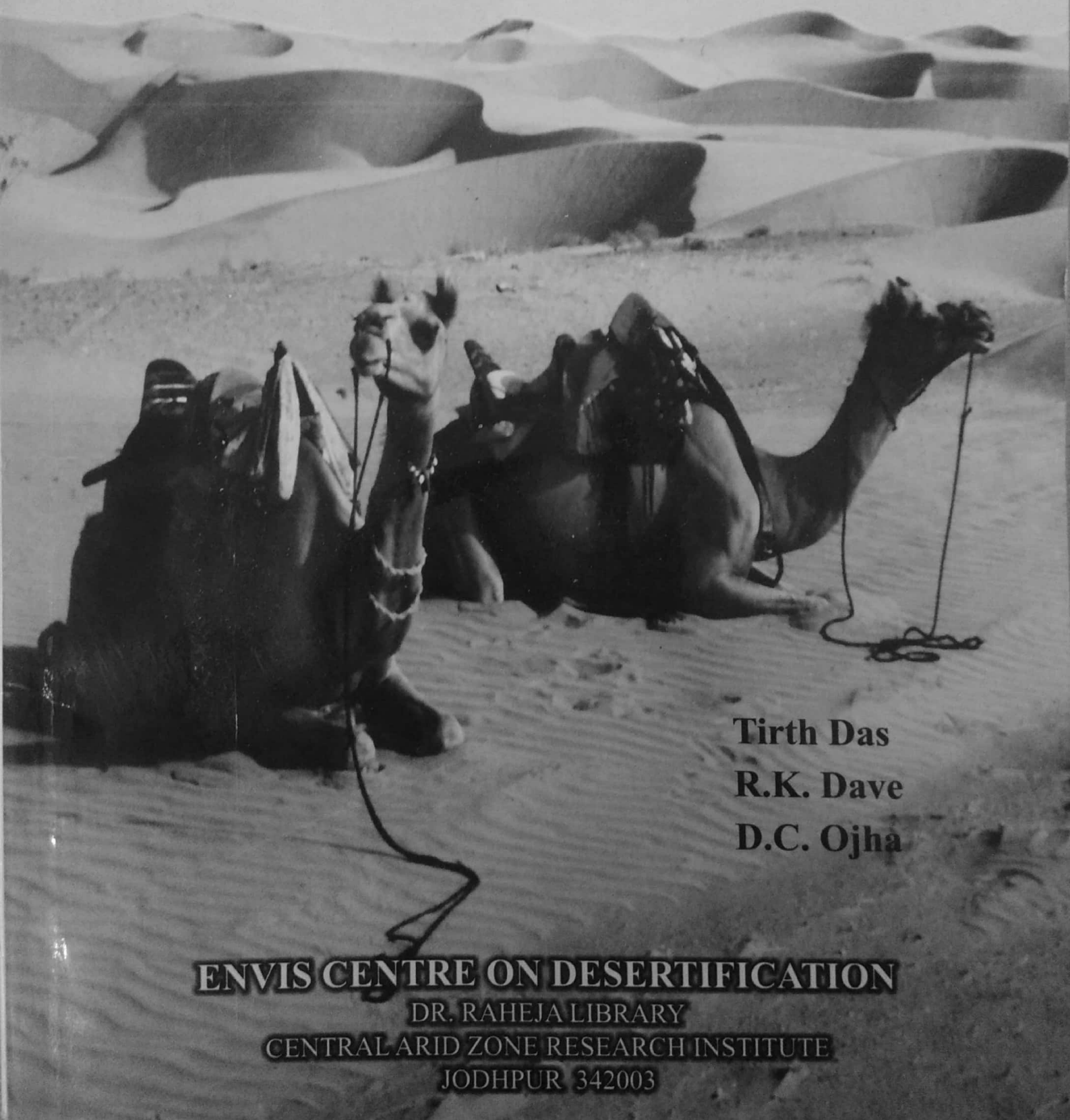


# DEN ABSTRACTS

(Desert Environment Abstracts)



Tirth Das  
R.K. Dave  
D.C. Ojha

**ENVIS CENTRE ON DESERTIFICATION**

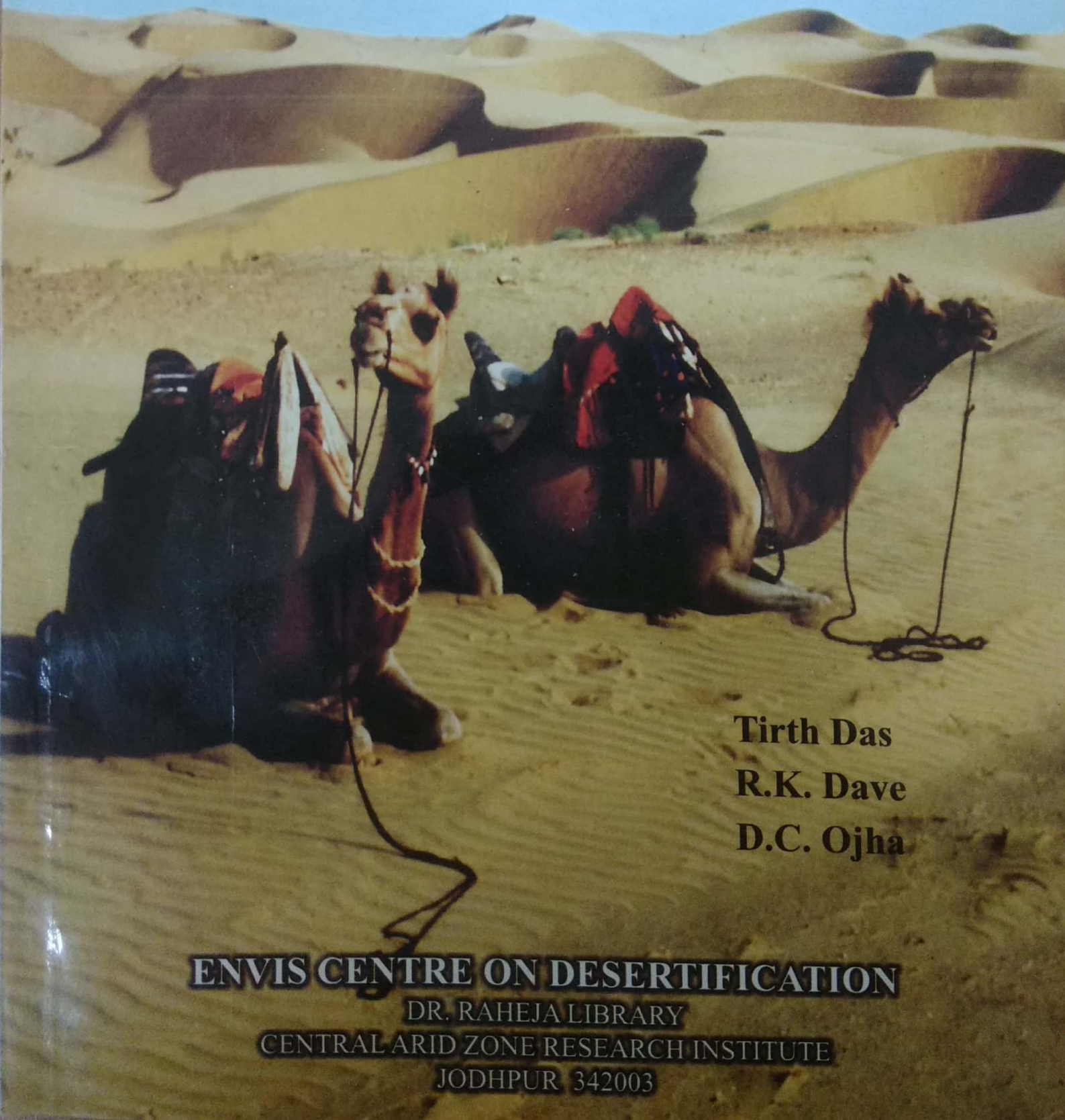
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**DEN NEWS**

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# FOREWORD

Thar Desert of India is one of the most thickly populated desert of the world. The Great Indian Thar has been a priority area for the Govt. of India for multitude of problems. Considerable deterioration in desert habitat and its ecology due to impact of human activities has attracted attention of national and international agencies. During the last five decades, focussed research and development activities have been carried out by the Central Arid Zone Research Institute, Jodhpur to explore the causes and consequences of desertification and measures to combat desertification. As a result voluminous information on desertification has been collected, which needs systematic compilation. There is frequent demand to the research articles published by the CAZRI scientists from different quarters.

Considering contribution of CAZRI, the Ministry of Environment and Forests (MOEF), Govt. of India established (1991) a ENVIS Centre on Desertification at this institute. As per objectives of ENVIS Centre, an Annotated Bibliography on "Desertification – An Indian Scenario" covering a span of 50 years was brought out by the ENVIS Centre. This effort is being continued and invaluable information pertaining to research articles published in various national and international journals covering a period of two years (2000 and 2001) is being brought out as a ENVIS activity. This systematically arranged updated Desert Environment Abstract (DEN Abstract) would be of great interest and immense use to the scientists, research scholars and development agencies working on desertification. I compliment the ENVIS team for their initiative and efforts for this excellent publication.

(PRATAP NARAIN)

Director  
Central Arid Zone  
Research Institute  
Jodhpur 342 003

Dated : 26.11.2002

# PREFACE

As a significant achievement of the institute library, the Ministry of Environment and Forest (MOEF), Govt. of India approved to establish a ENVIS Centre on "Desertification in 1991. It is mandatory for the centre to create database and to bring out bibliographies and indexes on the above subject. The centre has brought out many publications of repute. Recently a book titled "Desertification – An Indian Scenario (An Annotated Bibliography) " has been published in the year 2000. The book comprehensively covered all areas of research particularly in desertification. In due course of time, it has been observed that many scientists, students and other research scholars particularly interested in desertification and its causes, consequences and control demand for bibliographical references. Considering the above facts in mind a separate publication has thus been designed making use of the original source i.e. "Desertification – An Indian Scenario (An Annotated Bibliography) " to facilitate the readers. Around 152 new records concerning to desertification research identified during 2000 and 2001 (Two Years) have been added from 45 national and international periodicals at appropriate places to update the publication. In the end two indexes author and source have also been provided to facilitate easy retrieval of the information. All the references have been arranged alphabetically within their respective subjects.

The publication has been divided in major subject groups viz; Desertification, Arid and Semi Arid Zones, Environment, Forestry, Livestock, Natural Resources, Soil Conservation, Crop Production and Management, Waterlogging, Birds etc.

We would consider our labour amply rewarded if this publication comes to the help of Scientists, Planners and Policy Makers working on Desertification and its related aspects in search for published information. We also wish to record our thanks to all the staff members of Dr. Raheja Library, CAZRI, and to Shri R.K. Abhichandani, P.S. (Retired), CAZRI, who had extended their unstinted cooperation and help in bringing out this publication.

Tirth Das  
R.K. Dave  
Dr. D.C. Ojha

Dated : 7.10.2002



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# NATURAL RESOURCES AND DESERTIFICATION

## 1. AGARWAL, G.D. (2000)

People of the Arwari basin in Alwar, take proactive measures to battle drought. *Down To Earth* 9 13: 22-23

They worked together and revived a river. Now, faced with the third consecutive drought, the villages around the Arwari river in Alwar, Rajasthan, got together to work out a crisis management plan.

## 2. ALAM, M.M., AHMAD, A.H.M. and KHAN, M.H.A. ( 2000)

Diagenetic Features of Lower Jurassic Lathi Sandstones, Jaisalmer Basin, Western Rajasthan. *Journal Geological Society of India* 56 4: 4 15-24

The lower Jurassic Lathi Formation forms the lower part of the Jaisalmer basin and comprises 360 m thick succession of medium to coarse grained sandstones with interbeds of shale, claystone and occasional lignite. The rocks are exposed amidst desert sand as low mounds and in shallow stone quarries. The sandstones were deposited in shallow marine to deltaic depositional environments. Our study deals mainly with the identification of various diagenetic features such as cements and their pragenesis, compaction, depth of burial and porosity evolution. The sandstones are marked by iron oxide, calcite, silica and dolomite cements. Compaction is mainly mechanical with a depth of burial in the range of 725-1125 m. The sandstones show good amount of porosity with an average of 13.3%. Porosity reduction is mainly due to early stage of mechanical compaction and subsequent pervasive calcite and iron oxide cementation.

## 3. BAJPAI, V.N., SAHA ROY, T.K. and TANDON, S.K. (2001)

Subsurface Sediment Accumulation Patterns and Their Relationships with Tectonic Lineaments in the Semi-Arid Luni River Basin, Rajasthan, Western India. *Journal of Arid Environment* 48 4: 603-21

Sediment accumulation patterns in the Luni basin have been studied on the basis of tubewell lithologs and Bouguer gravity anomaly profiles. East-West geologic transects using these data reveal several sediment-filled graben depressions, for example, the Digrana-Bhawal graben in the northern part, the Mangta-Sindari, Sindari-Bhimgoda, and Bhimgoda-Juna Motisara grabens in the central part; and the Dungari-Ratanpura and Ratanpura-Khanpur grabens in the southern part. Maximum sediment accumulation of more than 300 m is located in the southwestern part of the Luni basin, more specifically in the Ratanpura-Khanpur graben. Minor depressions also occur towards west of Jodhpur and east of Bhadrarjun. Sediment filling in these graben depressions commenced with thick clay deposits, followed by multistoried fining up sand and gravel sequences. Sediment accumulation centres are coincident with major tectonic lineaments and thus indicate that important loci of sediment accumulation are, possibly, a response to synsedimentary tectonics.



4. **BANGARWA, K.S. (2001)**

Stop the march of deserts. *Intensive Agriculture* 39 5-6 : 15-16

The drive to produce enough food to support a growing population has resulted in the use of increasingly marginal resources and a full scale assault on the country's remaining forest lands. Every year the country is losing 1.5 lakh hectares of forest cover and 1200 crore tonnes of top soil. The most challenging task is to save the existing forests and arrest the march of the deserts followed up by intensive afforestation drive with the active involvement of the people. In the present circumstances, India needs a second green revolution based on environmentally safe technologies. Some suggestions are :

- Immediate attention and positive attitudes are required to conserve well endowed and beautiful kind of genetic diversity in plant.
- Considering the ill effects of the indiscriminate use of chemical pesticides, Biointensive Integrated Pest Management (BIPM), a more feasible and economical method of pest management is to be made popular.
- It is important to popularize judicious use of organic manure and chemical fertilizers to raise the yield of crop.
- The construction of earthen small dams to check the over flow of rainwater will not cost much money or labour.
- Sprinkler and drip irrigation are the latest and most efficient method of water utilization for crop growth and should be adopted.
- Agroforestry based farming system should be encouraged. Salt tolerant species like *babul* and *eucalyptus* are to be planted in salt affected areas. Such systems improve the productivity of plants and animals since they are based on sustainable land management and maximum utilization of natural resources, to increase the ecological and economic benefits.

5. **DAHLE, S.D. and PURANIK, P.V. (2000)**

Climatology and Predictability of the Spatial Coverage of 5-Day Rainfall Over Indian Subdivisions. *International Journal of Climatology* 20 4: 443-53

Six-state discrete simple Markov chain models was applied to the 5-day spatial rainfall features during the summer monsoon for 30 years (1964-93) over 3 meteorological subdivisions of India to understand the persistence behaviour of the spatial coverage of rainfall, and the underlying time-evolutionary processes on the synoptic scale. The stochastic models was cross validated on 5 years of independent data (1994-98) by evaluating various measures of forecast skill. It was revealed that the spatial coverage of rainfall does exhibit first order Markov persistence for all features, but diminishes for longer intervals for some features. The stochastic matrix, together with the climatic information about the spatial coverage of 5-day rainfall features, could be an aid to the operational forecaster to judge the evolution of specific areal rainfall events for qualitative prediction on a medium to extended range scale over a subdivision.



6. **DAS, B. (2001)**

A conference with an aim to drought-proof villages. *Down to Earth* 10 1:39-41

Centre for Science and Environment (CSE), a New Delhi based non-governmental organisation (NGO) and Tarun Bharat Sangh (TBS) an Alwar based NGO, organised the conference "Pani Sammelan" (Water Conference) during 23-24 March, 2001 in New Delhi and "Rashtriya Jal Sammelan (National Water Conference at Neemi village near Jaipur from 21st April to 23 April 2001. At Neemi, it was the spirit of democracy at the grassroots that thrived. Hundred and Eighty Nine delegates of 11 NGOs from Gujarat elected Shyambhai Antala, a veteran water harvester, to look after the pani samitis (water committees) in the state. He proposed to hold a similar "Jal Sammelan" of the 'Jal biradari' in Gujarat. In the "Sammelan", it was decided to revive traditional systems of water harvesting, which can be decisive in demarcating drought and greenery. Neemi village off the Delhi-Jaipur highway, learnt this historical truth when Tarun Bharat Sangh (TBS), an Alwar-based NGO successfully transformed their village in a green oasis.

7. **DASH, J. and BEHURA, N.K. (2000)**

Crisis Management:Lessons From The Past:A Case Study of Drought Situation. *Man in India* 80 1-2:75-88

The problem of drought in Kalahandi has become a perpetual issue and to focus empirical, the variegated dimensions of drought empirical studies have been undertaken in a few least and worst affected villages of the district, to reveal the efforts made by the local people, as well as the state Government, for the effective Management of the crisis situation. Moreover, looking at the situations of drought in the past years and people's response to it, lessons have been derived finally in the paper for the effective management of such a perennial suffering through the utilization of all local available facilities of different nature and pattern.

8. **DATTA, K.K., JONG, C.D. and SINGH, O.P. (2000)**

Reclaiming salt-affected land through drainage in Haryana, India:A financial analysis *Agricultural Water Management* 46 1: 55-71

The sustainability of irrigated agriculture in India is threatened by waterlogging, soil salinity and alkalinity. To reverse declining agricultural productivity, a combination of surface and subsurface drainage, supplemented by improved irrigation management, has been identified as the most appropriate strategy. But subsurface drainage for salinity control is costly. Therefore, its benefits in terms of sustained agricultural production must be thoroughly investigated to establish its technoeconomic feasibility. The present study attempts to do this by analysing the cost of installing subsurface drainage, the direct on-farm benefits of subsurface drainage, and the financial feasibility of subsurface drainage.



The site of the study selected for this study was Haryana State. The results show that, after the installation of drainage, land use intensified because a sizeable area of formerly fallow land was brought under cultivation. They also showed that the cropping pattern change in favour of more remunerative crops and that crop yields increased. These immediate gains from drainage are helping to increase land productivity, gain employment of the farmers and, hence, farm income. The financial and economic feasibility of drainage in waterlogged and saline areas looks favourable, provided that sufficient water is available for leaching and irrigation, and that a sustainable solution for the disposal of the low-quality drainage effluent is found. With regard to the latter, creating ponds to temporarily store drainage effluent is technically possible, while not threatening the financial feasibility of the investments in drainage.

9. DHAR, R.L., KRISHNAMURTHY, N.S. and PRAKASH, B.A. (2000)

Groundwater Investigations in Parts of Alwar District, Rajasthan. *Journal of Geological Society of India* 56 2:151-60

Geohydrological investigations, including deep resistivity, Schlumberger soundings were carried out to locate suitable drilling sites for groundwater exploitation near Ramgarh, Alwar district, Rajasthan. The area under study appears to be a synclinal valley and is covered by a thick pile of sediments comprising sand, silt, clay, gravel, pebble, *kankar* and scree underlain by rocks of Ajabgarh Group, which are exposed north-west of the area. The subsurface layer parameters obtained from the sounding interpretation have been presented in the form of fence diagrams and a geoelectric section. Characteristic resistivities of various litho-units were obtained by correlating the lithology of an existing tube well with the geoelectrical sounding data. The correlation indicated that there is very little resistivity contrast between water-bearing sandy layers and the *kankar* and clay beds. However, the *kankar* and clay beds are mostly confined to the top 20 m or so. Although occurrence of clay has not been reported in rocks of Ajabgarh Group except for thin lenses, the present investigations reveal a surprising low resistivity for the formation underlying the bedrock, which may be an indication of its saline and clayey nature. The possibility of an altered horizon in the bedrock comprising metasediment through lateral inflow of water cannot be ruled out.

10. DUTTA, D. and DAS, D.K. (2001)

Water Requirement of Some Crops Grown under Shallow Perched Water-Table at Indira Gandhi Canal Command, Western Rajasthan. *Journal of the Indian Society of Soil Science* 49 1:1-6

Reference crop evapotranspiration, water requirements and net irrigation requirements of kharif and rabi crops grown under shallow water-table in Lunkaransar area of Indira Gandhi Canal Command were estimated using Modified Penman and pan evaporation methods. Estimates of ET by both the methods were of similar magnitude the correlation coefficients being highly significant ( $r=0.87, 0.95$  and  $0.88$  during kharif, rabi and summer seasons, respectively). Estimates of water requirements by the two methods followed the order: pigeonpea (503 mm in each), pearl millet (488 and 491 mm).



groundnut (430 and 452 mm) for kharif and gram (239 and 260mm), wheat (213 and 227 mm), mustard (129 and 142 mm) for rabi crops. Phenophasic differences in ET of crops existed with peak values during flowering, pod development/grain filling stages of the crops. The ground water-table contribution (GWC) varied from about 79 to 98 mm in kharif crops and from 71 to 113 mm in rabi crops. When GWC was accounted for, the net irrigation requirements were reduced by 12.7 to 34.9 percent. The results demonstrated the potential use of simple pan evaporation method for estimating crop water requirements of canal command areas where detailed meteorological data are not available.

**11. GUPTA, S.C. (2000)**

Nitrate Problem in Water Resources of Western Rajasthan. *Current Agriculture* 24 1-2: 37-48

Occurrence of high nitrate in ground and surface waters is major water quality problem in western Rajasthan. Nearly 55 per cent ground water sources in the region contain nitrate more than 50 mg/L. In Barmer, Churu and Nagaur districts, vast stretches of ground water aquifers are polluted by high nitrate and its concentration above 250 mg/L is quite common. In urban areas, pollution of water sources by industrial, domestic and sewage wastes constantly add to nitrate build up both in surface and ground water. These waters are often used for drinking by local human and livestock population causing thereby potential danger to their health. Mass death of grazing animals and livestock due to intake of nitrate rich polluted waters, especially in summer period, is common in the area. Two such cases of animal mortality have been reported.

**12. JAIN, R.L., SURENDRA PRASAD and MATHUR, A.K. (2001)**

Note on the Present Stratigraphic Status of Khichan Conglomerate, Jodhpur District, Rajasthan. *Journal of The Geological Society of India* 58 6:543-44

Recent geological mapping has shown that Khichan Conglomerate marks the hiatus between the Nagaur Formation of Marwar Supergroup and the Permo-Carboniferous Badhaura Formation in Rajasthan.

**13. KAUL, R.N. (2000)**

Success and Sustainability of Desertification Control in the Aravalli Hills of Haryana: An Analysis. *Desertification Control Bulletin* 36:50-53

A project was initiated in 1990 to rehabilitate degraded common lands in the Aravalli hills of Haryana. It was completed in October 1999. An earlier article published in this Journal gives the project background, its design and the strategy adopted for rehabilitation of the degraded Aravalli Hills (Srivastava and Kaul, 1995). This article gives the project impact and an assessment of its future sustainability. The common lands of the Aravalli Hills, Haryana, are the main sources of fodder and firewood supply



supported a luxuriant growth of vegetation, the principal arboreal species being *Anogeissus pendula* which is valued both for fodder and firewood. The decline in the authority of local institutions over common resources and the exponential growth of both human and animal populations led to unregulated and exploitative use of vegetation, resulting in degradation of these common lands. The main objective of the project was environmental protection through restoration of green cover over village common lands, which are common property resources (CPRs). This was expected to enable the villagers to meet their fuelwood, fodder and small timber needs in an ecologically sustainable manner. The project undertook the difficult task of rehabilitation of these lands and restoration of their potential by involving local communities through the establishment of village forest committees (VFCs). Special efforts were made to create awareness among women, the principal users of common lands, about the project approach and the benefits that would accrue. Perceptibly, success has been achieved in bringing about the participation of people in regenerating very good vegetal cover on 38, 050 ha of land spread over extremely degraded hill slopes with only a thin veneer of soil.

14. KHAN, M.A. and SINGH, N. (2000)

Application of Remote Sensing Data in characterization and Mapping of Soil Resources For Watershed Planning in Arid Western Rajasthan *Photonirvachak* 28 2-3 : 93-113

Visual Interpretation of IRS-LISS-II (January 1995) FCC (1:50, 000 scale) of spectral bands 2, 3 and 4 was carried out for the identification and mapping of major physiographic units in an arid watershed of Jodhpur district (Rajasthan). Based on image characteristics and field traverses, seven major physiographic units identified are: (1) hills, (2) pediments, flat to undulating, (3) buried pediments, moderately deep to deep, coarse textured, (4) buried pediment, shallow to moderately deep and deep, medium to fine textured, saline, (5) older alluvial plains, deep and very deep, coarse textured, (6) younger alluvial plains, deep to very deep, very coarse textured and (7) dune complexes. Based on physiographic variation and soil or site characteristics such as texture, depth, slope, erosion and underneath substrata, 41 soil mapping units were identified and mapped. Final physiography, soil, slope, drainage and landuse maps were prepared on 1:50, 000 scale. Taxonomically, the soils of the watershed were classified as Para-Lithic Torriorthents, coarse-loamy, Lithic/Typic Haplocambids, fine-loamy, Lithic/Typic Haplosalids and Typic Torrifluvents and Typic Torripsammments. Land suitability for various mapping units in the watershed have been assessed on the basis of soil physico-chemical characteristics.

15. UMAMAHESWARI, L., KRISHNAMOORTHY, S., P.NASURUDEEN and KOLLI, R.K. (2001)

Pattern of droughts and survival strategies of farm households in a drought-prone district in Tamil Nadu. *Indian Journal of Agricultural Economics* 56 4 : 683-95



Droughts are a recurring feature (majority of the series have a cycle ranging from 2.0-4.4 years) in the study area warranting advanced contingent crop and employment planning. Satellite surveillance could be useful for timely and efficient monitoring of drought conditions. Soil moisture monitoring and watershed approach for management of drought-prone areas is another aspect for which research and development efforts have to be strengthened in future.

Farmers tried to compensate for their reduced income during drought through non-crop sources. Livestock was the major asset sold during the drought period due to difficulty in maintenance. Development of community grazing land in the villages will help to solve this problem. Gathering is another source of livelihood for small farms. Inter-face forestry with regulatory mechanism for cutting of trees by public at nominal charges is to be encouraged. This will also help in the supply of fodder at nominal charges to the farmers for livestock maintenance during drought.

Migratory income was another major income source particularly for small farmers and so off-farm activities like animal husbandry, sericulture, poultry and agro-based industries like fruit and vegetable processing, rope and mat making, etc., need to be encouraged.

The small farm households are greatly affected by drought. In this context, the Small Farmer's Agri-Business Consortiums have to be strengthened covering a number of activities and involvement of small farmers to provide better income stability.

**16. KUMAR, R., SINGH, R., SINGH, N.T., AHUJA, R.L. and GHABRU, S.K. (2001)**

Evaluation of Long-Term Management-Induced Changes in Sodic Soils of Semiarid India. *Arid Land Research and Management* 15 1: 89-96

Sodic soils of northwestern India (under common property rights) having three different types of management for 20 years (fencing, occasional cultivation, reclamation with gypsum) and an adjoining non-sodic soil, were compared for changes in selected soil physical and chemical properties. Fencing resulted in growth of perennial vegetation and the large biomass so produced led to self-reclamation of the surface horizon. All treatments resulted in considerable decrease in pH, EC, and ESP of the pedons. However, in the subsurface horizons, pH and ESP remained in the sodic range even after 20 years of reclamation with gypsum or due to accumulation of perennial vegetation biomass. In sodic soils under common property rights, where systematic reclamation with chemical amendments is not feasible, simple fencing or occasional cultivation on a long-term basis may slowly result in reclamation of such lands.

**17. MARATHE, R.A., MOHANTY, S. and SINGH, S. (2001)**

Meteorological Drought Analysis Based on Rainfall Data of Nagpur. *Journal of Soil and Water Conservation* 45 1-2: 1-5



Rainfall data from 1966 to 1998 were analysed to study the weekly, monthly, seasonal and yearly drought of Nagpur. The observed frequency of drought was maximum in 23rd week, and again in December and Post-monsoon season. During the 33 years period, 4 drought years were experienced. The severe most drought occurred in 1972, when total annual rainfall was 56.25% of the average annual rainfall.

18. **MEHTA, L. (2000)**

Drought Diagnosis :Dryland Blindness of Planners. *Economic and Political Weekly* 35 27: 2439-45

State-sponsored interventions in Kutch have not only failed to mitigate water scarcity but have exacerbated problems in some areas. This is largely due to the dryland blindness of planners who have applied solutions from the rest of Gujarat to Kutch instead of designing strategies suited to the region. What Kutch needs is rainwater harvesting, livestock development and better techniques of dryland agriculture.

19. **MOHARANA, P.C. and NEPAL SINGH (2001)**

Characterization of Degraded Landforms in Balotra-Pachpadra Area of Arid Western Rajasthan using Remote Sensing Technique. *Journal of the Indian Society of Soil Science* 49 1:154-63

Studies were carried out in 697.1 sq. km area in Balotra-Pachpadra region, Western Rajasthan, indicated that there were evidences of land degradation which had occurred due to environmental hazards caused by natural as well as human (biotic) interferences. The morphological characteristics of the landforms in this area indicate complex process-form interaction. In the north around Pachpadra, surface features indicate the long-term effect of natural hazards like wind and water erosion and salinity, but in the south near Balotra area, the degradation process is indicative of man's role in the form of wastewater disposal by textile industries. Such inter-play of both the factors has affected the resources like land, water and the soil. Based on the synoptic image (satellite data) and the ground truth, the degraded landforms identified are hills, pediments, alluvial plains, flood plains, saline depressions, buried stream courses and the river bed. Soil investigations comprising of their physical-chemical characteristics indicate the dominance of natural salinity and the prevalence of blown sand activity in the north, but in the south, the salinity/alkalinity situation has been aggravated by addition of effluent water in the land. Such situations have changed the quality of land in the region.

20. **PANDIAN, M.S. and DUTTA, S.K. (2000)**

Leucogranite Magmatism in Sewariya-Govindgarh Areas of Rajasthan and its Relevance to Tungsten Mineralisation. *Journal of Geological Society of India* 55: 289-95

In Sewariya-Alniawas-Govindgarh areas of central Rajasthan, the Delhi metasediments are intruded by an older, biotite granite (Sewariya granite) which is



equivalent to Erinpura granite occurring further south, and a younger, tourmaline leucogranite (Govindgarh granite) which is geochemically specialised. Sewariya granite hosts wolframite bearing quartz veins along its sheared contact with mica schist of Barotiya Group. Govindgarh granite occurs in the form of small intrusive bodies within rocks of Barotiya Group, essentially along a major ductile shear zone at the western margin of South Delhi fold belt. Our study reveals that leucogranite magmatism yielded tungsten mineralisation in Sewariya area.

21. PRATAP NARAIN, SAMRA, J.S., SINGH, R.K. and SINDHWAL, N.S. (2001)

Erosional Losses and USLE Parameters in Relation to Land Cover Management.  
*Journal of the Indian Society of Soil Science* 49 1:170-77

A field trial on runoff, soil loss and parameters of Universal Soil Loss Equation (USLE) in relation to land cover management was conducted (1993-98) at Central Soil and Water Conservation Research and Training Institute, Dehradun, on 1.86 m 13.5 m erosion plots at 8 per cent slope. These plots were gauged utilizing multislot divisor and cisterns to measure runoff and soil loss. Methodology for estimation of USLE-parameters are described. The average rainfall erosion index for Dehradun is 1179 and the soil erodibility factor (K) is 84 kg ha<sup>-1</sup> per unit of rainfall factor (R). *Chrysopogon fulvus* grass effectively reduced runoff and soil loss by providing excellent land cover particularly at onset of monsoon and throughout the growing period. Maize (0.55 lakh plants ha<sup>-1</sup>) with 4 t ha<sup>-1</sup> air-dry mulch also reduced runoff and soil loss effectively. The crop management factor 'C' for *Chrysopogon fulvus* was 0.04 and for maize having population of 0.55 lakh with 4 t ha<sup>-1</sup> mulch was 0.10. Maize with 1.1 and 1.6 lakh plants ha<sup>-1</sup> (50 of which was thinned and utilized as mulch after 30 days of sowing) reduced 'C' factor by 33 and 73 per cent, as compared to conventional maize with 0.55 lakh plants ha<sup>-1</sup> population exhibiting 0.41 value of C factor. Ground cover through mulching proved more effective than above ground canopy cover. The total land cover comprising of crop canopy and ground cover of 4 t ha<sup>-1</sup> mulch provided adequate conservation of soil exhibiting 0.1 value of 'C' factor. The doses of air-dry mulch can be reduced up to t ha<sup>-1</sup> when the plant population is increased to about 1 lakh plants ha<sup>-1</sup>.

22. RAGHAV, K.S. (2000)

Discovery of Foraminifera from Bilara Group, Jodhpur District, Rajasthan.  
*Journal of The Geological Society of India* 55: 395-97

Tertiary foraminifera belonging to Discorbis and Quinqueloculina were discovered by the author from the limestones of Bilara Group of Marwar Supergroup. These rocks were hitherto regarded as unfossiliferous and Neoproterozoic-Eocambrian in age. The present finding of foraminifera suggested that the formations were not older than lower Eocene, throwing new light on the age of the Marwar Super group.



23. **RAGHAV, K.S. (2000)**

On the Discovery of Middle Eocene Larger Foraminifera from Limestone Bed in Churu District, Rajasthan. *Journal of Geological Society of India* 55: 269-74

Definite Middle Eocene larger foraminifera has been found in the limestone at Sandwa, Bidasar area, Churu District in the Nagaur-Ganganagar basin, Rajasthan. Mammulites Cf. Obtus (Sowerby) 1840 with two forms, viz., A form (Dia. 2.8 mm) and B form (Dia. 9 mm) are observed. In the type area of Kachchh, N. Obtus had been assigned the age of Middle Eocene. This finding assigns the limestone bed to Jogira formation and it also extends the limits of the Eocene sea in Rajasthan by 80 km towards east.

24. **RAJESH. (2000)**

Drought, Debt and Poverty. *Economic and Political Weekly* 35 25: 2101-04

The culture of wasteful consumption of water has led to the current crisis in Rajasthan. Dependence on tube wells has grown over the years, and groundwater levels have fallen. Relief is inadequate and corruption eats into even this meagre help.

25. **RAMESH, P. (2000)**

Effect of drought on Nutrient Utilisation, Yield and Quality of Sugarcane (*Saccharum Officinarum*) Varieties. *Indian Journal of Agronomy* 45 2:401-06

An experiment was conducted during the main season (Jan-Dec) of 1996 and 1997 at Coimbatore to study the utilisation and uptake of nutrients in sugarcane (*Saccharum officinarum* L.) varieties, as well as on yield and quality, as influenced by drought during formative phase. Though drought treatments recorded higher concentration of plant nutrients, their uptake was significantly reduced as compared with that of the control. There was not much decrease in the percentage of nitrogen and potassium, whereas, it was evident in phosphorus at different growth phases of crop, being higher in drought treatments as compared with that of the control. There was significant reduction in total dry-matter production (TDMP), percentage of cane sugar (CCS), and cane and sugar yields in drought conditions as compared with the control. Among varieties, Co 6304 recorded higher TDMP, uptake of N and K and cane yield, whereas, Co 8208 recorded higher CCS percentage and sugar yield. Cane and sugar yields were significantly negatively correlated with decrease in percentage of phosphorus and positively correlated with that of potassium from tillering to grand growth (120-240 days) and from tillering to maturity (120-360 days) phases.

26. **RAO, A.S., SINGH, R.S., JOSHI, N.L. and RAMAKRISHNA, Y.S. (2000)**

Evapo-transpiration, water and radiation-utilization of clusterbean. (*Cyamopsis tetragonoloba*). *Indian Journal of Agricultural Sciences* 70: 149-53

The evapotranspiration rate of unstressed 'Maruguar' clusterbean (*Cyamopsis tetragonoloba* (L.) Taubert) in arid region at Jodhpur was 2.4-3.9 mm/day during early



growth, 6.3-9.3 mm/day at peak vegetative stage, 5.3-5.8 mm/day at flowering/pod formation stage and 1.2-4.2 mm/day at maturity stage. The crop coefficient (ratio of actual to potential evapotranspiration) was 0.42-0.58 at early growth stage, 0.62-1.17 at peak vegetative stage, 0.70-1.05 flowering and pod formation stages and declined to 0.43-0.60 at maturity. Irrigation enhanced seed yield of clusterbean by 123% at 50% rate and 180% at 100% rate of water application from that of rainfed crop. The water-use efficiency of the crop varied from 1.47 to 4.10 kg/ha/mm and the radiation use efficiency for unit dry matter production of intercepted photosynthetically active radiation was 0.57- 1.21 g/MJ under rainfed to 1.42-2.31 g//MJ under irrigated condition. Advection enhanced evapotranspiration of clusterbean by 50-78%.

27. RAO, M.M. and DASGUPTA, K. (2001)

The Government and People of Madhya Pradesh have joined hands in their fight against drought through various jan sahyog programmes. *Down to Earth* 9 16: 22-23

For the people of Mandsaur, Dewas and Dhar districts of Madhya Pradesh, drought has been a daily scourge that they learnt to live with. They would wait endlessly for water trains, lock barrels of water to prevent theft and protest sporadically against the scarcity. The recent drought, however, has made the government adopt a novel scheme in which it involved the victims themselves in conserving their lifeline. The scheme was simple. The district administration provided technical help and partly financed projects like construction or repair of talabs (ponds) and setting up of rooftop rainwater harvesting systems (RTRWHS). The people chipped in with cash and labour. Dewas had virtually declared war against water scarcity.

28. SAIFUDDIN and IQBALUDDIN. (2000)

Quaternary Signatures of Paleo-Humidity in Arid Zone, Rajasthan, India. *Journal of Arid Environments* 45 2: 151-58

The arid zone of Rajasthan has a humid past. The present communication records provide evidence of paleo-humidity from the Ajmer district in Rajasthan manifested as channel conglomerates and karst development in the marble rocks within the arid landscape, which suggests that a humid phase existed in the Luni Basin during the Quaternary period in Rajasthan. The present find of Quaternary signatures of paleo-humidity suggests that the humid phase in the Thar Desert extended beyond the Saraswati drainage basin up to the Luni basin, covering the entire Trans-Aravalli region.

29. SHARMA, A.N. (2001)

Major resource Management Problems in the Arid Zone of Rajasthan. *Current Science* 81 9:1156

Paper discusses major resource management problems in arid zone of Rajasthan caused due to tremendous pressure of constantly increasing human and livestock



population. IGNP is creating land degradation and water logging problems. Role of remote sensing in resource management has proved fruitful.

30. **SHARMA, K.D. (2000)**

Water Resource Development in Jamnagar District, Gujarat, India. *Annals of Arid Zone* 39 2: 145-50

Regression models for rainfall-runoff-drainage basin area relationship, based on past 30 years' observations, have been developed for Jamnagar district in arid Gujarat India. The runoff coefficient varies from 0.07 to 0.29 and the runoff efficiency decreases with the increasing area of drainage basin, since larger the basin, longer the flow path and longer the opportunity time for rainwater infiltration. The probability of a severe drought by 2020 varies from 19 to 35% in various talukas in the district. The risk of failure of water control structures by a storm having 100 years as a return period is 63%. The study is useful in predicting the peak flows, water yield, rainwater infiltration, sediment transport and channel stability in the arid regions.

31. **SHARMA, K.D., KUMAR, S. and GOUGH, L.P. (2001)**

Rehabilitation of Gypsum-Mined Lands in the Indian Desert. *Arid Land Research and Management* 15 1 :61-76

The economic importance of mining in the Indian Desert is second only to agriculture. Land disturbed by mining, however, has only recently been the focus of rehabilitation efforts. This research assesses the success of rehabilitation plans used to revegetate gypsum mine spoils within the environmental constraints of the north-west Indian hot-desert ecosystem. The rehabilitation plan first examined both mined and unmined areas and established assessments of existing vegetative cover and the quality of native soils and mine spoils. Tests were made on the effect of the use, and conservation of available water through rainwater harvesting, amendment application, plant establishment protocols, and the selection of appropriate germ plasm. Our results showed that the resulting vegetative cover was capable of perpetuating itself under natural conditions while concurrently meeting the needs of farmers. Although the mine spoils are deficient in organic matter and phosphorus, they possess adequate amounts of all other nutrients. Total boron concentrations ( $>5.0 \text{ mg kg}^{-1}$ ) in both the top soil and mine spoil indicated potentially phytotoxic conditions. Electrical conductance of mine spoil was 6-10 times higher than for topsoil with a near-neutral pH. Populations of spoil fungi, *Azotobacter*, and nitrifying bacteria was low. The soil moisture storage in rainwater harvesting plots increased by 8 over the control and 48 over the unmined area. As a result of rehabilitation efforts, mine spoils show a steady buildup in organic carbon, and P and K due to the decomposition of farm yard manure and the contribution of nitrogen fixation by the established leguminous plant species. The rehabilitation protocol used at site appeared to have been successful. Following revegetation of the area with a mixture of trees, shrubs, and grasses, native unplanted



species were established. Species diversity, measured in terms of species richness, increased after one year and then gradually declined over time; the decline was the result of the loss of annual species. The study not only develops methods of gypsum mine land rehabilitation but also helps in understanding processes of rehabilitation success in arid regions

**32. SINGH, B. and SINGH, G. (2000)**

Effect of Stand Age on Soil and Foliage Nutrient in Irrigated *D. Sissoo* Plantation in Arid Zone. *Journal of Tropical Forestry* 16 4: 38-45

The study was carried out in the irrigated plantation of *D. sissoo* with aim to provide the basis for studying turnover rate of nutrients through the plantation floor in Indira Gandhi Canal areas of Rajasthan. It was evaluated in randomly selected block plantation representing different classes of stand, viz., 4 years (Y4), 7 years (Y7), 9 years (Y9), 11 years (Y11), 19 years (Y19) and 30 years (Y30). Height and diameter at breast height (dbh) of the stand increased with stand age. In foliage, the concentration of various nutrients followed the order, NCaKPMg for macro- and FeZnMnCu for the micronutrients. The concentration of N and K decreased, whereas, P, Ca, Mg, Cu, Zn, Mn and Fe increased with stand ages with exception of older stand. Data on soil nutrients indicated that the soil under different age did not vary significantly in control plot. The increase in soil organic matter affected soil pH, and hence the availability of the nutrients. Available nitrogen ( $\text{NH}_4 + \text{NO}_3$ ) was the highest in Y9 and decreased in older stands. The level of P, K, Ca and Mg increased up to Y11 and decreased in older stands, whereas, Cu, Zn and Mn increased. The study suggested an increase in most of the nutrients, except the basic cations.

**33. SINGH, N. and KAR, A. (2001)**

Characteristics of Major Soils of Banni Mudflat in Arid Western India and Their Relationship with Topography. *Journal of Arid Environments* 48 4:509-20

Studies on the soil properties of the apparently flat-lying, but salt-affected Banni mudflat region of arid Kachchh in western India revealed the influence of subtle topographic variations on soil texture and nature and distribution of salts. Six master pedons were investigated to an average depth of 150 cm. The pedons on the upper surfaces showed an abundance of fine sand and a gradual impoverishment of silt and clay, as also lesser amounts of salts in the profiles. Pedons on the successively lower surfaces showed more silt and clay contents, as well as higher amounts of salts. The findings helped to identify the areas suitable for pasture development in this vast degraded rangeland and to suggest some management practices for improvement.

**34. SINGH, P., MERTIA, R.S. and SINGH, R.S. (2000)**

Thermal Time Investigations and Effect of Weather Variables on Development and Maturity of Date-berry in Thar Desert. *Current Agriculture* 24 1-2: 81-84



Heat units (thermal time) required to ripen the date-berry is directly related to time and temperature. The high climatic variability of Jaisalmer region influences growth and quality of date-berry. The other significant factor for success in cultivation is the atmospheric dryness during the period of fruit maturity. Thermal investigations showed that the lower mean temperature of May and June months delayed the ripening of date berry. The cyclonic rainfall in the month of May did not have any adverse effect on hard green (development) stage of date-berry, whereas heavy downpour with high relative humidity during July and August (dang maturity stage) caused severe fruit losses. The effect of distribution of rainfall and role of relative humidity during development and maturity stage of date-berry are also described.

35. **SIVASAMI, K.S. (2000)**

Drought and Rainfall Pattern, 1877-1999. *Economic and Political Weekly* 35: 1993-94

Rainfall data from 1875 to 1999 shows a cyclical pattern. Severe and widespread drought has followed years of good monsoons. An extrapolation of these observations is not valid for predictions. But considering that India has had good monsoons since 1999, it must plan for droughts now.

36. **SULOCHANAN, B. and KOTEESWARAN, M. (2000)**

Drought analysis for Ootacamund. *Madras Agricultural Journal* 87 10-12: 594-97

The daily rainfall data for the years 1967-96 (30 years) of Ootacamund station recorded by India Meteorological Department was collected from the Directorate of Statistics, Chennai. Drought analysis was done and the expected monthly, seasonal and annual rainfall at different probability levels were found out. The extent of normal, abnormal and drought years were 60.5 per cent, 9.4 per cent and 30 per cent of the total months in 30 years of study.

37. **TEWARI, V.P., SINGH, B. and KISHAN KUMAR, V.S. (2001)**

Volume Equations For *Eucalyptus camaldulensis* in Indira Gandhi National Park, Pariyojana. *Indian Forester* 127 12:1367-70

Volume equations presented in this article are based on the data collected from plantations of *Eucalyptus camaldulensis* situated at various locations along the IGNP corridor and covering different ages and densities. The equations are based on 91 felled trees. Different models were tried. The equation having the best fit on the basis of high  $R^2$  and minimum Furnival Index have been selected for volume predictions.

38. **TYAGI, B.K. and YADAV, S.P. (2001)**

Bionomics of malaria vectors in two physiographically different areas of the Epidemic-Prone Thar Desert, North-Western Rajasthan (India). *Journal of Arthropod Environments* 47 2: 161-72



Entomological and parasitological investigations were carried out on malaria vectors and disease prevalence in two sets of villages, the highly irrigated Indira Gandhi Nahar Pariyojana (IGNP) command-area villages (Madassar and Awai), and the truly desertic non-command (unirrigated) area villages (Kanasar and Khetusar), located in different ecological conditions in the Thar Desert, north-western Rajasthan (India). Malaria prevalence, as determined through sustained fever surveys, was higher in the IGNP villages with a slide positivity rate (32, marginally more than that of the unirrigated villages (25.5%), but with a high proportion of *Plasmodium falciparum* (76.6%) in the former villages as compared to the latter (16.6%). *Anopheles stephensi*, *A. culicifacies* and *A. subpictus* were amongst the eight anopheline species collected from all the four villages which were found positive for malarial parasites. *Anopheles stephensi* was the predominant species in the unirrigated villages (95%), although in the irrigated villages. *A. culicifacies* was also found. The major ecological changes associated with irrigation in the Thar Desert are understood to be playing an important role in accentuating the transmission of malaria by improving vector breeding conditions and survival in an otherwise hostile arid environment.

39. YADAV, O.P., BABU, T.B., SHRIVASTAVA, P.K., PANDE, A.K. and GUPTA, K.R. (2001)

Note on the first Report of Quaternary Sedimentation and its Significance in West Jahajpur Basin, Bhilwara District, Rajasthan. *Journal of The Geological Society of India*. 58 6:539-42

Quaternary sequences of mud/silt with carbonaceous matter and coaly layers, sandstone and conglomerate is found in the structural depressions near Jahajpur basin in Rajasthan. Uranium is also found in these sediments, which may have been derived from the basement of Berach Granite and phyllites of Jahajpur Group.

## CROP IMPROVEMENT

40. BOHRA, N.K. (2001)

Non-traditional cash crops of Rajasthan. *Agroforestry Today* 12 1:11-12

Although the third largest in area, Rajasthan, in the northwestern part of India, is one of the country's less-developed states. The harsh climatic conditions of the region are characterized by low and erratic rainfall, high temperatures and shifting sand dunes. Farm families grow traditional crops like bajra (*millet*) and til (*simsim*), but if the rains fail and the crops do not develop, they are helpless as they have no food security. Some non-traditional crops like jojoba, senna and tumba could provide not only economic profits but also vegetational belts on the wastelands.



41. BURMAN, U., GARG, B.K. and KATHJU, S. (2001)

Genotypic variations in growth, mineral composition, photosynthesis and metabolism of Indian mustard under sodicity stress. *Indian Journal of Physiology*. 64, (N.S.) : 374-380

Responses of five genotypes (Varuna, CZM-2, Pusa Bold, PCR-7 and BIO-902) Indian mustard (*Brassica juncea* L.) grown under three levels of sodium adsorption ratio (SAR) of irrigation water (0.7, 15.0 and 30.0) were studied on plant growth, mineral composition, net photosynthetic rates and leaf metabolism at the flowering stage. Increasing SAR levels progressively reduced plant growth in terms of height, leaf area, shoot dry matter and seed yield in all the genotypes. However, cvs. Pusa Bold and BIO-902 displayed higher sodicity tolerance whereas genotypes CZM-2 and Varuna were most sensitive with 25% reduction in seed yield at SAR level of 30. Genotype PCR-7 displayed an intermediate tolerance to sodicity. Concentrations of nitrogen and potassium in shoot declined while that of sodium increased with increasing SAR. Moreover sensitive genotypes CZM-2 and Varuna had higher concentration of Na and consequently lower K:Na ratio at all levels of SAR as compared to tolerant genotype Pusa Bold and BIO-902. Increasing SAR, significantly decreased net photosynthetic rate and increased leaf diffusive resistance in all cultivars but genotypes BIO-902 and Pusa Bold experienced less alterations. Sodicity-induced changes in the levels of total chlorophyll, soluble protein, free amino acids, starch, total soluble sugars and nitrate reductase activity were consistently less in genotypes BIO-902 and Pusa Bold compared to CZM-2 and Varuna. However, the response of cv. PCR-7 was variable and inconsistent. These differential genotypic responses have been discussed in the light of the present knowledge.

42. GAJJA, B.L. (2000)

Impact of Technological Change in Major Crops of Arid Zone of Rajasthan. *Current Agriculture* 24 1-2: 57-64

An attempt has been made to document the impact of technological change on major crops of arid zone of Rajasthan. For this purpose, secondary data pertaining to area and Production were collected from 1960-61 to 1996-97 for various crops. The results revealed that the agricultural production of various crops increased, except kharif pulses. The contribution of increase in crop production is due to expansion of area and interaction of area and productivity. The interaction indicated that due to increase in yield, area has increased at much faster rate. The growth rate during the second period of the study and the productivity of all crops increased, except rice and groundnut. The impact of technological changes was only in irrigated crops like rice, wheat, groundnut, rape and mustard, chilli and cotton. There is no structural break through technological change in rainfed crops. The compound growth rates of area productivity and productivity of bajra crop is very low which required special attention because bajra is a staple food of rural population.



43. GUPTA, G.K. (2001)

Efficacy of metalaxyl formulations in controlling downy mildew of pearl millet and their residues under arid climate. *Indian Phytopathology*. 54 2 : 210-214

A field experiment was conducted to evaluate the various formulations of metalaxyl for the control of downy mildew and its residue in pearl millet under two different rainy seasons in arid climate of Rajasthan. Seed treatment with Apron (4.2 g a.i. kg<sup>-1</sup> seed) + two Ridonil MZ 72 WP sprays (2.88 kg a.i. ha<sup>-1</sup>) at 20 and 40 days after sowing (d.a.s.), seed treatment with Apron (2.1 g a.i. kg<sup>-1</sup> seed) + two sprays of Ridomil MZ 72 WP (1.44 kg a.i. ha<sup>-1</sup>) and Apron seed treatment (4.2 g a.i. kg<sup>-1</sup> seed) + one Ridonil MZ 72 WP spray (2.88 kg a.i. ha<sup>-1</sup>) were found effective in controlling the disease, where disease incidences were 0.9, 3.2 and 3.5%, respectively as compared to check (49.4%) at 70 d.a.s. Apron (4.2 g a.i. kg<sup>-1</sup> seed) was superior than @ 2.1 g a.i. kg<sup>-1</sup> seed. spray of Ridomil MZ 72 WP alone was more effective than seed treatment with Apron. Efficacy of metalazyl was found higher in the season less conducive to downy mildew development. Harvest time residues of metalaxyl and of mancozeb were either nil or in trace in soil, grain and straw of pearl millet.

44. JAIN, N.K., POONIA, B.L. and SINGH, R.P. (2001)

Response of Pearl Millet (*Pennisetum glaucum*) to zinc fertilization in flood prone eastern plains zone of Rajasthan. *Indian Journal of Agricultural Science* 71 5: 339-40

A field experiment conducted during the rainy season of 1998-99 to find out the response of pearl millet (*Pennisetum glaucum* (L.) R.Br. emend. Stuntz) to zinc fertilization at Navgaon. Soil application of 15, 30 and 45 kg ZnSO<sub>4</sub> /ha resulted in significant increase in yield attributes, seed and stover yields. Application of 30 and 45 kg ZnSO<sub>4</sub> /ha in soil significantly increased the plant height over the control, but difference between 15, 30 and 45 kg ZnSO<sub>4</sub> /ha was at par. One or two foliar sprays of ZnSO<sub>4</sub> (0.5) and soil application of 15 kg ZnSO<sub>4</sub> /ha were at par in increasing seed yield of pearl millet. The economic optimum dose of ZnSO<sub>4</sub> was found to be 27.35 kg with optimum yield of 1 935.69 kg/ha.

45. JAI PRAKASH, KASERA, P.K. and CHAWAN, D.D. (2000)

A Report on Polyembryony in *Commiphora wightii* from Thar Desert, India. *Current Science* 78 10:1185-87

Deals with a new report on seed polyembryony in *Commiphora wightii* from the Thar Desert in India. Out of two black and white varieties of seeds, black variety has been found viable. Discusses three categories, viz; having bisexual and male flowers, having female flowers with staminodes and plants with only male flowers. Reported 36.25 percent germination in black seed under nursery conditions.



46. JAT, M.L. and GAUTAM, R.C. (2001)

Productivity and water use of rainfed pearl millet (*Pennisetum glaucum*) influenced by summer ploughing and *in-situ* moisture-conservation practices under semi-arid conditions of north-west India. *Indian Journal of Agronomy* 46: 266-72

A 2-year field experiment was conducted during the rainy season of 1997-1998 to study the effect of 3 summer ploughing (no summer ploughing, summer ploughing and summer ploughing + FYM + insecticide + herbicide) and 6 moisture conservation practices (uniform row sowing, paired row planting, ridge-furrow, straw mulch, kaolin and straw mulch + kaolin) on the productivity and water-use efficiency of rainfed pearl millet (*Pennisetum glaucum* (L.) R.Br. emend. Stuntz). Summer ploughing + FYM + insecticide + herbicide gave highest grain yield (22.70 and 25.09 q/ha in 1997 and 1998 respectively), which was at par with summer ploughing alone but significantly superior to no summer ploughing. Marked variation in water-use efficiency, consumptive use and moisture-extraction pattern by pearl millet was observed during summer ploughing during both the years. Straw mulch + kaolin recorded highest grain yield (21.78 and 26.97 q/ha), consumptive use (266.33 and 298.72 mm) and water-use efficiency (9.46 and 9.03 kg grain/ha/mm) in 1997 and 1998, respectively, and the lowest being by uniform row sowing. Straw mulch + kaolin and straw mulch alone were at par with each other but uniform row sowing. Straw mulch + kaolin and straw mulch were at par with each other but were superior to all other treatments in terms of consumptive use and water-use efficiency.

47. MANGA, V.K. (2000)

CZ-IC 923- a new pearl millet variety for north-western States of India. *Indian Farming* 50 1: 11-13.

The CZ-IC 923 has been developed by random matings of 21 S1's selected from crosses of ICMV 82132 x ICMV 87901, out of many S1's tested at many locations in north-western India and selected on the basis of their performance. The variety was further improved by mass selection for uniformity. The variety was tested in All India Co-ordinated trials during 1992-94. During trials, this variety recorded grain yield ranging from 2001 to 2463 kg/ha<sup>-1</sup> it out yielded the national standard checks ICMV RCB-IC 9 and ICTP 8203 by 6.15 to 23.42%. Based on its performance this variety was released by the Central Sub-Committee on variety Release and Notification meeting held in October 1996 for north-western states, both for rainfed and irrigated conditions.

48. MANGA, V.K. (2001)

Phenotypic Stability for grain yield in open-pollinated varieties of pearl millet. *Indian Journal of Agricultural Science* 71 11: 719-20

Phenotypic stability, for grain yield, of 6 open-pollinated varieties of pearl millet (*Pennisetum glaucum* (L.) R.Br. emend. Stuntz) developed at the Central Arid Region Research Station, Jodhpur.



Research Institute, Jodhpur and 3 varieties recommended for the area was studied by planting these during 1995-96 and 1997-98. Genotype x environment interaction was significant. A large portion of the interaction was accounted for by the linear component. 'CZP 9505', 'CZP 9501', 'RAJ 171', 'ICMV 155' and 'CZ-IC 315' were stable and their responses to changes in environments could be predicted. 'CZP 9505' was the most desired genotype, as it had the highest grain yield, a slope of unity and mean square due to deviation from regression was 0.

49. MITRA, J. (2001)

Genetics and genetic improvement of drought resistance in crop plants. *Current Science* 80 6: 758-63

Drought limits the agricultural production by preventing the crop plants from expressing their full genetic potential. Three mechanisms, namely drought escape, drought avoidance and drought tolerance are involved in drought resistance. Various morphological, physiological and biochemical characters confer drought resistance. Morphological and physiological characters show different types of inheritance pattern (monogenic and polygenic) and gene action (additive and non-additive), whereas, the genes responsible for biosynthesis of different compatible solutes have been identified and cloned from plants, yeast, mouse and human. Different breeding approaches for drought resistance have emerged, with their merits and demerits. Efficient screening techniques are pre-requisite for success in selecting desirable genotype through any breeding programme. Genetic engineering has been successfully applied to identify and transfer different genes responsible for biosynthesis of different metabolites such as proline, trehalose and polyamines from different organisms to crop plants through a targeted approach. Barley *hva1* gene responsible for late embryogenesis abundant (LEA) proteins has been transferred through a shotgun approach. Lack of multidisciplinary approach and precise screening techniques, incomplete knowledge about genetic basis of drought resistance, negative correlation of drought resistance traits with productivity and unavailability of appropriate genes to obtain transgenic plants are the main constraints for genetic improvement of drought resistance. Exploration of wide genetic variation of relevant characters, consideration of more genes at a time to transfer through breeding or genetic engineering method, application of antisense RNA technique, assessment of polypeptides induced under drought and multidisciplinary approach should be included in the future research programmes for drought resistance.

50. MURTY, K.N. (2000)

Changes in Taste and Demand Pattern for Cereals: Implication for Food Security in Semi-Arid Tropical India. *Agricultural Economics Research Review* 13 1: 25-51

The purpose of this study is to decompose the observed changes in quantity demanded of cereals into its components-due to changes in income, price, consumer taste and preferences and residual, including other omitted variables. Demand elasticities for cereals with respect to income, prices and taste are estimated for each of ten semi-arid tropical states and 'all India' using pooled time series of cross-sections data,



published by the National Sample Survey organization for the period 1972-94. The empirical results show wide variation in demand elasticities across states, income groups and rural/urban sectors. The consumer taste and preferences, captured through time trend variable, is significant and negative for most of the individual states as well as 'all India'. This has more than offset the positive effects of income and other variables in the model. This explains partly the decline in cereal demand over time despite rise in per capita income and fall in relative prices of cereals. The magnitudes of the effects are smaller in urban areas than rural with taste change becoming positive in some cases. Coarse cereals exhibit negative demand responses with respect to income, own-price and taste variables. Interestingly, in few cases-Andhra Pradesh, Karnataka, Madhya Pradesh and Maharashtra- consumer tastes seem to have changed in favour of coarse cereal consumption. However, the positive taste effect is nullified by negative income effect with the net result of decline in cereal demand. The test of nested hypotheses confirm the need for inclusion of taste, income group dummies and their interaction variables in the model. The decline in cereal consumption, despite fall in its relative price, among lower income groups that are still poor, raises serious food security concerns. Aggregate macro analysis is likely to blur the true picture for specific disadvantaged population groups across time and space in India.

**51. PRAJAPATI, N.D. (2001)**

The Legume for Desert. *Agriculture Today* April: 5-7

Senna's ability to withstand harsh conditions owing to its hardy nature and numerous medicinal applications in Unani, Ayurvedic and Allopathic Medicines, make it a sound proposition for farming in areas under water stress where it ensures nitrogen fixing in the soil while posting substantial gains to the farmers.

**52. SAINI, S.P. (2001)**

Application of targeted yield concept for efficient and economic fertilizer use in wheat in arid zone of Punjab. *Annals of Arid Zone* 40 1 : 49-52

The validity of the fertilizer adjustment equations was tested by conducting yield target trials with wheat var. PWB 343 for two years at farmers' fields in Bhathinda district. The results indicated that actual yields were 46.1, 51.2, 55.7 and 60.4 q ha<sup>-1</sup> with target of 45, 50, 55 and 60 q ha<sup>-1</sup> and when the fertilizers were applied on the basis of soil tests. Thus, the utility of this approach was established for recommending soil-test based fertilizers for wheat crop to the farmers. Every kg of applied nutrient produced 26.1, 25.4, 24.4, 21.3 kg of wheat grain for target of 45, 50, 55, 60 q ha<sup>-1</sup> and (22.4 and 23.2) and (19.4 and 19.8) for STRD and FP, respectively. It clearly pointed out higher fertilizer-use efficiency when fertilizer was applied on the basis of targeted yield concept as compared to farmers' practices (FP). Moreover target yield approach was found to be superior up to 55 q ha<sup>-1</sup> target over FP and soil-test-based fertilizer recommended dose approach.



53. SHAKIR ALL, PRASAD, S.N., SINGH, K.D. and SAMRA, J.S. (2001)

Evaluation of some parameters of usle for various cropping management practices in south-eastern Rajasthan. *Indian Journal of Soil Conservation*. 29 3 : 235-240

Standard runoff plot data from 1956 to 1998 wer used to evaluate the various parameters of universal soil loss equation (USLE) like rainfall erosivity (R), soil erodibility (K), crop management factor (C) and erosion control practices (P) by standard methods. It was observed that on an average 87% of erosive rainfall was received during cropping season only. the average seasonal and annual 'R' factor was found to be 341.62 and 404.49, respectively. Cropping season and annual soil erodiability factor 'K' of clay soil under climatic condition of south-eastern, Rajasthan was found 0.1145 and 0.1029 t ha<sup>-1</sup> unit<sup>-1</sup> of EI<sub>30</sub> (R), respectively. Cover and management factor 'C' for row crops, legumes, and intercropping of row crops with legumes ranged from 0.5236 to 0.6165; 0.3511 to 0.5115 and 0.3084 to 0.3718, respectively. The 'C' value of grasses ranged from 0.0072 to 0.1349, whereas natural cover comprising *Dichanthium annulatum* and *Cynodon dactylon* recorded value of 0.1512. The order of erosion control practive in protection of soil from erosion was compartmental bunding > dead furrow > contouring.

54. SINGH, B., PATIDAR, M. and SINGH, R. (2000)

Constraints in Fertilizer Use in Arid Zone of Western Rajasthan. *Current Agriculture* 24 1-2: 93-95

A study was conducted in Five villages of Luni Panchayat Samiti of Jodhpur district. Data collected from 100 farmers indicated that majority of farmers did not apply fertilizers in kharif crops. However, about 14.0 per cent farmers applied fertilizer in pearl millet, 11 percent in sesame, and 3 to 9 percent in pulses. Among the fertilizer users, maximum farmers applied nitrogenous fertilizers as compared to phosphatic fertilizer and both were applied lesser than recommended dose. It was also observed hat farmers applying fertilizers in pearlmillet, sesame and pulses crops were maximum rom large category, followed by small farmers. The main constraints perceived by the armers were lack of irrigation facilities, high cost of fertilizers and lack of knowledge.

5. SINGH, K.N. and SHARMA, D.P. (2001)

Response of Wheat to Nitrogen and Potassium in Saline Soils. *Experimental Agriculture* 37 3:417-27

A field experiment to evaluate the effect of N, K and time of K application on the growth, yield and chemical composition of wheat (*Triticum aestivum*) grown in saline soil with subsurface drainage, was conducted at the Central Soil Salinity Research Institute, Karnal Research Farm, Sampla, during the winter seasons of 1992-93 to 1994-95. The treatments consisted of three levels each of N (0, 120 and 150 kg ha<sup>-1</sup>) and K (0, 50 and 5 kg ha<sup>-1</sup>) with the K applied at two different times (full basal and half basal + half top dressed 30 d after sowing). The growth characteristics (plant height, number of tillers and dry matter weight m<sup>-2</sup> recorded at 60 d after sowing) and yield-attributing



parameters (number of productive tillers and length of spikes) increased significantly with increasing N levels up to 150 kg ha<sup>-1</sup> and K levels up to 50 kg ha<sup>-1</sup>. Similar responses of N and K were also observed on grain and straw yields of wheat. Time of application had no significant effect on growth and yields. The N concentration in grain and straw increased significantly with the application of 120 kg N ha<sup>-1</sup> over control. Application of K had no significant effect on the concentration of N in grain and straw. The K concentration in grain and straw increased significantly due to the application of 50 kg K ha<sup>-1</sup> but it was unaffected by the time of K application. Application of N increased the efficiency of utilization of applied N. A trend towards declining salinity of the soil profile due to leaching through the subsurface drainage system was observed from 1992-93 to 1994-95. For three consecutive years, the status of available N and surface soil (0-30 cm depth) increased due to their respective applications. This field study indicates that 150 kg N and 50 kg K ha<sup>-1</sup> should be applied under canal-irrigated conditions to get the sustainable and optimum yield of wheat in saline soils.

56. SINGH, R. and PRASAD, S.N. (2001)

Lysimetric measurements of evapotranspiration and water-use-efficiency of groundnut and chickpea in south-eastern Rajasthan. *Indian Journal of Soil Conservation*. 29 3 : 241-244

Lysimeter studies were conducted on groundnut (*Arachis hypogaea* L.) and chickpea (*Cicer arietinum* L.) during 1989-90 to 1991-92 at Kota to work out the evapotranspiration (ET) and water-use efficiency (WUE) of these crops by irrigating 50% available soil moisture depletion. Groundnut crop recorded 518 mm ET, and produced 2455 kg ha<sup>-1</sup> pod and 7098 kg ha<sup>-1</sup> total drymatter with water-use efficiency 4.77 kg ha<sup>-1</sup> mm<sup>-1</sup> for pod and 13.70 kg ha<sup>-1</sup> mm<sup>-1</sup> for total drymatter. The average weekly ET varied from <3.0 mm day<sup>-1</sup> during initial stage of crop to >6.0 mm day<sup>-1</sup> at pod and grain development stage. The peak ET was 7.59 mm day<sup>-1</sup> during 9 weeks after sowing (WAS) when leaf area index (LAI) was more than 6.0. In case of chickpea, the ET was observed 418 mm and crop yielded 4175 kg ha<sup>-1</sup> grain and 9513 kg ha<sup>-1</sup> total drymatter with WUE of 10.10 kg ha<sup>-1</sup> mm<sup>-1</sup> for grain and 22.85 kg ha<sup>-1</sup> mm<sup>-1</sup> for total drymatter. The average weekly ET was <2.0 mm day<sup>-1</sup> at the initial stage and achieved a peak value 5.84 mm day<sup>-1</sup> when maximum LAI was 6.60 during 13 WAS. The ET of groundnut had significant positive correlation with pan evaporation ( $r=+0.82$ ), sunshine hours ( $r=+0.5$ ) and mean maximum temperature ( $r=+0.62$ ). In chickpea, the ET was significantly positively correlated with pan evaporation ( $r=+0.70$ ) and sunshine hours ( $r=+0.62$ ) and non-significant positively correlated with mean maximum temperature ( $r=+0.40$ ).

57. YADAV, O.P., ELTZIEN-ATTUNDE, E., BIDINGER, F.R. and MAHALAKSHMI, V. (2000)

Heterosis in Landrace-Based Topcross Hybrids of Pearl Millet Across Arid Environments. *Euphytica* 112: 285-95

This study quantified the magnitude of heterosis in pearl millet topcross hybrids produced by crossing 16 diverse landraces and three high yielding non-pollinating



varieties on two homozygous male-sterile lines. Hybrids and pollinators were grown in 12 years X location combinations in India that were grouped into three zones. Genetic components of variance quantifying the differences among these hybrids were estimated. The hybrids showed a conspicuous heterosis for grain yield, earliness and biomass yield but not for straw yield. The level and direction of heterosis for time to flowering depended strongly on the earliness of the male-sterile line. In the terminal drought stress zone hybrids made on the early maturing male-sterile line 843 A had the highest level of heterosis for grain yield. This was partly due to escape from terminal stress. In the other two zones the heterosis for grain yield was on average 30%. Heterosis for biomass yield and biomass yield per day was on average also positive in all three zones. For all traits, except time to flowering and biomass yield per day, pollinator effects were the only significant source of variation. Differences between hybrids were mostly caused by additive genetic effects. Significant amount of heterosis observed in landrace-based topcross hybrids for grain yield and other productivity-related traits suggested that substantial improvement in pearl millet productivity in and environments can be obtained by topcrossing locally adapted landraces on suitable male-sterile lines.

**58. YADAV, O.P. and WELTZIEN, R.E. (2000)**

Differential Response of Landrace-based Populations and High Yielding Varieties of Pearl Millet in Contrasting Environments. *Annals of Arid Zone* 39 1: 39-45

Five populations of pearl millet (*Pennisetum glaucum*), having varying degrees of landrace germplasm from Rajasthan in their parentage, were evaluated across a range of environments differing greatly in their productivity levels. The populations showed different response patterns to environments with different productivity potentials. Comparison of landrace-based populations with high yielding control cultivars showed that the productivity of landrace populations for both grain and stover yields was clearly superior in low-yielding environments. In contrast, their productivity was often inferior to that of released high yielding varieties in more productive environments. Two populations, Early Rajasthan Population (ERajPop) and Early High Tillering Population (EHiTIP), flowered earlier than the control, ICTP 8203. The landrace-derived populations had significantly higher tillering potential than the elite controls and also had more stable flowering time and tillering than high yielding controls in stress environments. Based on these results, the potential use of these landrace-based populations in future pearl millet breeding programmes is discussed. In addition, the breeding history of all populations has been briefly documented to give an overview of selection procedures followed in developing them.

**59. YADAV, R.S. and YADAV, O.P. (2001)**

The Performance of Cultivars of Pearl Millet and Clusterbean Under Sole Cropping and Intercropping Systems in Arid Zone Conditions in India. *Experimental Agriculture* 37 : 231-40



Intercropping of pearl millet with clusterbean is a common practice in the arid zone of northwestern India. Field experiments were conducted for two years to examine the performance of two contrasting genotypes of each of these crops grown both as sole crops and as intercrops using all possible genotypic combinations of the pearl millet with the clusterbean. The seed yields of both crops were always lower in intercropping than in sole cropping, though the degree of reduction in the seed yield of each intercrop component was influenced greatly by the genotype of its companion crop. The seed yield of both clusterbean genotypes was reduced more when intercropped with the tall and late-maturing pearl millet, MH 179, than with the medium-statured and early-maturing HHB 67. On the other hand, the two clusterbean cultivars had similar effects on intercropped pearl millet. As a result, the highest land equivalent ratios were obtained with intercrops containing pearl millet HHB 67 rather than MH 179, while the genotype of clusterbean had little overall effect on LER. The results obtained are discussed in the context of developing cultivars for intercropping.

## CROP PRODUCTION

60. **BASAVARAJU, T.B., POHRIS, H. and GURURAJA RAO, M.R. (2001)**

Pattern on Light Interception and yield of Finger Millet in Agroforestry systems under Semi Arid Conditions. *Indian Journal of Forestry* 24 1:32-37

Pattern of light interception and yield of finger millet was studied in sixth year agroforestry trial during the rainy season of 1996 in the semiarid region of Karnataka. The trial included 9 combinations of three fruit tree species (Jack, Mango and Tamarind) and three spacing levels (8 x 8 m, 12 x 8 m and 16 x 8 m), and one control (no trees). Finger millet crop was grown in the inter-row spaces of trees as well as in the control. The trees planted in agroforestry system reduced the availability of light to finger millet crop due to interception of light by them. Jack intercepted more light compared to tamarind and mango due to its wider and denser canopy. During the noon hours (11.00-13.00 hours) of the day, jack intercepted light up to 4 m from the tree, while mango and tamarind intercepted light only up to 2 m from the tree. The yield of finger millet was reduced in agroforestry system compared to control. The reduction was more with jack and at closer spacing of 8 x 8 m. The significant reduction in yield was observed up to 2 m from trees in all the tree species. In jack, appreciable reduction in yield was also observed at 2-4 m from trees. The reduction in yield of finger, millet was attributed mainly to the competition offered by trees for light as indicated by low light interception by finger millet in agroforestry system.

61. **BHARI, N.R., SIAG, R.K. and MANN, P.S. (2000)**

Response of Indian Mustard (*Brassica juncea*) to nitrogen and phosphorus on Torripsamments of north-western Rajasthan. *Indian Journal of Agronomy* 45 4:746-51



A field experiment was conducted during winter (rabi) season of 1993-94, 1994-95 and 1995-96 to study the effect of nitrogen (30, 60, 90 and 120 kg N/ha) and phosphorus on Indian mustard (*Brassica juncea* (L.) Czernj. and Cosson). Application of N up to 120 kg/ha resulted in significant increase in plant height, primary and secondary branches and siliquae/plant except for seeds/silique and 1,000-seed weight upto 90kg N/ha. Phosphorus application upto 45 kg P<sub>2</sub>O<sub>5</sub>/ha resulted in significant increase in plant height, secondary branches and siliquae/plant. With the increased supply of P up to 45 kg P<sub>2</sub>O<sub>5</sub>/ha, the N need of the crop was raised up to 120 kg/ha for significantly higher seed yield (17.05 q/ha). Irrespective of P application, the seed yield increased up to the application of 120 kg N/ha.

**62. BHUSHAN, L.S. and OM PRAKASH (2001)**

Performance of Wheat (*Triticum aestivum* L.) Succeeding Different Kharif Crops in Semi-Arid Climate-An Approach Towards Reducing Chemical Fertiliser Dependence. *Indian Journal of Soil Conservation* 29 1:33-38

A field experiment was conducted on light textured soils at Research Centre, Chhalesar, Agra during 1982-83 to 1986-87 to study the effect of preceding rainy season crops, viz., pearl millet (*Pennisetum glaucum* L.) and clusterbean (*Cyamopsis tetragonoloba* L. Taub) on the performance of succeeding wheat. Grain yield of wheat was raised from 5.3 q ha<sup>-1</sup> under pearl millet-wheat cropping to 11.1 q ha<sup>-1</sup> under fallow-wheat and 12.8 q ha<sup>-1</sup> under clusterbean-wheat cropping system. The yield increased significantly with increasing levels of nitrogen upto 120 kg N ha<sup>-1</sup> under pearl millet-wheat and fallow-wheat sequences, whereas the response was only upto 80 kg, N ha<sup>-1</sup> under clusterbean-wheat. Clusterbean-wheat sequence was more profitable than pearl millet-wheat. The highest net returns were obtained under clusterbean-wheat sequence at 80 kg N ha<sup>-1</sup>, which was 3 and 5 times higher than pearl millet-wheat and fallow-wheat, respectively. Wheat succeeding pearl millet or fallowing was uneconomical without N application.

**63. DESAI, S.A. and SINGH, R.D. (2001)**

Combining ability studies for some morphophysiological and biochemical traits related to drought tolerance in maize (*Zea mays* L.) *Indian Journal of Genetic and Plant Breeding* 61 1:34-36

The material from a 7 x 7 half diallel cross involving relatively drought tolerant inbreds of maize was raised under rainfed condition. Analysis of variance revealed significant differences for gca and sca effects for ten characters studied. Among the parents, lb 1073, lb 1143 and lb 1155 were found to have negative gca effect for days to 50 per cent tasseling, day to 50 per cent silking and anthesis-silking interval. On the other hand, for plant height, ear height and grain yield per plot, they had positive gca effects. The crosses, viz., lb 1073 x lb 1143 and lb 1073 x lb 1155 were found to have negative sca effects for days to 50 per cent tasseling, days to 50 per cent silking and anthesis-silking interval. These crosses also exhibited positive sca for plant height, ear height, number of leaves per plant and grain yield per plot.



64. KATHJU, S., BURMAN, U. and GARG, B.K. (2001)

Influence of nitrogen fertilization on water relations, carbohydrate and nitrogen metabolism of diverse pearl millet genotypes under arid conditions. *Journal of Agricultural Science* 137 3:307-318

Effects of nitrogen fertilization (80 kg N/ha) were studied on pearl millet (*Pennisetum glaucum*) genotypes including hybrids (MH-179 and HHB-67), composites (CZ-IC-923 and CZP-9604) and land races (Barmer population and CZ-IC-718) grown for 2 consecutive years (1997 and 1998) under rainfed conditions of the Indian arid zone. Nitrogen application significantly increased the grain and stover yields in all the genotypes, particularly in the hybrids during both the years but more so in 1997 characterized by late onset of rains followed by adequate precipitation (299.5 mm). Notwithstanding lower plant water potential and leaf relative water content, N fertilized plants displayed significantly higher photosynthetic rates, leaf area, levels of total chlorophyll, starch, reducing sugars, soluble protein and free amino acids and nitrate reductase activity as compared with unfertilized control plants in all the genotypes during both the years. Genotypes HHB-67 and Barmer population during 1997 and HHB-67 and CZ-IC-718 during 1998 provided significantly higher grain yields than other genotypes, whereas, dry matter production was highest in cv, Barmer population during both the years. These genotypes generally maintained higher rates of photosynthesis, more efficient carbohydrate metabolism and higher nitrate reductase activity leading to better performance. Relatively higher yields of land races than composites and comparable with those of hybrids indicated adaptation of these cultivars to arid conditions and maintenance of several characteristics for their superior performance which could be further augmented by N application. Fertility induced improvement of metabolic efficiency, coupled with higher photosynthesis and nitrate reductase activity for efficient N utilization seem to be the control mechanisms for enhanced growth and yield of diverse pearl millet genotypes under limited water conditions.

65. KUMAR, D. (2001)

CAZRI Moth-1 Mothbean A new variety of arid and semi-arid areas. *Indian Farming* 51 6:11-15

CAZRI Moth-1 mothbean showed increase in grain yield 10.51, grain protein 30.91, whereas decreased in disease infection viz. yellow mosaic virus 30, macrophomina blight 28.9 and dry root rot 12 when compared with Jawala and Maru Moth-1 mothbean. The average grain yield of CAZRI Moth-1 mothbean is 510 kg/ha while fodder yield is 1800 kg/ha.

66. MAHLA, M.K., AMETA, O.P., JOSHI, A. and DADEECH, L.N. (2001)

Effect of seasons on grain infestation and biochemical composition of stored wheat in western Rajasthan. *Annals of Arid Zone* 40 1: 61-64



Studies conducted during 1997-99 on the seasonal effect on grain infestation and biochemical composition of grains revealed that the total infestation of grains due to *Rhizopertha dominica* (Fab.), *Trogoderma granarium* Everts, *Sitotroga cerealella* (Oliver), *Tribolium castaneum* (Herbst) and *Sitophilus oryzae* Linn. was lowest (6.36%) during June-July with a mean protein and alcoholic acidity of 11.72 and 0.083%, respectively. The grain infestation increased to 21.17% during September-October and reduced protein content of the grain to 8.23% and increased the alcoholic acidity to 0.097%. The infestation declined to 12.61% in January-February and caused slight increase in the protein (9.00%), but did not influence alcoholic acidity of the grains.

67. NAINU, T.C.M., RAJU, N. and NARAYANAN, A. (2001)

Screening of Drought Tolerance in Greengram (*Vigna radiata* L. Wilczek) Genotypes Under Receding Soil Moisture. *Indian Journal of Plant Physiology* 6 2:197-01

An experiment was conducted to screen ten greengram genotypes for drought tolerance under depleting soil moisture conditions during post rainy season. Relative water content of leaves and leaf area plant<sup>-1</sup> decreases in all the genotypes under drought stress situations, whereas, leaf proline content increased with drought stress. Seed yield decreased drastically in all the genotypes as the crop was subjected to progressive drought stress under receding soil moisture situation. Among the genotypes studied, K 851, Pusa 9072 and LGG-407 performed well under drought stress conditions by maintaining leaf area, leaf relative water content and high proline, resulting less reduction in yield.

68. PARODA, R.S. and KUMAR, P. (2000)

Food Production and Demand in South Asia. *Agricultural Economics Research Review* 13 1: 1-24

This paper provides information for the countries in South Asia region on the current situation and trends in food production, food consumption pattern and nutritional status of the household, projects the household and domestic demand for food grains, livestock, fisheries and horticultural products between the years 2000 and 2030, and fixes yield and production targets to maintain the self-reliance of different countries, and suggests the strategies for enhancing food production. The analysis reveals that public investment in infrastructure, research and extension during the Green Revolution period, have significantly helped to expand food production and diversified the consumers food basket. Food demand challenges ahead are formidable considering the non-availability of favourable factors of past growth, declining factor productivity in major cropping systems and rapidly shrinking resource base. It however appears that vast agricultural production potential still remains highly under-realized. The paper suggests the production enhancing strategies.



69. PATIL, S.L. and SHEELAVANTAR, M.N. (2000)

Yield and Yield Components of Rabi Sorghum (*Sorghum bicolor*) as influenced by *in situ* moisture conservation practices and integrated nutrient management in the vertisols of semi-arid tropics of India. *Indian Journal of Agronomy* 45 1: 132-37

A field experiment was conducted during winter (rabi) seasons of 1994-95 and 1995-96 to study the effect of *in situ* moisture-conservation practices, organic sources of nitrogen levels on yield and yield components of sorghum (*Sorghum bicolor* (L.) Moench) in the vertisols of Bijapur. The formation of compartmental bunds and ridges and furrows improved the yield components significantly over flat bed due to increased availability of moisture and nutrients. Application of subabul @ 2.5 t/ha proved beneficial in increasing the yield and yield components over farmyard manure (FYM) @ 2.5 t/ha and vermicompost @ 1.0 t/ha. Application of nitrogen up to 50 kg increased yield, water-use efficiency (WUE) and yield components.

70. PATIL, S.L. and SHEELAVANTAR, M.N. (2001)

Effect of *in-situ* moisture conservation practices and integrated nutrient management on nutrient availability and grain yield of rabi sorghum (*Sorghum bicolor*) in the Vertisols of Semi-Arid Tropics of South India. *Indian Journal of Agricultural Sciences* 71 4: 229-33

A study was conducted during 1994-96 at Bijapur on the effect of *in-situ* moisture conservation practices and integrated use of organic and inorganic sources of nutrients on crop yield and soil properties. Compartmental bunding and ridges and furrows increased the grain yield by 22.8 and 25.6%, respectively, mainly owing to reduction in runoff, soil loss and increased availability of moisture and nutrients, viz., N, P and K. Higher availability of nutrients in the top soil (0-15 cm depth) compared to sub soil (15-30 cm depth) was due to application of nutrients and higher rate of mineralisation. Among different sources of organics, application of white popinac (*Leucaena leucocephala* Lam.) proved superior over farmyard manure and vermicompost due to high moisture conservation and faster rate of mineralisation and higher nutrient availability. Increase in N dose up to 50 Kg/ha increased the availability of nutrients and their uptake resulted in improved crop growth and grain yield over 25 kg/ha and control.

71. PRASAD, A., SINGH, K.D. and PRASAD, S.N. (2001)

Sorghum + Pigeonpea (1:1) intercropping with *Leucaena* under rainfed conditions in South-east Rajasthan in Agroforestry system. *Indian Farming* 51 6:29-30

Sorghum + pigeonpea intercropping 1:1 showed highest yield of *Leucaena* for fodder (95 kg/tree), fuelwood (160.83 tonnes/ha), and leaf litter (44.2 tonnes/ha) when compared with intercropping of sorghum, blackgram, and castor alone. Sorghum + pigeonpea intercropping also fetched maximum net income of Rs 71, 462 when compared with intercropping of sorghum, blackgram, greengram and castor.



2. **RAI, S.K. and DE, P. (2000)**

Agricultural droughts: Role of Crop Growth Modelling. Meeting Reports. *Current Science* 79 2: 152

The prime objective of the 3rd SERC school on agricultural droughts was to discuss the nature of droughts, and assessment and management of droughts through crop growth models in association with Geographical Information System (GIS) and satellite imageries. Jodhpur being a desert area was aptly suitable for the venue. Thirty-nine participants from different backgrounds in agriculture sciences, mathematics and agrometeorology participated in this course.

3. **RANE, J. and NAGARAJAN, S. (2001)**

Evaluation of Ear:Stem Weight Ratio as a Criterion for Selection of Drought-Tolerant Wheat (*Triticum aestivum*) Genotypes. *Indian Journal of Agricultural Sciences* 71 8: 505-509

An experiment was conducted during 1998-99 to evaluate ear: stem weight ratio as selection criterion of drought-tolerant genotypes of wheat (*Triticum aestivum* L. emend. Fiori Paol.), by subjecting genotypes susceptible and tolerant to moisture stress, under natural water stress or potassium iodide-induced senescence of leaves and stem. The ear: stem ratio had significant correlation with grain yield, harvest index, single grain weight and grain-growth rate. Tillers had perceptible influence on association between the ratio and yield components. Path analysis, however, revealed that the correlation between the ratio and other traits was the indirect effect of grain weight. Ear: stem ratio was not as efficient as harvest index in differentiating susceptible and tolerant genotypes.

74. **SAHA, D.K., PUROHIT, M.L. and BHANDARI, C.S. (2000)**

Impact of Sprinkler Irrigation on Socio-Economic Conditions and Environment in Eastern Part of Thar Desert. *Annals of Arid Zone* 39 1: 73-79

A case study in three arid villages of Sikar district in northwest Rajasthan revealed a transformation in the adoption of sprinkler irrigation, where the marginal and small farmers had owned more than 60% sprinklers. Joint ownership with agnatic kin was dominant over the individual ownership. The rate of diffusion varied among the villages due to availability of irrigation facilities. In one of the villages, sprinkler was introduced in the early seventies. Sprinkler irrigation has not only increased the area under irrigation, but has also put undulating land under cultivation. The micro-climatic conditions are changing gradually with the plantation of trees. The labour demand has drastically come down at the ratio of 3:1 compared to that under flood irrigation. Also, there is 30 to 35% water saving. Five factors were extracted from factor analysis, which accounted for 60.5% of the total variability. Factor 1, accounting for 15.1% of variability, recorded high loading on subsidy and bank loan. The study, therefore, underscores the importance of economic factors in the adoption of sprinkler system of irrigation besides other social factors.



Herbicidal Weed Control of Water Hyacinth Under Semi-Arid Conditions  
*Pestology* 24 2:69-71

The pot study conducted of CCS Haryana Agricultural University, Haryana herbicidal control of water hyacinth revealed that spraying with two liters/ha of 2, 4-D amine followed by second spray of one litre/ha of 2, 4-D amine after four weeks spray was found effective than a single spray of 4 liters/ha of amine formulation D. Therefore, repeated spray practice should be followed to control water hyacinth under semi-arid conditions.

## 76. SHARMA, N.K., SAMRA, J.S. and SINGH, H.P. (2001)

Influence of Boundary Plantation of Poplar (*Populus deltoides* M.) on Soil Moisture and Water Use Efficiency of Wheat. *Agricultural Water Management* 51 85

Study was undertaken to assess the water use, moisture extraction and water use efficiency (WUE) of irrigated wheat, when grown in association with boundary plantation of poplar, at different distances (0-3, 3-6, 6-9, 9-12, 12-15 and 15 m (control) from poplar (*Populus deltoides* M.) tree line. Presence of 3-Year old poplar plantation at the boundary of wheat field caused 7.5 higher water use than control (plots having no effect of tree line) up to 3 m distance from tree line which further intensified up to 6 m distance with 4-year old plantation. Similarly, maximum moisture extraction, both laterally and vertically, observed near the tree line. Contrary to this, WUE of wheat was reduced by 4.6 between 0 and 3 m distance from tree line with 3-year old plantation, decline intensified further to 18.6 with 4-year old plantation. However, wheat was benefited by boundary plantation of trees between 3 and 15 m distance from the base of the tree line which resulted in increased WUE of the wheat crop up to 9 m.

## 77. SINGH, K.V. and BANSAL, S.K. (2001)

Susceptibility of *Culex quinquefasciatus*, the vector of lymphatic filariasis, to conventional and newer insecticides in different parts of Rajasthan. *Annals of Entomological Society of India* 40 1 : 79-84

Studies on the current insecticide susceptibility status of *Culex quinquefasciatus* against few conventional insecticides, i.e., DDT and Dieldrin, and more potent ones, malathion, fenitrothion, propoxur and permethrin, were carried out in three desert districts (Barmer, Jodhpur and Pali) and three non-desert districts (Ajmer, Kota and Udaipur) in Rajasthan. The results of the investigations revealed that this vector species was no longer susceptible to any of the tested insecticides. In desert districts, the species exhibited resistance to DDT, dieldrin and malathion (mortalities <80%) and intermediate resistance to fenitrothion, propoxur and permethrin (mortalities 80-98%). However, in non-desert districts, the species, besides resistance to DDT, dieldrin and malathion, also



also developed resistance to propxur (mortalities <80%), but it exhibited intermediate resistance to fenitrothion and permethrin (mortalities 80-98%).

78. SINGH, R., PRASAD, S.N., PRAKASH, C. and CHAUHAN, V. (2001)

Evapotranspiration and Water-Use-Efficiency of Soybean and Mustard Under Lysimeter in South Eastern Rajasthan. *Indian Journal of Soil Conservation* 29 1:22-25

A study was conducted during 1986-87 to 1988-89 in weighing type lysimeter to work out evapotranspiration (ET) and water-use-efficiency (WUE) of soybean (*Glycine max* (L.) Merr.) and mustard (*Brassica juncea* (L.) Czernj Cosson) by irrigating at 50 percent and 75 per cent depletion of available soil moisture, respectively. The results showed that soybean recorded 662 mm ET with grain yield of 4180 kg ha<sup>-1</sup> within a crop period of 108 days. The water-use-efficiency was worked out to be 63 kg ha<sup>-1</sup> cm<sup>-1</sup> for grain and 113 kg ha<sup>-1</sup> cm<sup>-1</sup> for total drymatter yield. ET of mustard was worked out as 430 mm with oilseeds yield of 2680 kg ha<sup>-1</sup>, and WUE of 62 kg ha<sup>-1</sup> cm<sup>-1</sup> for grain and 111 kg ha<sup>-1</sup> cm<sup>-1</sup> for total drymatter production within a crop period of 121 days. The average ET rate was 6.12 mm day<sup>-1</sup> in soybean and 3.55 mm day<sup>-1</sup> in mustard. Leaf area index (LAI) increased slowly upto 3 weeks of crop period but increased sharply thereafter. The maximum LAI was observed 5.33 after 76 days of sowing in soybean and 5.03 after 67 days in mustard, and thereafter it declined sharply. ET of soybean had significant positive correlation with pan evaporation ( $r=+0.76$ ), sunshine hours ( $r=+0.75$ ), mean maximum temperature ( $r=+0.69$ ) and significant negative correlation with relative humidity ( $r=-0.65$ ). In case of mustard, ET and significant positive correlation with pan evaporation ( $r=+0.73$ ) and sunshine hours ( $r=+0.58$ ).

79. SINGH, R.S., RAO, A.S., JOSHI, N.L. and RAMAKRISHNA, Y.S. (2000)

Evapotranspiration Rates and Water Utilization of Moth bean under two Soil Moisture Conditions. *Annals of Arid Zone* 39 1: 21-28

Moth bean (*Vigna aconitifolia* (Jacq.) Marechal) was grown under rainfed and 100% potential evapotranspiration (PET) irrigation (unstressed) conditions to quantify the influence of moisture availability on evapotranspiration (ET) rate, and water and heat use efficiencies. The experiment was carried out in gravimetric lysimeters, installed at Central Arid Zone Research Institute, Jodhpur, during 1991 and 1992. The evapotranspiration (ET) rate from 100% PET (unstressed) crop was maximum during 7th week after sowing, and lowest during crop emergence stage. The maximum evapotranspiration rate coincided with peak pod formation stage in the crop. Water use efficiency of the crop was 2.3 to 3.5 and 2.2 to 2.4 kg ha<sup>-1</sup> mm<sup>-1</sup> for unstressed and rainfed crop, respectively. At cardinal temperatures of 80 °C (base temperature below which moth bean development ceases), 330 °C (optimal temperature for development) and 450 °C (maximum temperature at and above which no development takes place), the crop required 1351 to 1569 °Cd growing degree days (thermal time) to reach physiological maturity. Linear relationship was developed between thermal time and leaf tip appearance. The leaf tip appearance on the main shoot of moth bean in relation to the thermal time was linear under both moisture conditions, requiring about 52 to 580 °Cd



leaf<sup>1</sup>. However, leaf tip appearance on primary branch was slightly faster and required 49 to 530 Cd for each new leaf. Appearance of first primary branch was earlier (at about 300 Cd after emergence) under the unstressed condition as compared to the rainfed condition under the potential ET (at 3000 Cd). Hence, it may be concluded that despite low water requirements, the crop growth is considerably influenced by the moisture available during crop growing period in the region.

80. SINHA ROY, S. (2001)

A new approach to the analysis of transverse river valley profiles and its implications for morphotectonics : A case study in Rajasthan. *Currents Science* 71: 106-12

Study of river profiles provides significant information on both hydrodynamic factors and geomorphic features of drainage basins. Longitudinal river profiles have been extensively studied and different parameters have been proposed by various authors for these profiles, but transverse river valley profiles (TRPs) have not received similar attention. A new approach to the TRP analysis has been proposed here, which identifies several TRP parameters that are easily quantifiable. These quantifiable parameters are useful for inter-TRP and as well as inter-drainage basin comparison. These are also useful to derive drainage basin attributes such as valley symmetry and the state of valley erosion, identify and correlate geomorphic features such as planation surfaces, and importantly, to draw morphotectonic inferences. The procedure has been successfully tested in a case study of the Banas drainage basin, Rajasthan.

81. SINSINWAR, B.S. (2000)

Input Management for Sustaining Mustard (*Brassica juncea*) Production Under Late-Sown Semi-Arid Situations of Rajasthan. *Indian Journal of Agronomy* 45: 367-70

A field experiment was conducted during 1993-94 to 1995-96 to study the effect of different agronomic inputs for taking good sustainable yield of mustard (*Brassica juncea* (L.) Czernj. and Cosson) under late-sown conditions. Maximum seed yield of mustard was recorded in all the years where all the four major agronomic inputs, viz., thinning, fertilizer, irrigation and plant protection were used as per recommendations. Considering the single factor, irrigation proved to be the most critical input in this semi-arid region, when there was no winter rains and rainfall during the season was low or normal. The reduction in the yield under no irrigation was up to 38% followed by fertilizer which contributed up to 28% yield. During the year when rainfall was more than normal, that too up to October and was accompanied with winter rains, fertilizer contributed to the yield up to 38% and proved the most critical. In its absence, reduction in the mustard yield was up to 38%. This was followed by plant-protection measures, as during the years of sufficient rainfall in rainy season with winter rains, the infestation of diseases and pests was much more, causing great reduction in yield. Thus, during the years of scanty rainfall, for taking good yield of mustard, irrigation and fertilizer are the most critical inputs in this semi-arid tract, whereas during the years



sufficient rainfall, fertilizer and plant-protection measures are the most critical inputs for taking good sustainable production of mustard.

82 TRIPATHI, K.P. (2001)

Improving resilience of resources for sustainable crop production in the arid zone of Rajasthan. *Indian Farming* 50 11: 19-21

The a number of revolutions in agriculture, we are in a dilemma whether to reomaticise the traditional practices observed in the past and feel nostalgic about it, or to glamorise the present day agriculture based on modern techniques. It is now obvious that modern techniques like fertilization, chemical application, heavy mechanization of farm and over-exploitation of resources have led to fragility, environmental pollution, soil loss, diminishing productivity potential and vulnerability to climatic and edaphic stresses. These problems are further encouraged in arid ecosystem due to low (150-500 mm) rainfall and its erratic nature, poor binding ability of soil particles, high wind velocity (30-40 km/hr), high evapotranspiration demand (1500-2000 mm) and poor vegetation cover. So, we are left with no option but to emphasize on the sustainable farming approaches.

83. YADAV, O.P. and BHATNAGAR, S.K. (2001)

Evaluation of Indices for Identification of Pearl Millet Cultivars Adapted to Stress and Non-Stress Conditions. *Field Crops Research* 70 3: 201-208

Pearl millet (*Pennisetum glaucum*) is cultivated across a wide range of environments ranging from extremely stressful to favourable. The objective of this research was to compare methods to identify productive cultivars for stress and non-stress conditions. Thirty pearl millet cultivars were evaluated at 22 locations that were grouped as stress, non-stress, or intermediate environments. Five selection indices, viz., arithmetic mean (AM), geometric mean (GM), AM (standard units), stress susceptibility index (S) and drought response index (DRI) were calculated for each genotype to determine correlation between selection indices and yield under stress (Ys), non-stress (Yns), and average conditions (Yav). Both cultivars and locations were significant sources of variation. Phenology of cultivars had different influence on yielding ability in contrasting environments. While earliness was advantageous for stress conditions, cultivars with longer duration tended to yield more under non-stress conditions. Ys was only moderately determined by Yns. Both AM and GM were suitable indices for selection of cultivars that would perform well across stress, non-stress, and intermediate environments. Stress susceptibility index (S) was negatively correlated with Ys ( $r = -0.62^{**}$ ) but should only be used as a selection criterion in combination with yield under stress (Ys) to identify cultivars adapted to stress environments. DRI was positively correlated with Ys but had no association with Yns. Results indicated that DRI might be useful for identifying cultivars with high performance under stress particularly when days to flower differ considerably among test entries.



84. YADAV, O.P., WELTZIEN, R. E., MAHALAKSHMI, V. and BIDINGER, F. (2000)  
Combining ability of Pearl Millet Landraces Originating From Arid Areas of Rajasthan. *Indian Journal of Genetics & Plant Breeding* 60 1: 45-53

The combining ability of sixteen landraces of pearl millet (*Pennisetum glaucum* L. Br.) originating from the arid areas of western Rajasthan was determined for four traits by evaluating their crosses in 12 environments grouped into three zones. Three varieties (as pollinator controls) and their hybrids were also included. The results indicated that general combining ability (GCA) effects were more important in the genetic control of grain yield and stover yield, while both GCA and specific combining ability (SCA) effects were important for time to flower and 100-seed weight. The GCA effects were influenced by environments. IP 3333 was identified as best general combiner for grain yield for north dry (ND) zone, IP 3228 for north wet (NW) zone and IP 3188 for terminal stress (TS) zone. GCA effects of most pollinators varied substantially across three production zones. However, a few good combiners across all environments were identified. None of the pollinators exhibited desirable GCA effects for all traits simultaneously. The landraces established their superiority as pollinators over high yielding controls under dry conditions of north India. GCA estimates of pollinators with respect to grain yield for ND zone could not be predicted from evaluation of crosses in NW and TS zones.

## FRUITS AND VEGETABLES

85. BHATNAGAR, P., ATUL CHANDRA. and GUPTA, P.K. (2000)  
Studies on Nutrient Status of Fruit Orchards Soils in Bikaner District of Rajasthan. *Current Agriculture* 24 1-2: 119-22

Studies were conducted on the mineral nutrition status of fruit orchards located in Bikaner district. All the orchard soils were found to be poor in organic matter. Electrical conductivity was found to be in normal range and soil pH was in the high range from 7.94 to 9.11. All the orchard soils were found low in available nitrogen content. Besides the deficiencies of N, P, K, S, Cu and Zn were observed. The soils were found medium to high in exchangeable Ca and Mg. There was wide variation found in the calcium carbonate percentage at different soil depths in orchards.

86. DHAKA, R.S., LAL, G., FAGERIA, M.S. and AGRAWAL, M. (2000)  
Studies on Zero Energy Cool Chamber for Storage of Ber (*Zizyphus mauritiana* Lamk.) Fruits under Semi-arid Conditions. *Annals of Arid Zone* 39 4:439-41

Ber fruits harvested at color-turning stage were stored under two storage conditions, i.e., in cool chamber and at ambient condition. Four year study revealed that storage in sealed polythene bags in cool chamber reduced PLW and spoilage percentage and recorded better quality attributes.



**JALIKOP, S.H. and KUMAR, P.SAMPATH (2000)**

New fruit varieties for arid regions....Pomegranate "Ruby" and Custard-Apple "Arka Sahan". *Indian Horticulture* 45 2: 19-20

'Ruby', a multiple pomegranate hybrid, has been bred mainly for red arils and few seeds, while 'Arka Sahan', an interspecific custard-apple hybrid, is identified for its very sweet pulp, less number of seeds and slow-ripening fruits. Both the new varieties emerging from IIHR, Bangalore, deserve a place to be grown in arid regions.

**MEGHWAL, P.R. (2000)**

Vesicular Arbuscular Mycorrhiza (VAM) : Roles and Scope in Horticulture. *Intensive Agriculture* 38 3-4:16-17

Vesicular Arbuscular Mycorrhiza (VAM) forms symbiotic association with plant roots and play important roles in nutrient recycling in the ecosystem through increased solubility of phosphorus. A variety of horticultural crops have been reported to benefit from mycorrhiza association which includes vegetables crops and spices, tropical plantation crops, subtropical and temperate fruit crops and certain floricultural crops. The main benefits from mycorrhizal association have been reduced phosphorus requirement, enhanced seedling growth, resistance to stresses and increased productivity.

**9. PRASAD, R.N. (2000)**

Varietal Evaluation of Pomegranate under Arid Conditions. *Annals of Arid Zone* 39 4:427-30

Among the nine cultivars of pomegranate evaluated, cv. Jodhpur Red, P-23 and Basin Seedless were more vigorous than other cultivars. Jalore Seedless showed its superiority with respect to fruit size, juice content, softness of seeds and other characters. The cracking percentage of fruits was maximum (63.4) in cv. Jodhpur Red and minimum in cv. Jalore seedless (21.2%)

**10. RATHORE, D.S. (2001)**

In Arid, Hilly and Tribal Areas . . . . . Overcoming malnutrition through non-traditional fruits. *Indian Horticulture* 45 4: 8-12

The presence of various nutrients is essential in human diet for healthy and active life. Alarming situation of malnutrition is existing in the country particularly in arid, hilly and tribal areas. Fruits are considered as a protective food being rich in vitamins and minerals. Non-traditional fruits which generally grow in arid, hilly and tribal areas can provide a solution to the problem of malnutrition. These fruits are easier to cultivate, hardy in nature and rich in nutrients. The potential non-traditional fruits for hot arid region are aonla, bael, wild ber, karonda ker, lasora, mulberry, phalsa and datepalm; for cold arid region are chilgoza, India hazel, wild apricot and seabuckthorn; for humid high and midhills are kaiphal, Himalayan yellow raspberry, wild fig, wild



pomegranate, sand pear and pummelo; and for tribals of other region are aonla, carambola, chironji, custard-apple, jack fruit, jamun, karonda, kokum, pum, tamarind and wood apple. The production of non-traditional fruits can be increased by cultivating them in wasteland and adopting in agroforestry management systems. research support is required for evolving superior varieties, genetic conservation, development of production technology and postharvest management, emphasizes Rathore, a leading horticulturist.

91. YADAV, R.S. (2001)

Integrated weed management in transplanted chilli under irrigated conditions in arid zone. *Annals of Arid Zone* 40 1 : 53-56

An investigation was carried out to evaluate effect of integrated method of weed control on weeds and their effect on chilli (*Capsicum annum* L.) yield during 1994 and 1995-96. Among the weed control treatments, oxyflourfen at 0.2 kg ha<sup>-1</sup> supplement with two hoeings at 30 and 60 days after transplanting (DAT) significantly reduced the dry weight of grassy as well as board-leaved weeds compared to oxyflourfen at 0.3 kg ha<sup>-1</sup> alone or supplement with one hoeing at 30 DAT. Oxyflourfen (0.2 to 0.3 kg ha<sup>-1</sup>) or pendimethalin (1.0 kg ha<sup>-1</sup>) when integrated with one or two weedings produced significantly higher dry chilli yield compared to herbicide alone (oxyflourfen at 0.3 kg ha<sup>-1</sup>). Highest benefit: cost ratio was also obtained in oxyflourfen at 0.2 kg ha<sup>-1</sup> supplement with two hoeings at 30 and 60 DAT.

## FORAGE PRODUCTION

92. DUTTA, B.K. and SHARMA, S.K. (2000)

Crude Protein Variations in Woody and Forage Grass Species in Arid Habitats of Rajasthan. *Annals of Arid Zone* 39 4:419-25

Selection of top-feed and grass species in establishment of silvi-pastoral system plays an important role in maintaining quality and sustainability of the system. In an integrated vegetation survey, 30 woody species and 20 grass species were collected from variable habitats falling in eight arid districts of Rajasthan. Plant samples of some individual species analyzed for nitrogen had large variation in nutritional status from one habitat to another. Among top-feed species, *Acacia nilotica*, *A. senegal*, *Capparis decidua*, *Lycium barbarum*, *Prosopis cineraria* and in grass species, *Cenchrus ciliaris* and *biflorus* had maximum crude protein value in variety of soils, i.e., loam, loamy sand, loamy fine sand and fine sand.

93. MEENA, L.R., MANN, J.S. and MEHTA, R.S. (2001)

Grassland improvement in semi-arid tropics of North India. *Indian Farming* 51 9:15-18



The forage productivity of the grassland could be increased by 4.5-fold and crude protein yield by about 9-fold with increased forage availability for 9-10 months through silviculture against open natural grassland with productivity of 1.0 tonne/ha and availability for 3-4 months.

94. **TRIPATHI, M.K., MISHRA, A.S., MISHRA, A.K. and KARIM, S.A. (2001)**

Soil estimates (pH, N and OM), biomass yield and chemical composition of vegetation of community range land in semi-arid region of Rajasthan. *Indian Journal of Animal Sciences* 71 3: 285-86

Biomass yield, quality of vegetation and soil estimates, affecting the pasture growth of semi-arid community rangeland, were studied. The nutritive value of grazing and was sufficient to meet the requirement of animals.

95. **YADAVA, N.D. and BENIWAL, R.K. (2000)**

Effect of Nitrogen on Productivity of Grasses in Sole and Intercropping System in Arid Zone Under Rainfed Condition. *Indian Journal of Agronomy* 45 1: 82-85

An experiment conducted during 1995 and 1996 on sandy soils in rainfed condition revealed that *Cenchrus ciliaris* L. gave highest dry-matter yield (50.67 q/ha) at 40 kg N/ha with 50 cm x 50 cm spacing in sole cropping, which was at par with grass planted at 100 cm x 50 cm spacing at same level of N. The response of *Lasiurus indicus* to different rates of N application was not significant (1995) due to low and ill-distribution of rainfall. The highest dry forage yield (32.30 q/ha) of *L. indicus* was recorded at 50 cm x 50 cm spacing and was significantly higher over than that obtained at 100 cm x 50 cm spacing during 1995 and 1996 at same level of N. The lowest dry-forage yield was recorded where no nitrogen was applied at all the spacings.

## FOREST AND ECONOMIC PLANTS

96. **ARYA, R. and TRIPATHI, Y.C. (2000)**

Content and Quality Traits of Gum from *Acacia nilotica* Grown at Jodhpur. *Indian Drugs* 37 7: 332-34

*Acacia nilotica* (Babul), a moderate-sized tree found throughout the drier parts of India is well known for its commercially valued products, viz., timber, tannin and gums. Babul gum, though is not the true gum arabic, can be used as a substitute of gum arabic in the manufacture of confectionery, cosmetic, pharmaceutical and various industrial products. Despite considerable industrial value and market demand, no systematic work has been done on production enhancement, collection and processing and location specific variation in gum quality. The paper presents an account of the work conducted on determination of correct developmental stage for gum tapping, yield improvement through selective pruning of trees at various stages and qualitative evaluation of gum.



97. BURMAN, U., BHORA, M.D., HARSH, L.N. and TIWARI, J.C. (2001)

Water Relation and Growth of *Simmondsia chinensis* and *Prosopis juliflora* Seedlings at Nursery Stage. *Indian Forester* 127 3:351-57

Leaf water relation and growth of *Simmondsia chinensis* was compared with *Prosopis juliflora*, a plant which had long ago achieved status of a 'weed' and replacement. Continuous monitoring of survival, shoot water potential, transpiration, leaf turgescence and dry matter accumulation at weekly intervals in seedlings attained the 'transplantable' growth revealed the superiority of *S.chinensis*. Coupled with high economic value, *S.chinensis* emerges out to be potential alternative to *P.juliflora* in Indian arid tracts, especially where limited irrigation is possible during reproductive phase.

98. DAGAR, J.C., SINGH, G. and SINGH, N.T. (2001)

Evaluation of Forest and Fruit Trees Used for Rehabilitation of Semiarid and Sodic Soils in India. *Arid Land Research and Management* 15 2:115-33

In India about, 3.58 million ha are alkali soils. These soils are characterized by high pH, low organic carbon contents, excessive exchangeable sodium, low fertility, low infiltration rate, and the presence of indurated  $\text{CaCO}_3$  in the profile. These properties make the soils unsuitable for most vegetation. To find suitable forest and fruit tree species for these areas, long-term experiments were conducted on highly alkali soils (pH > 10). Thirty forest tree species, 15 strains of *Prosopis*, and 10 fruit tree species were planted at the Saraswati Range Forest site in the semiarid region of Haryana in India to identify suitable and cheap technology for forest tree establishment. Two methods of planting were used: (1) deep augers piercing the kankar pan, and (2) shallow augers piercing the kankar pan. After seven years of planting, only 13 out of 30 species survived and of the surviving species only *Prosopis juliflora*, *Tamarix articulata*, and *Acacia nilotica* were found suitable for such soils. *Eucalyptus tereticornis* showed good survival but height but no meaningful biomass production was observed. *Dalbergia sissoo*, *Pithecellobium dulce*, *Terminalia arjuna*, *Kigelia pinnata*, *Parkinsonia aculeata*, and *Cassia rostrata* showed higher than 70% survival but could not attain economically suitable biomass. Out of 15 strains of *Prosopis* after six years of growth *P.juliflora* was the superior species in terms of growth and biomass production. Among the fruit tree species two methods of planting were tested using 5 and 10 kg of gypsum in each auger hole and 20 kg of gypsum in each pit as soil amendments. After seven years *Zizyphus mauritiana*, *Syzgium cumini*, *Psidium guajava*, *Emblica officinalis*, and *Carissa caranthea* were the successful species for these soils showing good growth and also initiated fruit setting. At the establishment stage, there was no significant difference in growth up to two years between the two methods, but later, the growth was better in pits. Establishment cost for pits was almost double that of the auger holes. These studies helped in selection of most suitable forest and fruit tree species for rehabilitation of difficult soils.



99. Deserted Delicacies. *Down to Earth* 9 3:27-29

The article is emphasising on the desert delicacies of food. The Thar Desert of Jaisalmer has been having food items such as Khejri's sangari, bantka (gum from khejri tree), ker, kumbhat. Ber is desert fruit which grows abundantly in summer. Flowers and buds of 'Phog' (*Calligonum polygonoides*) are eaten with curd. Vegetables of goonda, goondi and sahajan (*Moringa oleifera*) are prepared and used as food. Peelu (*Salvadora oleoides*), also called mitha jaal and khara jaal, in one of the desert fruits abundantly available in Jaisalmer district of Rajasthan. Due to irrigation through Indira Gandhi Canal, these desert species are now growing less and due to their medicinal value, these are being exported and becoming deserted.

100. DESWAL, R.P.S., DHANKHAR, R.S., KAUSHIK, N. and SINGH, B. (2001)

Babul- A valuable tree for farm forestry plantation in dry areas. *Intensive Agriculture* 39 3-4 : 16-17

Babul (*Acacia nilotica* (linn), Willd exdel) is an evergreen moderate sized tree (height varies from 2.5 m to 25 m) with spreading crown, indigenous to Indian subcontinent and found in almost all states and Union territories in the country except in north-eastern states, Kashmir and Kerala. It is a multipurpose tree, belongs to family Mimosidae and able to bear very harsh climatic conditions in arid region. The annual rainfall in its normal habitat is 200-1270 mm. It can be successfully grown on marginal lands also, however, it grows best on the alluvial soils in riverian areas. It can be grown successfully on salt affected soils also. Under unfavourable conditions its growth is stunted in form of shrub or straggling tree.

101. DIXIT, A.M. and RAO, S.V.S. (2000)

Observation on distribution and habitat characteristics of Gugal (*Commiphora wightii*) in the arid region of Kachchh, Gujrat (India). *Tropical Ecology* 41 1:81-88

Generation of ecological information about the rare and endangered species is the prerequisite for their conservation. 'Gugal' (*Commiphora wightii*), over exploited for various medicinal and cosmetic use-values, is one of the threatened plants of Indian arid regions, with very little ecological knowledge. This paper examines its abundance, distribution pattern and associations with different species in coastal side of Kachchh district of Gujarat State. During this study, 286 circular plots of 0.1 ha size were sampled where all the woody plants were counted and the main habitat characteristics recorded. Spatial variation in the abundance of *C. wightii* was clearly evident within the area. Topography, soil type, soil depth and biotic pressures were found as the major controlling factors. A positive association was recorded with species like *Acacia nilotica*, *Acacia senegal* and *Euphorbia nivullia*, while negative association was recorded with *Cassia auriculata*. The study reveals that *Prosopis juliflora*-an exotic weed, has no influence on the abundance of *C. wightii*. As one of the few conservation measures, study recommends the establishment of small reserves in the north-eastern part of the study area.



An Indigenous Sub-surface Micro-irrigation system for Establishment of Trees in Hyperdesertic Conditions. *Current Agriculture* 24 1-2: 1-7

An indigenous micro-irrigation sub-surface system of irrigation has been invented. The system consists of a double walled earthen pot in which two pots of same height (30 cm), but different top diameters (25 cm and 15 cm) and base diameters (18 cm and 12 cm), are joined together at the base so that the basal portion of the inner pot is almost open to allow the growing roots to pass through. The outermost wall of the device is made impervious by brushing with snowcem or rubber paint, etc. A tree sapling, alongwith soil ball, received from nursery is transplanted in the inner pot. The pot is placed in a pit dug in the soil so that brim of the pot is in line with the surface of soil. The space between the two pots is filled with water (3-4 L at a time) and covered with a lid whose centre is open (10 cm diam.). The device called as 'Jaltripiti' works on two simple principles, viz. (1) soil moisture tension and plant roots create suction force which draws moisture towards it from neighbouring high moisture zones, and (2) inner earthen pot has many micropores in its wall which do not allow water to flow freely but allows its seepage in the direction where suction develops. Field experiments conducted with ber (*Ziziphus nummularia*) and neem (*Azadirachta indica*) at Bikaner (hyperdesertic place in Thar Desert of Western Rajasthan) have revealed a saving of more than 80 per cent water through sealing of percolation and minimising evaporational losses.

## 103. JINDAL, S.K., SINGH, M., PANCHOLY, A. and KACKAR, N.L. (2000)

Performance of *Acacia senegal* (L.) Willd accessions for Tree height at rocky Rangelands of the Thar Desert. *Journal of Arid Environments* 45 2:111-18

*Acacia senegal* (L.) Willd, a multipurpose tree, is commonly found on the rocky sites and the sand dunes where annual rainfall is 200-350 mm. To identify fast growing genotypes, seeds of eleven accessions were collected from arid and semi-arid areas of Rajasthan. The germplasm was evaluated at the nursery and the plantation was established at the rocky rangeland of the Range Management area, Central Arid Zone Research Institute, Bhopalgarh, during 1985. The accessions differed significantly for tree height over all the six growth years. Acc. No. 363 from Bar (Ajmer) and Acc.No. 35 from Jhurli (Jodhpur) were top performers from the second year onwards. There was no gum exudation in any of the plants. The overall survival percentage of the population over the years studied decreased from 97 in first year to 93, 90, 87, 84 and 79 during subsequent years. Mean tree height over the six years was 33.8, 50.0, 55.9, 59.5, 70.8 and 90.4 cm, respectively. The juvenile-mature relationship showed that selection in the nursery is effective to isolate fast growing genotypes.

## 104. KHAN, H.A. VISHISHTHA, B.B. and AZAM, M.M.E. (2001)

First Record of Gum Exudation From The Gonda Tree, *Cordia myxa* Linn (Family: Boraginaceae) *Bombay Natural History Society* 98 1: 152



For the first time, gum exudation from Gonda tree has been reported. The gum was in the form of irregular broken tears in varying sizes, generally colourless, with a brittle, fractured surface. Despite slight variations in its properties compared to Indian gum, the high solubility in water and attractive physical appearance, Gound gum may be exploited for use in various applications.

**105. NAGARAJAN, M. and SUNDARAMOORTHY, S. (2000)**

Effect of (*Prosopis cineraria*) Canopy Size on Soil Microbial Biomass-C, N and P in Arid Zone. *Current Agriculture* 24 1-2: 75-80

The distribution at microbial biomass-C, N and P were studied under three different canopy sizes of *Prosopis cineraria* at regular intervals throughout the year at two depths. The study revealed that mostly the *P.cineraria* canopy sizes, seasons were significantly enhanced microbial biomass-C to the percentage from 2.761 to 277.587, microbial biomass-N 2.668 to 207.15 and microbial biomass-P from 0.432 to 451.520 when compared to open field.

**106. NAGARAJAN, M. and SUNDARAMOORTHY, S. (2000)**

Effect of *Prosopis cineraria* (linn.) Druce on Microbial Biomass and Soil C, N in Arid Agroforestry Systems of Western Rajasthan, India. *Annals of Arid Zone* 39 4:431-38

In the semi-arid farming of western Rajasthan, the practise of having trees in farmer's fields and cultivation of crops in the inter spaces has been in vogue traditionally among the farmers and they have long recognized the improvement of soil fertility due to trees, particularly *Prosopis cineraria* (khejri). A comparative study on microbial biomass C and N and soil organic C and N in uncultivated and cultivated sites was performed during cropping and fallow periods. The microbial biomass C and N, as well as soil organic C and N, were higher at uncultivated site than at the cultivated site. The age of the tree, in terms of canopy size, affect soil indices significantly. The improvement was maximum in understorey of big, followed by medium and small trees. There was no significant relation of microbial biomass C and N with soil organic C and N, apparently due to farming under arid condition. There was an appreciable seasonal variation in microbial biomass C and organic C and microbial biomass N and soil N, at all the selected sites.

**107. NATH, V., PAREEK, O.P., SAROJ, P.L. and SHARMA, B.D. (2000)**

Biodiversity of Khejri in Arid Region of Rajasthan: I-Screening of Khejri for Culinary Value. *Indian Journal of Soil Conservation* 28 1: 43-47

A survey was conducted in 14 districts in arid region of Rajasthan during 1995-97 to select some superior genotypes of Khejri (*Prosopis cineraria* (L) Druce) based on their pod characters which is utilised as a vegetable. A wide range of variability with respect to pod length, thickness, number and weight of seed, pod appearance, tenderness and nutritional value was observed. A weighted score was allotted for desired culinary



characters of pods and nine genotypes of Khejri, i.e., tree no. 1, 2, 3, 13, 14, 20, 21, 26 and 29 have been identified for vegetable purpose. The selected genotypes should be multiplied by vegetative means for preservation of desired genetic purity. It was also advocated that remaining genotypes, though not fit for culinary value but this biodiversity of Khejri in arid ecosystem must be conserved either *in situ* or *ex situ* which can be utilised as parent materials for any future breeding programme.

108. **SANJAY KUMAR, JHORAR, B.S., BATRA, M.L. and MALIK, R.S. (2001)**

Effect of Trenching on Soil Moisture Extraction by *Acacia tortilis* under Arid Zone Environments. *Journal of the Indian Society of Soil Science* 49 1:7-11

A study was conducted at NARP farm, Balsamand, CCS HAU, Hisar, to evaluate the effect of trenching on soil moisture extraction pattern by twenty-year-old *Acacia tortilis* trees. A trench, 1.5 m deep, 0.5 m wide and 30 m long, was excavated on south and parallel to east-west side at a distance of 2 m from the tree line of block plantation. Pearlmillet was taken as a test crop beyond the trench. Soil moisture content at different depths (0-1.20 m) at a distance of 10 m and 20 m normal to tree line under two conditions viz. with trench and without trench at different times after a heavy rainfall (76 mm) were determined gravimetrically. It was found that the soil moisture content increased with depth in all the cases. The rate of increase of amount of water extracted from 0-1.20 m profile was appreciably less in trenching treatment than that under without-trenching treatment; the rate remained constant with distance, whereas, it was 27 per cent higher in 10 m as compared to that in 20 m under no-trench treatment. The amount of water content in 0-1.20 m was on an average 52 per cent higher in trenching than under no trenching treatment when time and distance factors taken together. It was observed that the grain yield of pearlmillet from 30 m x 15 m plot under trenching treatment was 683 percent higher than that under no-trenching treatment. Practical implications of this study are: a) *A. tortilis* should not be planted on the field boundaries and on road sides, and b) if these trees are already planted then trenching technology may be practiced to check the moisture extraction spread horizontally.

109. **SINGH, G. and GUPTA, G.N. (2000)**

Living Barriers in Indian Arid Zone and Their Ecological Benefits. *Indian Forest* 126 3: 257-67

The Indian arid zone, which covers mainly the States of Rajasthan, Gujarat and Haryana, was surveyed for the physical and biological benefits of the prevailing living barriers. These living barriers are generally raised to demarcate boundaries of agricultural field and to protect home yards or agricultural crops/or newly planted seedlings from domestic as well as wild animals. It controls runoff, facilitates the infiltration of rain water to the soil, conserve moisture and increase the production of agricultural crops. The fodder and fuel demands are also fulfilled by some of the species viz., *Zizyphus* sp., *Prosopis juliflora*, *Calligonum polygonoides*, *Clerodendron flomoides*, *Lycium barbarum*, etc. The most important benefit of living barriers is microclimate amelioration particularly they moderate the hard climate.



erection of living barriers are *Euphorbia*, *Opuntia*, *Prosopis* and *Acacia*. Some others are *L. barbarum*, *C. flomoides*, *B. aegyptiaca*, *M. emerginata*, *Ipomoea* sp., etc. All these species have various multipurpose uses and can be generated either by direct seed sowing or by planting cuttings or nursery raised seedlings.

SINGH, G. and SINGH, B. (2000)

110. Plant Growth and Nutrient Uptake in *Azadirachta Indica* Planted Along Municipal Sewage Channel In Indian Arid Zone. *Indian Forester* 126 1: 22-29

Field observations were recorded on the growth, soil properties and nutrient uptake of *Azadirachta indica*, planted along sewage channel. The data indicated that availability of soil water and nutrients affected the growth of the plants. The trees at 1.5 m distance were 620 cm in height and 22.4 cm in dbh as compared to the plants at 15 m distance where the plants were 460 cm tall and 10.0 cm in dbh at 68 months of age. The leaf water content as well as in soil water decreased with increasing distance. Concentration of all the nutrients, viz., N, P, Ca, Mg, Cu, Zn, Fe and Mn were lower in stem as compared to leaf samples, Phosphorous and N increased with increasing distance and was due to reduction in total biomass. The concentrations of micro-nutrients viz. Cu, Zn, Mn and Fe decreased with increasing distance, though their concentration were low as compared to the reported values except Fe which was in normal concentration. Soil analytical data indicated that the availability of  $\text{NO}_3\text{-N}$ ,  $\text{HH}_4\text{-N}$ ,  $\text{PO}_4\text{-P}$ , Ca, Mg and K along with pH were higher in 0-10 cm layer as compared to 40-50 cm layer. Soil nutrients also varied with distance with minimum at greater distance. Thus the results indicate that availability of moisture and nutrients which came through seepage from the sewage channel enhanced the growth and nutrient uptake in the plants and the plantation along the channel has not only utilize the excess nutrients and water but also useful in waste water renovation.

111. SRIVASTAVA, K.K., MOHAN, V. and VERMA, N. (2001)

Impact of Vam Inoculation on Some Semi-Arid Tree Species. *Indian Forester* 127 8:936-40

Use of biofertilizer, particularly VAM fungi, has a great importance in forestry, as it provides minerals, wide absorption area of root zone, water uptake and tolerance to water stress conditions, etc. Rajasthan covers about 61% of the geographical area of the total desert area of the country. In these harsh conditions, VAM fungi can play a significant role in survival of plants. In the present study, some economically important tree species of Jaipur region, namely, *Cordia myxia*, *Artocarpus integrifolia*, *Dalbergia sissoo*, *Pongamia pinnata*, *Mangifera indica* and *Alestronia* sp. were selected for the study. VAM inoculated seedlings of above tree species performed better in term of shoot height, root height, biomass and percentage of colonization. The shoot height increase was maximum (32.2) in *A. integrifolia* and minimum (11.2) in *Mangifera indica*. The other parameters were also found better than uninoculated plants.



112. SURESH KUMAR and FARZANA PARVEEN (2000)

Potential Medicinal Plants for Diversifying Crop Base in the Indian Arid Zone. *Current Agriculture* 24 1-2: 65-68

Arid zone flora has 116 plants of medicinal importance, most of which are collected from the wild habitats. In view of increasing trade in herbals, their natural population will stand threatened in the near future. Based on data of plant species used in drug preparation and its export value, an attempt has been made to prioritize species for standardizing agrotechnique suitable for arid zone. Some of these species are *Withania somnifera*, *Cyperus rotundus*, *Tribulus terrestris*, *Pedaliium murex*, *Boerhavia diffusa* and *Tinospora cordifolia*.

113. SWAMINATHAN, C. and KANNAN, K. (2001)

Sowing methods for Pasture Establishment in Semi Arid Regions. *Indian Journal of Agricultural Sciences* 71 1: 38-40

A field experiment was conducted during 1997-99 to find out the best sowing method for establishing pastures at Pudukkottai, Tamil Nadu. Three pasture grasses viz., *Andropogon gayanus* Kunh, *Cenchrus setigerus* Vahl and *Pennisetum polystachion* Schultes were tested against four sowing methods for their performance and productivity. The results revealed that direct seedling is the best method of sowing *Cenchrus setigerus* and *Pennisetum polystachion* with higher green fodder production of 5.61 and 22.3 tonnes/ha/year respectively, while broadcasting seeds in sand mixture is ideal for *Andropogon gayanus* (2.5 tonnes/ha/year).

114. THAKER, V.S. and SINGH, Y.D. (2001)

Selection of Tree Species for Energy Plantation in Arid-Semi-Arid Areas: Comparative Growth Studies. *Indian Forester* 127 6:678-84

Comparative growth analysis of three tree species, viz., *Acacia nilotica*, *Leuca leucocephala* and *Prosopis juliflora* were studied. The correlation coefficient and regression models were worked out between biomass and dependable variables like, stem diameter at base, leaf weight, branch weight and plant height. Amongst the three species tested, *L.leucocephala* recorded maximum biomass, followed by *A. nilotica* and *P.juliflora*.

115. VARSHNEY, V. (2001)

Arresting 'Axation'. *Down to Earth* 10 12:38

Paper deals with the thriving story of Kailadevi Wildlife Sanctuary in Rajasthan. In 1985, villagers developed a concept of Kulhari Bandh (axe ban) in the region. Dwindling forest in kailadevi wildlife sanctuary in Rajasthan is getting a fresh lease of life and new look because of this new approach. Sanctuary has again started thriving Thanks to the villagers.



# WATERSHED MANAGEMENT AND SOIL CONSERVATION

116. **GARG, N.K. and ALI, A. (2000)**

Groundwater Management for Lower Indus Basin. *Agricultural Water Management* 42: 273-90

The present study aims to find out an optimum policy for pumping out the optimized volume of groundwater obtained from the authors earlier Two Level Optimization Model (N.K.Garg and A.Ali 1998). The level optimization model for Lower Indus Basin. *Agric. Water Management* (36 1-21) for the Dadu Canal Command of the Lower Indus Basin. It is shown that the tubewells in this canal command may be operated at their maximum capacities to pump out the required volume of water to get the overall benefits. The groundwater hydraulics simulation model results show the development that by suitably increasing and placing the tubewells, the waterlogging problem can be tackled very effectively.

117. **HAZRA, C.R. and SAHA, D. (2001)**

Agroforestry in Watershed Management. *Agroforestry Today* 12 1:23-28

Faced with unproductive soils, rocky and degraded terrain, a community in Uttar Pradesh State of India has made nearly uninhabitable land productive using simple agroforestry technologies. The result? More farm produce to eat and sell, an increasing awareness about conservation, and a mushrooming of rural-based industries.

118. **KHAN, M.A., GUPTA, V.P. and MOHARANA, P.C. (2001)**

Watershed Prioritization using Remote Sensing and Geographical Information System: A case study from Guhiya, India. *Journal of Arid Environment* 49 3:465-75

Land resource development programmes are applied generally on a watershed basis. Delineation of watersheds within a large drainage basin and their prioritization is required for proper planning and management of natural resourced for sustainable crop production. An integral part of Guhiya basin (with an area of 1614 km<sup>2</sup>) was studied for priority watershed delineation with the objective of selecting watersheds to undertake soil and water conservation measures using remote sensing and Geographical Information System techniques. Using the terrain information derived from geocoded satellite data and 1:50, 000 topographic maps, 68 watersheds were assessed on the basis of their erosivity and sediment-yield index values. Thematic maps of landform, landuse and land-cover, and slope were digitised using ARC/INFO. On the basis of sediment yield index values, the watersheds were grouped into very high, high, moderate and low priorities. High priority watersheds with very high SYI value (150) need immediate attention for soil and water conservation, whereas, low priority watershed having good vegetative cover and low SYI value (50) may not need immediate attention for such treatments.



119. RAJU, K.V. and SHAH, T. (2000)

Revitalisation of Irrigation Tanks in Rajasthan. *Economic and Political Weekly* 23: 19 30-36

This paper is based on a larger study which was carried out to assess the socio-ecological importance of irrigation tanks, organisational capabilities of the department and local non-governmental organisations on the rehabilitation of irrigation tanks in Rajasthan. The paper provides the background of irrigation tanks, and justification of their pivotal role; and describes the approach that we have evolved to rehabilitate the tanks in Rajasthan.

120. SHARMA, K.D. and SINGH, H.P. (2001)

Contour Vegetative Barriers conserve Soil and Water in Arid Regions. *Indian Farming* 51 4: 12-13

On-farm trials (19) were conducted in 50 ha area over 3 years. Runoff volume and specific peak discharge were reduced from 28 to 97%, and from 22 to 9% respectively, using contour vegetative barriers (CVB) with negligible soil loss. Resultant increase in soil moisture storage increased clusterbean and pearl millet yields by 40 and 35%, respectively. These barriers are easy to raise, less labour-intensive, and acceptable to the farmers in the region.

121. SINGH, K.K. and SHEKHAWAT, M.S. (2000)

Watershed approach to dryland agriculture. *Indian Farming* 50 5: 4-8

The experience during the post-green revolution phase has cast doubts about the capacity to feed the growing population. Besides, green revolution has been largely crop-and region specific and the benefits accrued to the irrigated wheat growing areas leaving vast areas of the country outside the development process. This has led to development duality. The approach to watershed management calls for an integrated effort on many counts, viz. area development, resource identification and management, programme planning, implementation and evaluation and also the disciplines involved. Only an integrated approach to watershed management can ensure rich dividends to the programme.

122. SINGH, M.P., WARIS, A., CHAUHAN, K.N.K. and RATHORE, B.B. (2000)

Tanka-A Boon for Arid Zone Farmers. *Intensive Agriculture* 38 9-10: 28-31

An operational Research Project (ORP) on Agro-Forestry, funded by Department of Wasteland development, Govt. of India, was carried out in village Khetasar, Jodhpur district. Small and poor farm families were selected to disseminate appropriate technological package for Agro-forestry related activities. 'Tanka', a water harvesting structure, was constructed on the farmer's fields. Water from this tanka was utilised for supplementary irrigation of bet orchard and also establishing forest nursery and plantation stands. The agro-horticulture system of growing ber, alongwith pulse crop



provided substantial income to farmers. The multipurpose tree species provided the much valuable fodder for animals and fuel for the family energy needs besides improving the soil fertility.

## LIVESTOCK PRODUCTION AND MANAGEMENT

123. BHAKAT, C. TANDON, S.N. and SAHANI, M.S. (2000)

Camel Management in the hot arid villages of Bikaner District. *Indian Farming* 50 6 : 32-34

Due to erratic pattern of rainfall and low soil productivity, it is very difficult to produce food by the farmers in hot arid villages. Therefore, to ensure a regular income and sufficient food for their families and better living standards of the farmers, it is necessary to go for some other alternate land use based farming systems or subsidiary enterprises, which will provide more income and employment to the farmers. Such enterprises include camel rearing and it may also include other species like cattle, buffalo, sheep and goat, etc., for multiple uses. It holds practical values for cost-effectiveness. It is sustainable, environment friendly and socio-culturally acceptable. The idea of sustainability of agriculture and livestock production revolves around better utilization of time, money, resource and family labour of the farmers. The Farmers' family gets scope of livestock production, if they adopt improved technologies for this area.

124. BHATTA, R., SANKHYAN, S.K., SHINDE, A.K. and VERMA, D.L. (2001)

Seasonal Changes in Diet Selectivity and Grazing Behaviour of Goats on Semi-Arid Rangeland. *Indian Journal of Animal Sciences* 71 1: 62-65

Dietary preference and grazing behaviour of male Kutchi goats grazing on semi-arid rangeland were continuously monitored from 08:00 to 17:00 hr, during monsoon, winter and summer. Crude protein (CP), neutral detergent fibre (NDF) and acid detergent fibre (ADF) contents of pasture were 9.94, 72.45 and 52.86% in monsoon, 7.19, 67.76 and 54.42% in winter and 6.61, 73.75 and 64.55% in summer, respectively. CP content of diet in monsoon was 13.40%, which slightly declined to 12.78% in winter, and again increased to 14.84% in summer. Preference index (PI) for CP progressively increased from 1.35 in monsoon to 1.78 in winter and 2.25 in summer. Grazing period was 7.41 hr in monsoon, 8.46 hr in winter and 8.07 hr in summer, and it was negatively correlated with ambient temperature ( $r=-0.76$ ) and relative humidity ( $r=-0.34$ ). Masticating rate (chew/min) was almost similar in 3 seasons and average value was 76. Ruminating rate was 1.44, 1.11 and 1.08 in monsoon, winter and summer, respectively. The bipedal stance was lowest in monsoon (0.52), highest in winter (2.86) and intermediate in summer (1.25). It is concluded that goats grazing on semi-arid rangeland select quality nutrients with deterioration of pasture condition and alter behavioural pattern to minimize the environmental stress.



125. DANG, A.K., JOSHI, A., NAQVI, S.M.K. and MITTAL, J.P. (2000)

Productive quality of Awassi rams in Rajasthan. *Indian Journal of Animal Science* 70 2:181-83

Superior productive performance of Awassi breed of sheep is likely to improve production of nondescript sheep in arid and semi-arid regions of India. An experiment was conducted to study reproductive adaptability of Awassi rams under semi-arid climate of Rajasthan. The sexual behaviour, libido and semen quality of 2 adult rams kept on semi-intensive management system were studied. The sexual behaviour studied in terms of sniffing/nosing of external genitalia, kicking with forelegs, mounting in and out of the tongue, courting grunts was similar to rams of native breeds. Awassi were able to donate good quality semen sufficient for one oestrous cycle. Each of these rams was capable of ejaculating 3-4 times during the span of 15 minutes. Semen volume, sperm motility and sperm concentration, in first and in subsequent ejaculations, were similar to native and Awassi rams. It was apparent from these results that Awassi rams are well adapted in their sexual behaviour, libido and sperm characteristics under semi-arid region of Rajasthan.

126. JAIN, R.D., QURESHI, M.I. and JOSHI, S. (2000)

Genetic Studies on Greasy Fleece Yield in Rambouillet Sheep in The Arid Region of Rajasthan. *Indian Veterinary Journal* 77 :317-20

The least squares mean of greasy fleece weight (two clips annually) in Rambouillet sheep under arid region of Rajasthan was found to be  $2.213 \pm 0.024$  kg during the period from 1972-1981. The effects of year, season, shearing number and various interactions between main effect were found to be significant. The pooled  $h^2$  for greasy clippings was  $0.184 \pm 0.057$  and the repeatability estimate was  $0.116 \pm 0.017$ .

127. KHEM CHAND, SINGH, K. and KUMAR, S. (2001)

Milk collection systems and profitability of commercial dairies in Bikaner (Rajasthan) *Annals of Arid Zone* 40 1 :85-89

The overall net return and family labor income from a liter of milk were Rs. 1.25 and 2.76 respectively. The milk producers were selling the milk directly to consumer sweet manufacturing units and organized dairy plants, etc. The auctioning system of contractual procurement of milk is the special feature of milk marketing in Bikaner. This contract ensures a remunerative floor price to milk producers. The study has revealed the increased profitability of milk production, which is reflected through increase in number of dairy herds by about 30% in a period of three years.

128. PATEL, A.K., MATHUR, B.K., MATHUR, A.C., MITTAL, J.P. and KAUSHISH, S.K. (2000)

Productive and reproductive performance of Tharparkar cattle in hot arid region of Rajasthan. *Indian Journal of Animal Science* 70 5: 530-32



Animal Husbandry is the main occupation of arid zone farmers. This region is endowed with the best milch breeds of cattle. Tharparkar is one of the well known milch breeds of cattle of Thar region. Tharparkar cattle are very well adapted to desert vagaries due to their capacity to thrive on poor quality forage and local non-conventional feed (Mathur *et al.* 1989). Black pigmented skin with white coat is an ideal combination for rendering an animal adaptive to intensive heat radiation of the arid zone. However, seasonal variations in solar radiation, environment temperature, relative humidity, precipitation and the consequent differences in quality and quantity of forage available to the livestock, influence the animal productivity. The management variations and physiological maturity of the animal are also some of the important factors, which ultimately affect the productivity of the animal. The main aim of the present investigation was to analyse the effect of season and period of calving and parity on productive and reproductive performance of Tharparkar cattle in hot arid region.

**129. RAI, B., KHAN, B.U. and YADAV, M.C. (2001)**

Genetic and phenotypic parameters of milk production traits in Marwari goats. *Indian Journal of Animal Sciences*. 71 2:177-79

Data on 402 lactation records of 162 Marwari goats, the progeny of 23 sires born between 1987 and 1994 at Western Regional Research Centre (CIRG), Avikanagar, were analyzed to estimate genetic and phenotypic parameters of milk production traits. The milk production traits considered under the study were 90 days milk yield (90 DMY), 150 days milk yield (150 DMY), lactation milk yield (LMY), average daily milk yield (ADMY) and lactation length (LL). Phenotypic correlations were positively high among the traits except the correlation with lactation length. A negative phenotypic correlation (-0.151) was found between lactation length and average daily milk yield. The results suggested that selection of does can be made effective if 90 DMY is considered for selection for achieving higher milk yield in Marwari breed.

**130. ROY, R., SINGH, L.B., ROUT, P.K. and KHAN, B.U. (2001)**

Growth trend of jamunapari kids in intensive system of management in semi-arid zone. *International Journal of Animal Science*. 16 1 : 77-80

Data on body weight of 287 Jamunapari kids maintained at Central Institute for Research on Goats, Makhdoom from 1985 to 1996 were utilised for study of growth trend during feedlot and post-feedlot period. Average body weight at 3, 6, 9, 12 and 18 months of age was  $10.30 \pm 0.13$ ,  $14.86 \pm 0.19$ ,  $21.21 \pm 0.28$ ,  $26.12 \pm 0.33$  and  $29.85 \pm 0.40$  kg, respectively. Daily weight gain during 3-6, 6-9, 9-12 and 12-18 months was 57.22, 82.11, 65.33 and 25.61 g/ day, respectively in males and 43.22, 59.77, 43.77 and 15.88 g/day, respectively, in females for corresponding periods. Maximum daily weight gains of 82.11 and 59.77 g, was observed both in males and females during 6-9 months of age, thereafter, daily weight gain decreased, which was static in male kids during 12-18 months. Body weight gain during 12-18 months of age was static in male kids and might be due to autritional and behavioural stress. These findings revealed that influence of environmental, behavioural and nutritional stress on body weight gain modified the



genetic merit. Year of kidding, type of birth, sex and weight of dam at kidding nutritional factors had significant influence on body weight at different stages.

131. SANKHYAN, S.K., BHATTA, R., SHINDE, A.K. and KARIM, S.A. (2001)

Seasonal changes in dietary composition and rumen fermentation pattern in sheep on semi-arid rangeland. *Indian Journal of Animal Sciences* 71 2:162-64

Two rumen cannulated sheep were grazed on semi-arid rangeland in a year long study to assess the seasonal changes in dietary composition and rumen fermentation pattern. Average CP, ADF and lignin content of the pasture during monsoon, winter and summer were 9.43, 4.50 and 3.80; 28.73, 51.38 and 53.84 and 4.60, 11.52 and 16.12 respectively. The pH values of the rumen liquor in monsoon, winter and summer were 6.86, 6.90 and 7.11, respectively. Ammonia nitrogen (mg%) significantly ( $P < 0.05$ ) declined from 22.86 in monsoon to 5.28 in winter and 3.32 in summer. Total nitrogen of rumen liquor in monsoon and winter was almost similar (2.1) and significantly ( $P < 0.05$ ) increased in summer (5.7). Total volatile fatty acids (TVFA) concentration (m.mol/litre) increased from 71.45 in monsoon to 112.1 in summer. It is concluded that season has profound effect on dietary composition and rumen fermentation pattern in grazing sheep in semi-arid region.

132. SHINDE, A.K., SANKHYAN, S.K., BHATTA, R. and VERMA, D.L. (2000)

Seasonal changes in nutrient intake and its utilization by range goats in a semi-arid region of India. *Journal of Agricultural Science* 135 4:429-36

This study was carried out from September 1998 to August 1999, by conducting three experiments, one each in the monsoon, winter and summer seasons. The availability and botanical composition of native range were obtained. Five 3-4 year Kutchi males, weighing 50-55 kg, were used to determine total faecal output, and observed to allow the diet selected to be sampled by the hand plucking method. DM yield of range was highest during winter and lowest during monsoon, annual mean being 1611 kg DM/ha. Contribution of shrub foliage to total forage yield in monsoon, winter and summer was 3.81, 1.64 and 9.98, respectively. Crude protein content of ground vegetation declined from 99 in monsoon to 72 in winter and summer, while that of top foliage remained similar in all the seasons. Goats consumed diet of almost the same CP content (mean CP 137 g/kg) in all the seasons. Goats consumed 64.0, 54.0 and 55.9 g DM/kg  $W^{0.75}$  /day, in monsoon, winter and summer (annual mean 58.0 g DM /kg  $W^{0.75}$  /day). DM and CP digestibility coefficients were higher in monsoon and summer and decreased ( $P < 0.05$ ) in winter (DM 0.485, CP 0.266 in winter and 0.415 and 0.326 in summer. Digestible crude protein (DCP) was almost similar in monsoon and summer (mean 4.6g/kg  $W^{0.75}$  /day) and declined ( $P < 0.05$ ) in winter (3.1g/kg  $W^{0.75}$  /day), while metabolizable energy (ME) intake was higher in monsoon (0.90 MJ /kg  $W^{0.75}$  /day) and declined ( $P < 0.05$ ) to 0.78 and 0.68 MJ/kg  $W^{0.75}$  /day, in winter and summer, respectively. Average body weight of goats



monsoon, winter and summer was 54.0, 54.6 and 56.5 kg, respectively (annual mean 55.0 kg). It is concluded that goats grazing on a semi-arid rangeland meet their DCP and ME requirement throughout the year.

133. SULE, S.R., TAPARIA, A.L., JAIN, L.S. and TAILOR, S.P. (2001)

Breeding Behaviour of Surti Buffaloes Under Sub Humid Environment of Rajasthan. *Indian Journal of Dairy Science* 54 4: 229-31

The present investigation was planned to study the effect of climatic factors, i.e., combined effect of atmospheric temperature and humidity and photo period on breeding behaviour of Surti buffaloes maintained at Livestock Research Station, Vallabhnagar, and Surti type buffaloes maintained by farmers under sub-humid environment of Rajasthan.

## WASTELAND MANAGEMENT

134. JODHA, N.S. (2000)

Waste Lands Management in India: Myths, Motives and Mechanisms. *Economic and Political Weekly* 35 6:466-73

Public policies and programmes after independence affecting waste lands have, by and large, ignored the fact that waste lands are the common property resources of village communities, who recognise the economic and ecological contributions of these lands far better than policy-makers. Only in recent years have waste land management programmes accorded higher priority to participatory approaches. This paper discusses the factors affecting participation and suggests possibilities for the horizontal and vertical upscaling of participation in the management of natural resources.

135. KUMAR, S., GULYANI, R., VINAY KUMAR and SINGH, R.N. (2001)

Effect of genetic and non-genetic factors on weekly body weight of broiler rabbits in semi arid-region of Rajasthan. *Indian Journal of Animal Science* 71:11 1075-77

Effect of genetic and non-genetic factors on weekly body weight of broiler rabbits in semi-arid region of Rajasthan were studied. Season of birth, litter size at birth and doe weight at kindling affected the body weights.

136. PANDIAN, M.S. and DUTTA, S.K. (2000)

Leucogranite Magmatism in Sewariya-Govindgarh Areas of Rajasthan and its Relevance to Tungsten Mineralisation. *Journal of the Geological Society of India* 55 3:289-95

In Sewariya-Alniawas Govindgarh areas of central Rajasthan, the Delhi metasediments are intruded by an older, biotite granite (Sewariya granite) which is equivalent to Erinpura granite occurring further south, and an younger, tourmaline leucogranite (Govindgarh granite) which is geochemically specialised. Sewariya granite



hosts wolframite bearing quartz veins along its sheared contact with mica schists of Barotiya Group. Goivndgarh granite occurs in the form of small intrusive bodies within the rocks of Barotiya Group, essentially along a major ductile shear zone at the western margin of South Delhi fold belt. Our study reveals that leucogranite magmatism is associated with tungsten mineralisation in Sewariya area.

137. PRAKASH, I. and SINGH, H. (2001)

Composition and species diversity of small mammals in the hilly tract of southeastern Rajasthan. *Tropical Ecology* 42 1:25-33

The Aravalli range diagonally bisects the state of Rajasthan and this older Archaean rock formation is also spread in southern and southeastern Rajasthan. The latter zone is an conglomeration of Aravallis, Vindhyan and Deccan trap and it has undergone a change in landuse pattern, from forest to irrigated cropland, during recent years. Studies were taken up in this biologically interesting hilly tract to investigate the spatial diversity of small mammals as practically no information exists on this aspect. Small mammals were trapped in 35 habitats at 11 locations during 1997-99 and 100 individuals belonging to 15 species were collected in 5210 trap days. On an overall basis the house shrew, *Suncus murinus*, was found to be the most abundant small mammal in all habitats at all localities. Another commensal mammal, the house rat, *Rattus rattus*, predominated in crop fields along with the mesic species like *Millardia melitaea*, *Gomphosorex ellioti* and *Bandicota bengalensis*. However, the typical faunistic element of hills, the mountain rat, *Cremnomys cutchicus*, occurred in low numbers in the Vindhyan scarp and Deccan trap due to presence of cracks and crevices which are its preferred ecological niche. The mice species preferred the vindhyan scarp as 62 per cent of them occurred in this formation. Among the four rock types, Aravallis, vindhyan scarp, Vindhyan plains and Deccan trap; the vindhyans were the most occupied as well as species rich rock type. Among the habitats, crop fields and scrubland were most diversified and species rich habitats. The impact of transformation of forests into irrigated crop field is evident from a significantly higher frequency of occurrence of commensal small mammals in croplands apparently due to relatively superior soil moisture regime, food resource and shelter.

138. RAGHAV, K.S. (2000)

Discovery of Foraminifera from Bilara Group, Jodhpur District, Rajasthan. *Journal of the Geological Society of India* 55 4:395-97

Tertiary foraminifera belonging to Discorbis and Quinqueloculina are discovered by the author from the limestones of Bilara Group of Marwar Supergroup. These rocks are hitherto regarded as unfossiliferous and Neoproterozoic-Eocambrian in age. The present find of foraminifera suggests that the formations are not older than late Eocene, throwing new light on the age of the Marwar Supergroup. The study also



**139. RAGHAV, K.S. (2000)**

On the Discovery of Middle Eocene Larger Foraminifera from a Limestone Bed in Churu Distric, Rajasthan. *Journal of the Geological Society of India* 55 3:269-74

Definite Middle Eocene Larger foraminifera has been found in the limestone at Sandwa, Bidasar area, Churu district in the Nagaur-Ganganagar basin, Rajasthan. Nummulites Cf. Obtuses (Sowerby) 1840 with two forms, viz., A form (Dia 2.8 mm) and B form (dia.9mm) are observed. In the type area of Kachchh. N. Obtues has been assigned the age of Middle Eocene. This finding assigns the limestone bed to Jogira Formation and it also extends the limits of the Cocene Sea in Rajasthan by 80 km towards east.

**140. RAO, A.V. and TAK, R. (2001)**

Effect of Rhizobial Inoculation on *Albizia lebbeck* and Its Rhizosphere Activity in Mine Spoils. *Arid Land Research and Management* 15 2:157-62

The evolution of stable and productive mine spoil requires active microbial populations for effective energy flow and nutrient cycling. This can be achieved either by introducing beneficial microorganisms through inoculation or increasing the microbial activity through the incorporation of amendments. Efficient strains of Bradyrhizobium sp. were isolated from mine spoils and used to inoculate seeds of *Albizia lebbeck* grown in both gypsum and limestone mine spoils. It was observed that nodulation and nitrogenase activity were significantly improved by about 2- and 20-fold, respectively, with inoculation, along with an enhancement in the growth of 5-month-old seedlings by about 50%. Inoculated plants had higher concentrations of nitrogen and phosphorus, indicating better nutrition. Soil metabolism, as indicated by the activities of dehydrogenase and phosphatases and AM-fungal spores of the mine spoils, was significantly improved with inoculation. The results suggests that the use of efficient strains of Bradyrhizobium for *A. lebbeck* may be a useful technology for revegetating mine spoils and improving the productivity of these mine spoils.

**141. SHARMA, D.P., SINGH, K. and RAO, K.V.G.K. (2000)**

Subsurface Drainage for Rehabilitation of Waterlogged Saline Lands : Example of a Soil in Semiarid Climate. *Arid Soil Research and Rehabilitation* 14 4:373-86

In irrigated agriculture of arid and semiarid region, soil salinity, coupled with waterlogging, is a serious problem. Provision of subsurface drainage seems to be a prerequisite for optimal crop production. A study was conducted to evaluate the long term impact of a subsurface drainage system on soil properties and yields of wheat. The study was located in a severely affected, waterlogged, barren, sandy loam saline soil. The subsurface drainage system was installed at a 1.75 m depth with three drain spacings (25, 50 and 75 m). The drains facilitated reclamation of the waterlogged saline land which had variations in salt removal with space and time. The removal of salts from the root zone varied initially with distance from the drain and with depth. However, after a few years, the variations were reduced and the land was reclaimed



sufficiently to grow most of the crops of the region. Plots provided with a drain spacing of 75 m required more time for complete reclamation compared to plots provided with 25 m drain spacing. Leaching through subsurface drainage increased soil porosity, modulus of rupture, infiltration rate, organic carbon, available nitrogen, phosphorus, potassium, and available water, and decreased bulk density differently in the three drain spacings (25, 50 and 75 m). In the 75 m drain spacing plots, soil salinity and water content remained higher than in the 25 and 50 m drain spacing plots. Soil ECe and water content were less near the drains, were highest in areas midway between the drains, and the effects were more apparent in the summer season. Wheat grain yield decreased with increasing drain spacings in the initial years of reclamation. With the gradual improvement in soil salinity, yield from plots with a 75 m spacing reached those of narrower drain spacing plots by the fourth year. It was concluded that by installing a subsurface drainage system in a monsoon climate, waterlogged saline soils can be reclaimed by the natural leaching that can take place from rainfall. The optimum yield can be attained with a drain spacing of 75 m, which is 50 m more than the design spacing of 50 m. Faster reclamation and more yield were with 25 m drain spacing and was achieved at a higher cost for the more expensive drainage system.

**142. SHEKHAWAT, M.S. (2000)**

Derivatives of ultramafic rocks as decorative and dimensional stone in Rajasthan  
*Current Science* 78 7:789-92

The Precambrian formations of southern Rajasthan host the unique and largest deposits of 'green marble' in India located mainly around Rikhabdev, Kherwa and Dungarpur areas. Field study, coupled with mineralogic and petrologic studies indicate that the deep green and massive bodies of serpentinite are mainly composed of antigorite with subordinate amounts of carbonates and iron oxides. These serpentinite bodies occur as large sheet-like masses, emplaced concordantly within the Proterozoic formations of Aravalli Supergroup. These deposits are being utilized by fully mechanized, open-cast, block-bench mining methods for their extensive use as decorative and dimensional stone. About 70% of the recovered 'green marble' is being exported to various countries either in the form of well dressed blocks or in the form of finished products as slabs or tiles of suitable sizes. The highly fractured deep green serpentinites are also being exploited by small-scale, manual, open-cast mining methods to manufacture immensely popular flooring mosaic chips for civil engineering works. A very small quantity of steatitized serpentinite (steatite and chlorite schist) is also being used to manufacture different types of carved items and idols.

**143. SOMANI, R.L. and SRIVASTAVA, P. (2000)**

Origin and Evolution of Hydrothermal Fluids Associated with Granitoid-Hosted Tungsten Mineralization at Degana, Rajasthan. *Journal of the Geological Society of India* 56 6:661-71

The Degana tungsten deposit is found genetically and spatially related to the post-Delhi granite. Hydrothermal fluids associated with this granitic magmatism have



evolved in three stages. Early greisenization stage took place in the temperature range of 480-260 °C. Brecciation, followed by boiling and emplacement of quartz sheets responsible for most of the wolframite mineralization occurred in the temperature range of 270-350 °C. In the last stage, addition of meteoric water took place in the temperature range of 130-260 °C. Salinity of mineralizing hydrothermal fluids ranges from 67-9 eq. wt NaCl. Evidence of fluid boiling suggests a depth of mineralization at 600-1250 m, consistent with a range of hydrostatic pressure for about 60-300 bars.

## ENERGY MANAGEMENT

### 144. AHMAD, B. (2000)

Users and Disusers of Box Solar Cookers in Urban India-Implications for Solar Cooking Projects. *Solar Energy* (Supp) 69 1-6:209-15

The purpose of this study is to understand the reasons behind the continued use or disuse of solar cookers, and to outline the implications from the results of this study for future solar cooker projects. Twenty-eight families in three urban sites in Gujarat, India who have a solar cooker have been interviewed. Their experience with solar cookers and solar cooking is studied. Direct discussions with families who have practical experience with solar cooking, brings forth significant practical issues. The study shows that many disusers of solar cookers do not have a suitable place for their solar cookers. Other disusers could not adjust their daily routines with what solar cooking requires, and some disused their solar cookers because they were not interested in using them. Both *objective factors* and aspects of *practical interest* have been shown to be important issues for understanding the conditions of prospective users and the shaping of the projects and the relevant technologies. It is concluded that project developers should consider the potential users as an important partner in project development processes. For example, project developers can by close dialogue with them, uncover and define practical parameters which have important bearing on higher usability of solar cookers.

### 145. DAS, A.K., MOHANTY, U.C., SATYANARAYANA, A.N.V. and SARKAR, A. (2001)

Planetary Boundary Layer Structure During February and May, over a semi-arid Station-A Numerical Simulation. *Journal of Agrometeorology* 3 1-2:237-60

Two-dimensional version of a high-resolution non-hydrostatic mesoscale model namely ARPS was used to simulate the Planetary Boundary Layer (PBL) processes over a semi-arid region of western India. Intensive observational data during two different seasons, viz., winter and summer (Feb and May) were collected from the Land Surface Processes Experiment (LASPEX-97), conducted at Anand during 1997 over Sabarmati Basin Gujarat. A comparative study of three subgrid-scale turbulence parameterization schemes was conducted to find out the most suitable scheme. The model generated vertical profiles (zonal and meridional wind components, potential temperature and specific humidity) were validated against available observations bringing out the



significant characteristics of thermal structure and circulation pattern in the PBL. Diurnal variation of surface and soil temperature, net radiation, sensible, latent and soil heat flux distinguish the surface response during two different seasons. Besides, the study of temporal variation of turbulent kinetic energy (TKE) from model simulation facilitates the understanding of the characteristics of the PBL structure.

## SOCIO-ECONOMICS AND AGRICULTURAL EXTENSION

146. BADAL, P.S. and DE, H. K. (2001)

Translating farmers' constraints into development priorities- participatory rural appraisal of a village in Rajasthan. *Indian Farming* 50 11: 11-14

Rural households in any particular area face a multitude of developmental problems. However, only a few of them can be addressed in an effective manner during a given period of time. Identifying priority areas of intervention and their ranking is an essential component of the priority setting exercise for development. We are faced with a number of sophisticated and exotic models advocating set formulae for raising national income and attaining development. However, these models presuppose people as mere objects of development and adopt a 'blueprint' to the issues concerned whether at the national or at the village level. Even when the results from the application of such models are not very encouraging, especially in the context of rural development, the mindset is such that development professionals are unable to accept anything different. They tend to operate on a basic presumption that they are the best judge of any situation and that the welfare of rural masses rests solely on them. Hence, with best of knowledge, resources and benign motives, they remain oblivious of the fact that the majority of their rural clients are passive spectators of their magic wand of development. In the absence of participatory framework at the grass-root level, projects for rural masses are ill-informed, ill-conceived, and show little capability of generating benefits which the programmes envisage.

147. SAHA, D.K. and MATHUR, Y.N. (2001)

Differential characters and work participation of women in an arid village of Western Rajasthan. *Man in India*. 81 3-4 :305-11

An attempt has been made to study the socio-cultural factors affecting the education and work participation of women. The sub-ordinate nature of women is being practised in the rural; arid areas of western Rajasthan since generations. The study revealed that the socio-cultural factors did not play much important role in the level of education of women as indicated by the test of significance. The impact of education on occupational structure was negligible as agriculture was largely practised by the majority of women population. In the work participation of women the land holding size played an important role. The women belonging to lower economic strata devoted maximum time in various agricultural and livestock activities than the women of upper strata. By and large, the differential socio-cultural factors had little impact on the work



participation of women. The study concludes that the women share equal economic burden with their male counterparts irrespective of their status with little variation.

## WILDLIFE/BIRDS

### 148. SHARMA, D. (2001)

Estimating the Density of Porocupines in Semi-Arid Sariska Valley, Western India. *Journal of The Bombay Natural History Society* 98 2:161-68

The population of the Indian crested porcupine (*Hystrix indica*) was estimated over a period of 3 months (May-July 1989) in semi-arid Sariska valley in the Sariska Tiger Reserve, Rajasthan. The methods included count of pellet groups in four transects each in three vegetation types, and direct counts of animals in a vehicle at night. The data collection using these two approaches was repeated 17 times. Calculation of density for indirect estimates involved data on the pellet decay rate and the defecation rate (of captive animals). The animal density was estimated to be  $8.8 \pm 2.4$  animals/sq.km through direct count, while pellet group count provided an estimate of 12.4 animals/sq.km with a variation of 0.9 to 24.9 animals/sq.km in different habitats. The influence of some factors such as possible use of latrine sites and slow decomposition rate on density estimates are discussed.

### 149. SWAMINATHAN, S. and VERMA, S.K. (2000)

Comparative Efficacy of Different Covers Against Bird Damage and Their Effects on Berry Characteristics in Date Palm. *Annals of Arid Zone* 39 2: 185-89

Rose-ringed parakeet, house sparrow, bulbul and crows are major bird pests of date palm in arid western Rajasthan. Various covers were evaluated to protect the berries from bird damage. Nylon net (19 mm<sup>2</sup> mesh) afforded the maximum protection to berries but were the most costly. By their beneficial effects on fruit quality and high benefit to cost ratio, polyethylene bags, followed by gunny bags, proved to be better. Wire gauge coverings were difficult to handle in the effort to avoid mechanical injury to berries. Paper bags were not satisfactory on account of poor stability under wind or showers.

### 150. TIWARI, J.K. (2001)

Status and Distribution of The White-Naped TiT *Parusnuchalis* in Gujarat and Rajasthan *Journal of the Bombay Natural History Society* 98 1: 26-30

This paper describes the status and distribution of the white-naped tit *Parusmuchalis* in Gujarat and Rajasthan. Results are drawn from surveys carried out in seven districts of Rajasthan and three districts of Gujarat. Habitat loss is described in detail. It is established that the grey tit *Parus major* and white-naped tit *P. nuchalis* are not mutually exclusive. Conservation measures to save the habitat of the endangered white-naped tit are also discussed.



151. VYAS, R. (2001)

Important Birding Areas in South East Rajasthan for Threatened Bird Species  
*Newsletter for Birdwatchers* 41 5:60-61

The author has presented sites and threatened bird species found in four districts of south east Rajasthan, namely Kota, Bundi, Baran and Jhalawar out of 129 threatened bird species of India, the author recorded 16 in his study area, which fall in different categories of risk to their existence. The author felt that it would be a good idea if all the readers of the Newsletter of Birdwatchers report important sites in their district or region and also the status of threatened birds of India according to Asia Red Data Book. It would positively have better acceptance from governmental agencies responsible for protecting these areas.

152. YADAV, A.S. (2001)

Distribution and Regeneration of *Holoptelea integrifolia* Planch. In Alwar District, Rajasthan. *Journal of The Bombay Natural History Society* 98 2:217-23

Studies indicate that the distribution of *Holoptelea integrifolia* (Family:Ulmaceae) is restricted to hilly areas and reserve forests of Alwar District, Rajasthan. Although this species produces an enormous number of fruits (samara) per unit area, only a fraction of them form seedlings. Dry spells and high temperature in the monsoon, low temperature and soil moisture content in winter, dry and hot summer, and grazing adversely affect seedling survival. Observations from the four study sites (Dhobighatta hills, Sagar hills, Garvaji, R.R. College campus) in Alwar District, Rajasthan, indicate that natural regeneration of *H.integrifolia* is taking place only in areas which are partially or fully protected against biotic disturbances.



# SOURCE INDEX

## A

Agricultural Economics Research Review  
Agricultural Water Management  
Agriculture Today  
Agroforestry Today  
Annals of Arid Zone  
Arid Land Research and Management  
Arid Soil Research and Rehabilitation

## B

Bombay Natural History Society

## C

Current Agriculture  
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## D

Desertification Control Bulletin  
Down To Earth

## E

Economic and Political Weekly  
Experimental Agriculture

## F

Field Crops Research

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Indian Drugs  
Indian Farming  
Indian Forester  
Indian Horticulture  
Indian Journal of Agronomy  
Indian Journal of Animal Science  
Indian Journal of Dairy Science  
Indian Journal of Forestry  
Indian Journal of Genetics & Plant Breeding  
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Intensive Agriculture  
International Journal of Climatology

## J

Journal of Agricultural Science  
Journal of Agrometeorology



Journal of Animal Science

Journal of Arid Environments

Journal of Soil and Water Conservation

Journal of The Bombay Natural History Society

Journal of The Geological Society of India

Journal of The Indian Society of Soil Science

Journal of Tropical Forestry

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Man in India

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