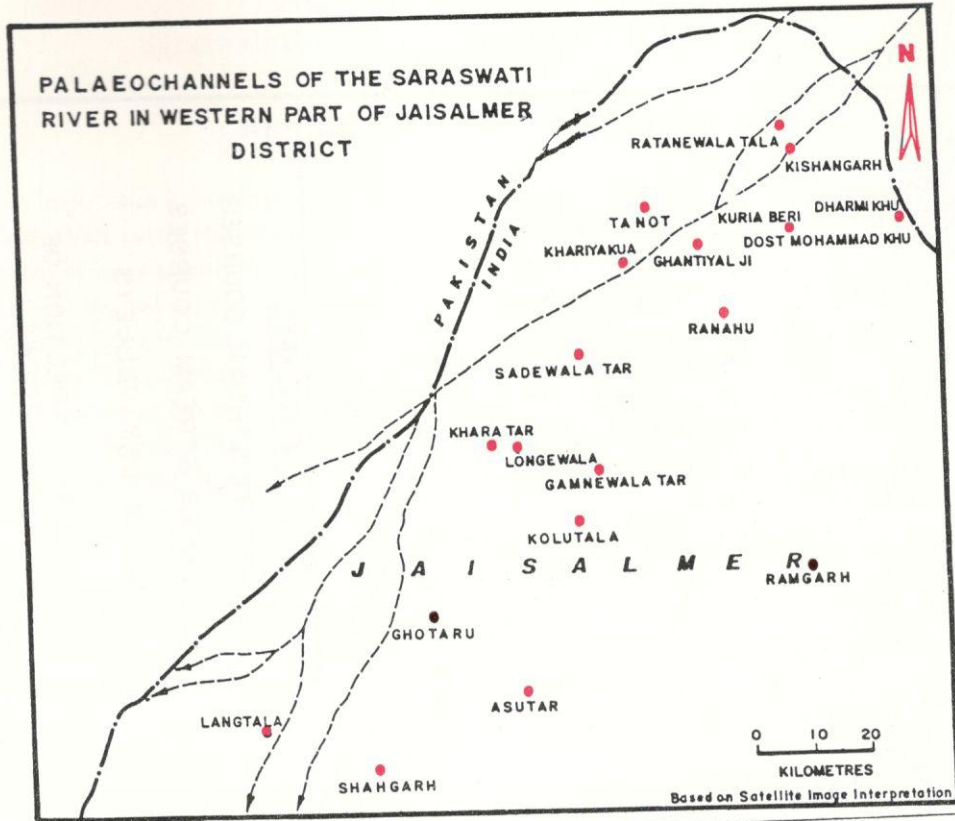
The courses are buried under high sand dunes and sand sheets of the Thar. It is possible that these courses predated the well known dry valley of the Ghaggar, and are much older than 40,000 years, when the climate was wetter for a long period. The Luni and its major tributaries originating from the Aravalli hill ranges, used to drain into this Himalayan system. The spatial pattern of the remote sensing signatures suggests that the Saraswati-Drishadvati river system experienced several shifting during the late Quaternary period (Fig. 1). The shifts perhaps took place in response to climatic fluctuation and neotectonic activities. The direction of shift was roughly from east to west. So, the northeast-southwest oriented courses could be considered as the gradually shifted courses of the Saraswati system over a period of time. After the Saraswati shifted away from the Luni, it began to flow roughly through Sirsa, Anupgarh, Sakhi (in India), Khangarh (in Pakistan), Ghantialji and west of Shahgarh (in the extremely western part of Jaisalmer district in India), and then the lower courses of the Nara (in Pakistan). Further shifts took the Saraswati through the Raini and the Wahinda and the Kakra-Nara segment in Pakistan. Finally the river ceased to flow even through that course and met the Sutlej (Satadru in the early Indian literature) to the west of Ahmadpur East (in Pakistan), via Anupgarh and Fort Abbas. The Drishadvati also gradually shifted northwestward, ultimately occupying the Narnaul-Hansi-Hisar-Bhadra-Nohar course to meet the Saraswati near Rangmahal. This tract has now many east-west oriented palaeochannels which are in various stages of obliteration and are bordered by sand dunes. Some

of the dry valleys have been canalized. The Sutlej (or the Satadru of the ancient scriptures), which originates in Tibet, used to nourish many of the early courses of the Saraswati, especially in the plains of Punjab-Haryana. Numerous southflowing palaeo-courses of the river can be identified from satellite images, suggesting that the Sutlej shifted its course several times in the sub-Himalayan plains. Ultimately it shifted away from the Saraswati.

Some of the course of the Saraswati may have good prospect for ground water. The dry valley of the Ghaggar has shallow ground water, and so also have the courses of the Drishadvati between Nohar and Rangmahal. Before the canals a number of dug wells along these courses used to sustain life in the vicinity. The buried former courses of the Saraswati in the western part of Jaisalmer district also have good water potentiality. A few dug wells at Dharmi Khu, Dost Mohammad Khu, Kishangarh, Ghantialji, Makne ka Tar and Mondhlo, which occur in the vicinity of the courses, have potable water at shallow depth, and do not go dry inspite of high cattle pressure and almost no contribution from the local rainfall. The average annual rainfall in the area is less than 150 mm.

In order to locate ground water along the Saraswati palaeochannels in western part of Jaisalmer, a joint program was undertaken between CAZRI and Ground Water Department (GWD), Jodhpur. Under this program we carried out in 1992-93 a detailed remote sensing and geophysical investigation in the Ghantiyalji-Tanot-Kuria Beri tract. In order to provide near-accurate locations for the geophysical transects in the difficult dune covered terrain, first a detailed mapping of the palaeochannels was carried out using the false color composites (FCC's) of Landsat and IRS images at 1:250,000 scale and larger. The palaeochannel signature in the FCCs of dry cool season of the area is dominated by a few narrow and sinuous bands of reddish brown tinge, which are roughly oriented northeast-southwest. These are the green vegetation banding, especially the banding of the relatively closely-spaced grasses and shrubs on the dunes and interdune plains. Since the area is almost devoid of human settlements, and has a very low rainfall, such banding suggests exploitation of shallow ground water by the natural plant species, especially through long tap roots and capillary rise of moisture through aeolian fine sand. One course was traced roughly through the vicinity of Kishangarh, Kuria Beri, Ghantiyalji, and Sadhewala. Another course was marked approximately to the





west of Kishangarh and north of Shakti Post (Fig.2). These courses have upstream and downstream links with the palaeochannel courses of the Saraswati marked earlier.

Geophysical investigation was carried out in the Ghantiyalji-Tanot-Kuria Beri tract. A low frequency (about 4 Hz) instrument, the Aquameter, was used for electrical resistivity soundings. Vertical Electrical Soundings (VES) were carried out using the Schlumberger electrode configuration. Between Ghantiyalji and Tanot profiling was carried out at every 100 m and potential half-electrode spacing of 20 m. This layout was decided on the basis of VES, taken during soundings. The distances were worked out on the basis of points of inflection. A total of 66 observations were taken along the road from Tanot to Ghantiyalji. Frequency of observation for VES was kept at 500 m. Plotting and interpretation of the gathered data revealed the configuration of a palaeochannel in sand and silt-dominated sediments, as well as a water bearing sand formation (Fig. 3).

Between Tanot and Kuria Beri sand thickness prevented sounding at every 500 m. Isolated soundings were therefore, carried out in the less sandy interdune locations at Kuria Beri, which also suggested a promising aquifer. In other words, the study, based on satellite remote sensing and ground-based geophysical soundings, provided clear indications of the occurrence of potable ground water along the marked palaeochannels. Detailed soundings between 3.2 and 3.9 kms from Tanot on the Ghantiyalji road will provide additional information on the palaeochannel. Additionally, bore hole drilling up to a depth of 50 m, with core bit, may be taken up at 3.5 km distance from Tanot. Deep drilling at any site along the buried streams may be counter-productive. It has been found elsewhere in the desert that the potable ground water at a shallow depth along the

buried streams is followed at a greater depth by saline ground water. Consequently, if there is high exploitation of the shallow aquifer, the water quality in the wells will deteriorate significantly.

It may be worthwhile to mention here that a subsequent detailed geophysical resistivity survey in Kishangarh-Kuria Beri tract by GWD (1994) has reconfirmed our findings on the existence of a water potential palaeochannel in the area. Dating of ground water samples from one of the pre-Ghaggar Saraswati palaeochannels between Fort Abbas and Marot in the Cholistan desert of Pakistan by German researchers revealed that the last recharge of fresh ground water took place between 12.9 and 4.7 thousand years before present, with a break between 8 and 7 thousand years before present. Since the recharge period agreed well with the period of higher rainfall over the region, it was concluded that this recharge took place when the monsoon vigour was re-established after a prolonged arid phase. Recent isotope studies of ground water in shallow dug wells along the Saraswati palaeochannel in Kishangarh-Ghantiyalji tract by Bhabha Atomic Research Centre, Trombay, also suggest that the ground water in this part is old, and is not being recharged presently. Another isotope study further downstream on the same palaeochannel to the south of Shahgarh and up to Mondhlo by the Defence Laboratory, Jodhpur, confirms that the recharge to the aquifer did not take place from local rainfall. All these findings not only vindicate the courses interpreted by us, but also provide additional information on them. The finding that there is hardly any recharge to ground water at present needs a serious consideration, because it implies that too much tapping of this water will lead to drying of the aquifer, unless there is any planning for substantial artificial recharge.

ENVIS SUB-COMITTEE CONSTITUTED

A sub-committee was constituted for ENVIS centre on Desertification :

Dr. I. Prakash Emeritus Scientist, ZSI, Jodhpur	Chairman
Shri D. Bandyopadhyay (Addl. Director, Ministry of Environment & Forest, New Delhi)	Co-chairman
Dr. H.C. Bohra Sr. Scientist, CAZRI, Jodhpur	Member
Dr. Amalkar Sr. Scientist, CAZRI, Jodhpur	Member
Dr. D.C. Ojha Principal Investigator, ENVIS, CAZRI, Jodhpur	Member
Shri D.V. Kothari Sr. Technical Officer (ENVIS) CAZRI, Jodhpur	Member Secretary

ARID HORTICULTURE

by

Dr. R.N. Prasad

Sr. Scientist

Zonal Coordinator Unit

CAZRI, Jodhpur

Horticulture has special significance in arid zone especially in drought prone areas because fruit crops once established become permanent source of income and impart stability to uncertain agriculture.

1. Ber : Technology standardized by CAZRI for propagation of ber plants by 'T' budding gained popularity and widely adopted. Conventional method of propagation used to take more than one year to raise a grafted ber plant. The technique of raising ber rootstock (*Ziziphus rotundfolia*) seedling in polythene tube in the first week of April and budding operation is performed in the first week of July. The budded plants are ready to plant in the field in August. Thus the method has cut down period from one year to four months.

The technology standardized helped the farmers to multiply improved ber cultivars (Var. Gola and Seb) and at least 2 dozen nurserymen even small and marginal farmers have started multiplying ber plant in large number. The grafted plants thus are supplied in lakhs every year all over the country from Jodhpur earning a substantive profit which raised their standard of living.

So far CAZRI, has identified 3 cultivars of ber namely, Gola, Seb and Mundia suited best to arid conditions. Package of cultivation practices have been standardized. The processed products like dehydrated ber, jam, murabba, ber juice etc. have been prepared.

2. Pomegranate (*Punica granatum*) : Pomegranate is another important fruit crop suitable for arid region. This fruit is tolerant to drought and salinity and can be grown with limited irrigation facilities. Germplasm collection of 35 varieties has been made. The CAZRI has identified an early variety 'Jalore Seedless' which is best suited to the arid condition having attractive red colour and soft seeded with pleasant flavour. An income of about Rs. 35,000/- per hectare may be obtained from 5th year onwards. The cultivation practices including propagation, nutrition, water requirement, spacing etc. have been standardized. Because of the technology developed at CAZRI, about 10 orchards of Cv. Jalore Seedless are established and there is great demand of this variety in other parts of the country too.

Attractive red colour pomegranate squash which is very delicious in taste has been prepared from the variety. Good quality 'Anardana' used for souring taste is prepared at this institute. Further, improvement program in pomegranate resulted in few promising selection from open pollinated seedlings of Cv. Jalore

Seedless and Khog. Hybridization program with 15 cross combinations of important cultivars of pomegranate resulted in some of the promising hybrid seedlings suitable for arid condition.

3. Date palm (*Phoenix dactylifera*) is another fruit which has maximum scope for cultivation around Indira Gandhi Canal in dry districts of Jaisalmer, Barmer and Bikaner. Halawy cultivar has been observed to be most promising as it is early ripening as compared to other 17 cultivars under evaluation. Techniques on establishment, nutritional requirement and propagation by tissue culture have been standardized.

4. Sitaphal (*Annona squamosa*) has been recently introduced in Jodhpur. Local collection from Rajasthan and some improved cultivars are being evaluated. Cultivar *Balanagar* and *Chittorgarh* local found to be performing better in arid zone. Propagation technique has also been standardized.

Other indigenous fruits namely Gonda (*Cordia myxa*) and Kair (*Caparis decidua*) are important fruits of arid zone used as vegetables and pickles. Improvement program is in progress with the objective of better quality fruits and higher yield.

Please Send :

- Books for Review;
- Information, news and events pertaining to Desert Environment; and
- Research finding, reports etc. Concerning to Desert.

ENVIS CENTRE PUBLICATIONS

1. Catalogue of Periodicals
2. Select list of Publications in Soil Science from CAZRI
3. Bibliography on Desertification
4. Current Awareness Bulletin

Phytogeography of Useful Plants in the Great Indian Desert

The study of Dr. A.K. Charan, Head, Department of Geography, Vinodini PG College, Khetri, revealed that 150 plants of Western Rajasthan Desert are useful. Similarly the observations revealed that these useful plants fall under five main categories i.e. applied categorization according to the nature of their utilization for the welfare of the human beings as well as domestic animals; namely, A. Fuel (12%), B. Medicinal (24%), C. Fodder (12%), D. Edible (30%) and E. Commercial (22%).

Regarding the study of multipurpose plants, it has been investigated that this group comprises about 9 percent of the total useful plants of Western Rajasthan which covers whole of Jaisalmer, Barmer, Jodhpur and south west part of Churu and western part of Nagaur.

It was observed that among Western geographical elements, 46 percent species fall under Sudano Rajasthanian group (viz. *Acacia jacquemontii*, *A. senegal*, *Capparis decidua*, *Cenchrus setigerus*, *Commiphora Mukul* and *Salvadora oleoides*), 40 percent belong to the saharo-sindian group (viz. *Citrullus colocynthis*, *Lasirus sindicus*, *Leptadaenia pyrotechnica*, *Tecomella undulata* and *Zizyphus nummularia*), 7 percent belong to the Indus Plain group (*Prosopis cineraria*) and remaining 7 percent to the Mediterranean flora (*Calligonum polygonoides*), respectively.

It is concluded that among these selected plant species, about 70 percent have by nature more selected plant species, be utilized for providing raw material to small industrial units particularly in rural areas. The remaining 30 percent, which are mostly grasses, have their more applied value as fodder.

Reproduced from Vigyanonnayan, V.1 No. 2, April-May-June-1998

VISIT ENVIS AT

<http://www.nic.in/envfor/envis>

Recently, the Ministry of Environment and Forests, Government of India have created website and Home page in Internet which carry the information about the Ministry and its associated bodies. Detailed information about the Environmental Information System (ENVIS) centres all over the country including the list of ENVIS centres with their areas of specialisation and complete address is also provided.

The Bisnoi of Rajasthan

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About five years ago I was travelling by car in the desert country of Rajasthan in India. The countryside was like much of the central two-thirds of Australia, though with antelope instead of kangaroos. Suddenly I saw some chinkara (small antelopes) grazing the edge of a field where men and women were working and I asked the driver to stop.

I expected the chinkara to head for the distant hills-for most animals a car means danger and usually wildlife makes itself scarce in the kind of visual extinction so familiar to bush travellers.

To my astonishment, the chinkara scampered towards the men and women in the millet paddock and stood next to them like domestic pets! I turned to my companion, the famous wildlife expert, Kailash Sankhla, the first director of Project Tiger and, at this time, the Chief Warden of Rajasthan Wildlife Conservation. He laughed.

'It's not a miracle. This is Bisnoi country', he said, then added reflectively, 'Perhaps it is a miracle. Here is the ecological road to the future shown by a guru some 500 years ago.'

Kailash then told me the story of these people and the desert country in which they live.

More than five centuries ago droughts, famines, invasions and spreading deserts causing humans to move were all part of the Thar desert. It stretches some 700,000 square kilometres across the states of Rajasthan, Gujarat, Haryana and the Punjab. In 1452, Jangeshwar Baghwan was born. Like many prophets before him, he went into the desert to seek wisdom and there he discovered the profound truth that ecological disorder was the prime cause of all their troubles. This was 400 years before ecology as a science was developed.

Baghwan proclaimed twenty plus nine (Bisnoi) basic principles for the good life. The Bisnoi principles deal not only with direct ecology of the plant and animal life but also how humans should live in harmony with the environment. Until about 10,000 years ago, all people, being huntergatherers, naturally lived in harmony with the environment but this was more a matter of state of their technology than religion or ecological understanding. Any creature living on what nature provided, the Garden of Eden situation of the Old Testament, achieved this harmony. When any grasseater or predator presses too hard on its food source, nature limits the number of offspring by making it more difficult to get food.

The Bisnoi people are farmers with both stock and agriculture. They were originally Hindus and Bisnoi became an offshoot of the religion. Today their settlements stretch over 80,000 square kilometers of desert yet, despite this, they enjoy a richer lifestyle than most of their neighbours and have contributed political leaders. Kailash told me that a Bisnoi was then Minister for Environment and Forests in Rajasthan.

So what are these Bisnoi principles that could provide a guide to farmers in arid lands throughout the world?

Foremost is that no tree or its branches should be destroyed. One particular tree, the khejari, should be worshipped as it is so vital to the Bisnoi's future.

Second, all animals must be protected. Black buck are a sign of environmental quality; the howl of jackal is welcomed as the sign of a health village. Similarly, foxes and wolves are given protection.

The Bisnoi flourished until about 250 years ago they faced a great trial. The fort at Jodhpur needed repairs and the Maharajah's servants could find no suitable trees to use except those in the village of Khejarli where trees were sacred. Felling them would cause trouble so soldiers went with the woodcutters.

On that particular day the only leader in the village was a woman named Amrita. She hugged the khejari tree and paid for this defiance with her life. Day by day, more trees were cut, each defended by a Bisnoi who, after taking a ritual bath, stood in front of the tree to die for the Bisnoi truth.

In this great demonstration of faith, 363 Bisnoi were executed. Finally, the news of this massacre reached the Maharajah. Overcome with horror, he then decreed that no-one should cut trees and kill animals and birds in the territories of Bisnoi villages throughout the State of Marwar.

The people and their land, with its precious cargo of wildlife, were saved.

Even today, the Bisnoi die for their beliefs. Sporting shooters come to this region because of the abundant wildlife. Chinkara, blackbuck and other creatures run either into the fields to their protectors or into the villages. Bisnoi men, women and children have stood in front of the animals and many have died from gunshot wounds.

Kailash asked if we would like to visit these people and, as well our party were keen conservationists, we were soon travelling towards a village which had been warned of our impending arrival. The Bisnoi live in communities, often of about 100 families. They were studied by zoology Professor S.M. Mohnot of Jodhpur University and his students and the results of their intensive survey were published in *New Scientist* magazine of 17 December 1988.

Most Bisnoi income comes from milk products and each man has four cows to care for. Sheep and goats were never used because these are believed to be the desert makers. According to Bisnoi lore, more empires have fallen through the nibbling teeth of

goats than the spears of invaders, for such ecological dangers first weaken the community making them easy victims.

The Bisnoi grow crops such as millet in the hollows between sand dunes. If no rain comes and there is not sufficient water to be used for irrigation, then so be it. The Bisnoi accept that there will be droughts every three to four years and that is taken into account in their calculations of survival. In most years the rains do come and crops can be harvested with the surplus stored for the lean years.

The famous khejari tree is carefully husbanded. The dry twigs are used both for fuel and thatch for the houses. The cattle eat the leaves which have up to 14 percent by weight of protein. Their intake is carefully watched and, even in drought years, there is no increase in the amount of leaves harvested. This is one of the hundreds of ways in which the Bisnoi respect the twenty-nine principles, taking only what they need from the land.

Bisnoi homes are built of adobe, as are their kilns to store grain and cisterns to store the occasional rain. The houses were clean and prosperous and all the people seemed healthy and happy.

As Kailash wrote in a later article, 'Bisnoi men are all tall and handsome, clad in snow-white clothes and large turbans. The hard work of the Bisnoi women shape their forms. They are bold and colorful, and continue to be custodians of their culture. They surpass the men in charm, beauty and jubilation'.

Professor Mohnot thinks that we have much to learn from the Bisnoi. He points out the weakness of much modern-day agricultural advice.

This comes from the city and rarely filters down to the villages in crisis. What we need to see happening is a reversal - an ecological sensibility that starts at the village level. This is why the Bisnoi are so significant.

Kailash made the same point to us. Five hundred years is sufficient time for the ecological truth of the Bisnoi way of life to have been tested in full.

We travelled hundreds of kilometers through Bisnoi country and everywhere found how closely all followed the twenty-nine truths of their religion. It not only enshrined ecological principles but also ways of life. Unlike Hindu religion culture, they have no caste system and face the threat of overpopulation by encouraging family planning.

The Indian government is well aware of the value of these people and their twenty-nine principles. Each year, people come to the Khejarli Village in September in a celebration of the environment and to visit the grave of the Great Guru.

The Indian Government in 1988 named the village as the first National Environmental Memorial in honour of those 363 people who died for their faith.

Reproduced from Desertification Control Bulletin, No 26, 1995

New Publications received on Environment and Desertification

Rao,A.V., Ojha,D.C. and Saxena, Anurag	50 years of Arid Zone Research in India : An Annotated Bibliography	Scientific Publisher, Jodhpur - 342 001	(1998)
Hooja, Rakesh and Joshi,Rajendra	Desert, Drought and Development : Studies in Resource Management and Sustainability	Rawat Publications, Jaipur - 342 003 (Raj.)	(1999)
Amadeo M. Rea	At the Desert's Green Edge	University of Arizona Press, Arizona	(1997)
Pareek, O.P. and Vishal Nath	Coordinated fruit research in Indian arid zone.	National Research Centre for Arid Horticulture, Bikaner (Raj.)	(1996)
Baker, Randall	Environmental Management in the Tropics : A Historical Perspective	CRC Press, London	(1993)
Faroda, A.S. and Singh, Manjit	50 years of Arid Zone Research in India	Central Arid Zone Research Institute, Jodhpur - 342 003 (Raj.)	(1998)

NEW DESERTIFICATION RESERACH CENTRE

DRC , SEPA in CHINA

Desertification is one of the serious problems in China, and Chinese government thinks highly of desertification combating. Recently, authorised by State Environmental Protection Administration of China (SEPA, former NEPA), Desertification Reserch Center , SEPA is officialy established in Nanjing of China. The Center is engaged in studying desertification and its control both in China and other developing countries which are endangered by desertification. Researches of the center includes :

- Status and causes of desertification
- Trend monitoring of desertification
- Measures of desertification combating

ADDRESS

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New Journal on Environment

1. REGIONAL ENVIRONMENTAL CHANGE

(Natural and Social Aspects)

Editor-in-Chief :

Win Salomons

The aim of the journal is to focus on the interactions of human and natural systems at the regional level within the context of global change. Regions covered are : river catchments, estuaries, deltas, adjacent seas, and wetlands as well as the interactions between cities and their environment. Disciplinary but in particular multi-disciplinary approaches to the study of these systems will be considered.

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2. PROGRESS IN ENVIRONMENTAL SCIENCE

Managing Editor

Prof. Donald A Davidson

The key functions of the journal is to provide state of the art reviews of major themes such as global change, environmental risks and hazards, pollution, waste disposal, natural resources and biodiversity.

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3. INDIAN JOURNAL OF ENVIRONMENTAL PROTECTION

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Dr. Surendra Kumar

The Journal covers all aspects of environmental pollution and its control. This includes scientific, administrative, economic and political aspects of these interactions. All types of pollution are covered such as Air Pollution, Wastewater, Industrial effluent, Ground water, Environmental impact assessment, Industrial ecology, Sustainable development, Hazardous radioactive and industrial wastes, Legislation-policy and regulation etc.

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Permanent Services of ENVIS Centre / Dr. Raheja Library

The Central Library of Central Arid Zone Research Institute (CAZRI), Jodhpur was established in 1959 and ENVIS centre on 'Desertification' was started in 1991 to collect and disseminate agricultural research information to its scientists. Apart from providing the services in the form of printed material i.e. Books and Journals, it has extended the digitized services by providing computerized databases to its readers. The Library provides the information retrieval Services using the following databases :-

1. **International Information System for the Agricultural Sciences and Technology (AGRIS) CDs**

AGRIS, an international bibliographical database compiled by FAO on agricultural sciences and technology, is available in the form of Compact-Disks (CDs), operated in Windows environment. The multi-lingual database contains above 2 million records and the on-line search is very user-friendly.

2. **CAB Abstracts CDs**

The Compact Disks compiled by CAB International contain comprehensive bibliographical database pertaining to agricultural sciences. The database contains cent-percent abstracts through which the references can be obtained using keywords in all possible permutation-combination. The database runs in Windows environment.

3. **BIA**

The database contains the references regarding the published and available articles of the institute scientists. The database has been designed using Micro CDS/ISIS software.

4. **BOOK**

The reference regarding all the books available in the Library is available in the database. The search can be made on any keyword e.g. Authors, Title, Accession Number, Classification Number, Subjects, keywords etc. The database was created using Micro CDS/ISIS software.

5. **CAT**

For the automation of the journals being subscribed by the library, the CAT database was designed using CDS/ISIS software. The references are available for the available journals in the library. The details regarding the incomplete, missing and discontinued journals can also be obtained by the references.

6. **NEW**

Information regarding all new books purchased by the Library from 1993 onwards till date is available in this database. The database was created in order to facilitate the scientists about the new as well as indented publications in their respective subjects. Micro CDS/ISIS software was used to design the database.

7. **Database on ICAR Institutes and State Agricultural Universities (SAUs)**

A very user-friendly database has been designed using MS-ACCESS software pertaining to ICAR Institutes and SAUs. The search can be made by selecting abbreviated name of the institutes as well as states.

Request for any of the above services can be sent to **Dr. D.C. Ojha, Incharge Library & ENVIS Centre, Dr. Raheja Library, CAZRI, Jodhpur - 342 003.**

Telephone : 0291-740931
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New Journal on Environment

1. REGIONAL ENVIRONMENTAL CHANGE

(Natural and Social Aspects)

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The Journal covers all aspects of environmental pollution and its control. This includes scientific, administrative, economic and political aspects of these interactions. All types of pollution are covered such as Air Pollution, Wastewater, Industrial effluent, Ground water, Environmental impact assessment, Industrial ecology, Sustainable development, Hazardous radioactive and industrial wastes, Legislation-policy and regulation etc.

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The Central Library of Central Arid Zone Research Institute (CAZRI), Jodhpur was established in 1959 and ENVIS centre on 'Desertification' was started in 1991 to collect and disseminate agricultural research information to its scientists. Apart from providing the services in the form of printed material i.e. Books and Journals, it has extended the digitized services by providing computerized databases to its readers. The Library provides the information retrieval Services using the following databases :-

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2. CAB Abstracts CDs

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3. BIA

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4. BOOK

The reference regarding all the books available in the Library is available in the database. The search can be made on any keyword e.g. Authors, Title, Accession Number, Classification Number, Subjects, keywords etc. The database was created using Micro CDS/ISIS software.

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6. NEW

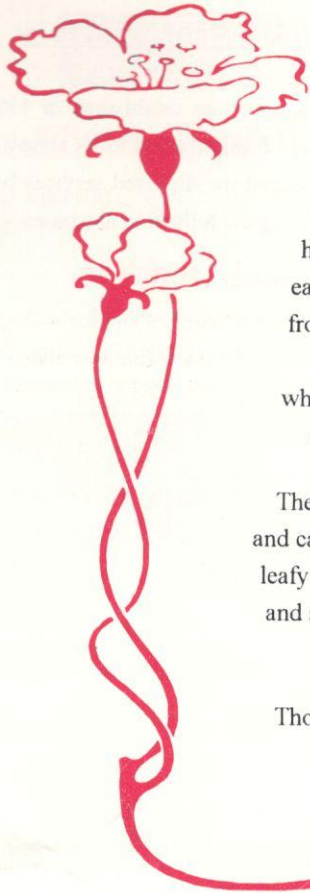
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7. Database on ICAR Institutes and State Agricultural Universities (SAUs)

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Desert Rain

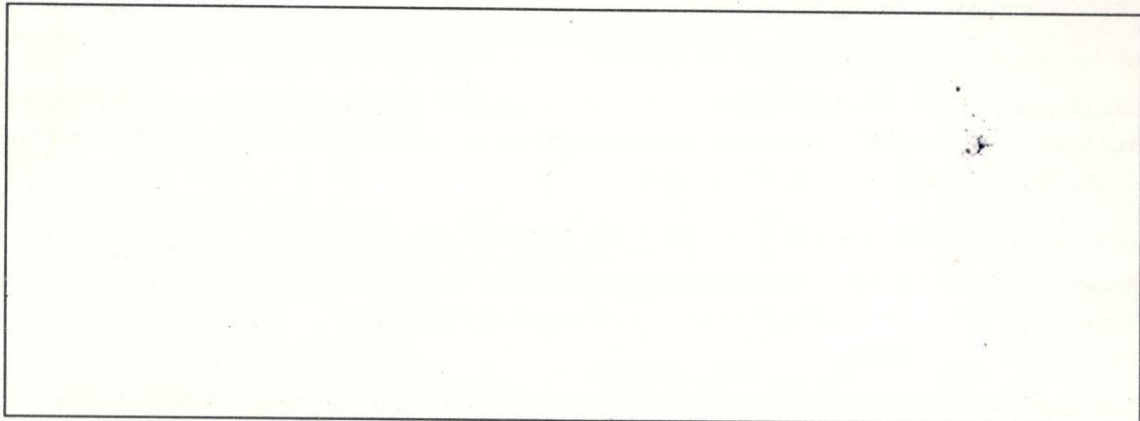
As dew point rises, so the clouds begin
high over mountain, thunderhead and rim
each day spread wider till the rains descend
from peak to slope and valley. Living things
respond in floral torrent, insects swarm
while toad and reptile gorge against the norm
of dust and heat in leaner days to come.

The day of riches over, plains return to cresote
and cactus (soft leaves burn). Odd palo verde loses
leafy fronds, the dry arroyo holds mesquite alone,
and sharp against the evening sky are thrown the
flaming spikes of ocotillo wands.

Though lure of sand and sun and rock remain,
most desert beauty lies in desert rain.

- JOHN G. SINCLAIR

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