DEN NEWS

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

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EDITORIAL

Kofi Annan says "Droughts and desertrification threaten the livelyhood of over one billion people in more than 110 countires around the world" The term drought is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance - water supply reservoirs get empty, wells dry up and crop damage ensues. The severity of the drought is gauged by the degree of moisture deficiency, its duration and the size of the area affected. If the drought is brief, it is known a dry spell or partial drought. A partial drought may go for few days, where as a complete drought may continue for the years. Generally, the droughts are classified under three categories viz; : Meteorolgical, Agricultural and Hydrological. The meterological droughts are triggered by insufficient rainfall; agricultural due to lack of adequate soil moisture to sustain crops and hydrological as a result of severe depletion in water table. The present drought (India) which is said to be the worst drought of the century (*Vikram*) is a cocktail of all these conditions. In western Rajasthan India, about 68% of the area is occupied by sandy soils and sand dunes. The productivity level of these lands is generally low because of sandy nature of soils with low moisture retention and storage characterstics. The problem is further accentuated by low and erratic distribution of rainfall, extermes of soil temprature, high evaporative demand of the atmosphere and the sand movement particularly during the periods of prolonged droughts. It has been observed that out of four years one year is of severe drought with little plant/crop/grass production leading there by to acute scarcity of drinking water, food and fodder and resultant into the migration of livestock and human beings to safer places.

The frequent occurance of drought in the state has compelled the people of the region to evolve drought proffing methodlogies which includes ponds and khadins catchment system of water harvesting and irrigation through collected water during hardy days.

If we look the drought and its mitigative policies in the country's prespective, the situation is still more worst. An overview of the situation depicts that Indian land is gradually turning into a roasted and unproductive land. The system is so faulty that the policies framed to combat the situation by one govt. are changed by the successive govt. As reported by Down to Earth (Sept. 15,2002. p.48) the Drought Prone Area Programme (DPAP) initiated by the central government in 1974, estimated 50 mha of land under drought, which truned to 80 mha in 1990s.

Editor

D.C. Ojha
P.I. ENVIS

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HEENA: A CASH CROP FOR ARID GUJARAT

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Henna or Mehndi (*Lawsonia innermis L.*) is one of the important export oriented medicinal plants grown extensively as a garden hedge in arid and semi-arid regions of the country. Plant is valued for its orange-red dye used to providing colouring to skin, hair and as natural dye for colouring fabrics. The dye "Lawsone" is found in leaves. In India, it is cultivated for its leaves as commercial crop in the states of Rajasthan, Haryana and Maharastra. In Rajasthan, Sojat City of Pali district produces about 15000 tonnes of dry leaves from about 15402 ha land. This fatches an earning of around 25-30 cores per year. About 40-45 % of this product is exported annually. The "Sojat City" has become a synonymous for the "Asli Rachni Mehndi".

Plants are perennial shrubs of about 2.5-3.0 m hight having red when young and grey when old much branched stem. The leave which yield dye are sessile, opposite, ovate and lanceolate in shape. The leaves are leathery glandiolated. The large number of glands have essential oil with distinct order. The flowers are solatory axillary, pedicialate. The calyx are five and triangular in shape. Corollas petalloid, five and scented. The stamens and overies are numerous and arranged in whorls.

The crop can be grown in sandy-loam to loamy soils. It is generally raised by transplanting of 20-30 cm tall seedling raised in nursery beds. The seedlings are planted in wet monsoon season at 30x30 or 40x40 cm spacing. Plants start to yield leaf crop from 3rd year on word and continues for next 25-30 yrs. The branches are cut in the months of March-April and in Oct.-Nov. The leaves are harvested after shed drying of branches.

Studies conducted at CAZRI, Regional Research farm, Kukma to popularize this crop in the arid zone of Gujarat. Table 1. clearly indicate that crop adopted well in the region and gave economically viable yields. The plants produced on an average 682.1 and 182.9 kg day leaves per hactere land which gave an income of Rs. 15006 and 5136 respectively during normal (305.6 mm) and drought (39.9 mm) rainfall in the 3rd and 4th year of planting.

Table-1 Production Potential and Economic Returns of Heena at Bhuj (Gujrat)

Production Potential:-

Population	2001			2002		
	L	S	BM	L	S	BM
62,500	637.5	1181.9	1891.4	185.6	286.8	472.4
50,000	776.0	1080.0	1856.0	192.5	138.0	330.5
41,500	632.9	1076.9	1709.8	170.8	233.3	404.1
Mean	682.1	1112.9	1819.1	182.9	219.3	402.3

Enonomic Returns:-

Population	2001			2002		
	L	S	Total	L	S	Total
62,500	14025.0	1418.3	15443.3	4083.2	344.2	4427.4
50,000	17072.0	1296.0	18368.0	4235.0	165.6	4400.6
41,500	13923.8	1292.3	15216.1	3737.6	279.9	4017.5

Rainfall:-

Year	mm
2001	305.6
2002	39.6

This suggest that crop can be profitably grown in the poor soils of arid Gujrat without addition of even any fertilizer and under natural rainfall however, the leaf yield varies with management practises and rainfall.

INDIA'S WATER POLICY 2002

Indian Prime Minister H.E. A.B. Vajpayee released the recently adopted revision of the Naional Water Policy 2002, on 1 April 2002. The new Policy is an improved version of the earlier policy of 1987 and provides guidelines for planned development and management of water resources at the national level. In India, water is a state subject and each state may now formulate its own 'Water Policy' backed by an operational 'Action Plan' within two years. The State Policy will evolve its own detailed resettlement and rehabilitation strategies for people displaced by infrastructure projects. The Union Minister of Water Resources (MOWR), will prepare an action plan to support the states in implementation of the Policy. With amendments to the Inter State Water Disputes Act in place, it will be possible to settle the pending inter-state water disputes in a time-bound manner, as according to the envisaged amendments the Water Dispute Tribunals have to give their decision within a maximum period of six years.

Among other provisions, the Water Policy 2002 Provides for setting up of River Basin Organizations (RBO) by States for planned development and management of a river basin as a whole or sub basins whereever necessary. The revised Policy gives top priority to drinking water in water allocation followed by irrigation, hydropower, ecology, agro-industries and non-agricultural industries and navigation. The priorities, however can be modified depending on regional considerations. The State Policy will take into account community participation for water resource development and management . (Source: The Hindu and The Times of India, 2 April 2002).

ICID-News Update May 2002

AGRICULTURAL RESEARCH INFORMATION SYSTEM (ARIS)

B.K. Mathur
I/C ARIS Cell, CAZRI, Jodhpur

Agricultural development in the country is facing new challenges on food, nutrition and environmental front because of burgeoning human and livestock population. Quick access to information at global level through electronic media provides the way to address the present and future challenges of Indian Agriculture. Keeping this in view , Indian council of Agricultural Research (ICAR) established the Agricultural Research Information System (ARIS) with the object to develop and strengthen information management culture using computer-based network within National Agricultural Research System (NARS) so that agricultural research become more efficient and effective.

The year 1997 has been of great significance for CAZRI when ARIS programme was launched at the institute under Information System Development (ISD), which is a sub component of National Agricultural Technology Project (NATP). The activities of ARIS were started by creating a centralised work space known as ARIS Cell and with a small computer network consisting of servers, workstations, laser printers, modems and UPS. With consistent and constant efforts, a huge 100 mbps Local Area Network (LAN) of computers and their related peripherals has been established covering all buildings of the institute and catering services to about 60 nodes.

Through LAN we are providing E-mail and Internet connectivity to all the nodes installed at different buildings of the institute using fibre optic and UTP cabling channels and this LAN is the largest fibre optic LAN of the Western Rajasthan. We are catering the electronic connectivity facility through LINUX (Red-hat 7.0), a specialised LAN operating system. To fetch Internet facility and to capture and send the vital information through e-mail, via LAN, the institute has its own 64 kbps, ku-band VSAT system. The LAN is also utilised for the purpose of sharing information on research publications contained in CAB and AGRIS CD's designed and compiled by CABI and FAO through CD-Towers which cater simultaneous access of 14 CD's by any user, thus increasing the efficiency and saving the time of the scientist. Sharing facility of database for crops, landuse, livestock and meteorological parameters developed in respect of all the arid districts of Rajasthan is also provided through LAN to all users at their desk.

To provide and disseminate of CAZRI's research activities a website of CAZRI namely *http://cazri.raj.nic.in* has been developed and launched on Internet which describes the origin and objectives, research achievements, training and future thrust of the institute. Information on research activities of NATP projects running under AED (NATP) and information about ENVIS project taken up by the library have been given links to CAZRI's website.

Statistical and other software have been developed at ARIS Cell to cater the analyses needs of researchers. The ARIS Cell also conducts training courses on use of computer applications in agricultural research for scientists and other employees of the institute.

The future plans of ARIS activities include development of dynamic website for ATIC project which will provide technical know how about research outcomes and technologies developed for the farmers. A dedicated interactive website describing various research activities of a UNCCD based programme TPN-2 on Agro-forestry and soil conservation in Arid, Semi-Arid and Dry Sub Humid regions would be prepared and relevant databases would also be developed using Visual Basic at front end and Oracle at back end.

DROUGHT PROOFING A CLUSTER OF VILLAGES

(His Highness Maharaja Hanwant Singhji Charitable Trust, Umaid Bhawan Palace, Jodhpur – 342006)

His Highness Maharaja Hanwant Singhji charitable Trust in collaboration with Sir Ratan Tata Trust and Aga khan Rural support Programme (1) Services has planned a project to drought proof a cluster of villages in Balesar Panchayat Samiti. The Trust has planned its activities in five Macro Watersheds and one independent catchment index; viz., Nos. 18,12,13,16,17 & IC-1; thus covering and benefiting 15 villages. The Project will be implemented over a period of three years (2002-2005) commencing 01st September, 2002.

Background:

The inherent variable character of rainfall in semi arid West Rajasthan (Jodhpur, Jaisalmer, Bikaner and Barmer) has oftern caused drought, which manifests in terms of crop failure, unreplenished ground and surface water resources, and deprivation of fodder for cattle, thus adversely affecting the livelihoods of people, leading to migration. West Rajasthan, which is mainly desert, get less than 300 mm of rainfall per annum. The region suffers a perennial shortage of water and fodder, and agriculture remains solely dependent on rainfall. There is a defined and true impression that irregular and uncertain rainfall followed by drought and famine is inevitable, every three year cycle, in the region. During the 20th Century, for example, Jodhpur district faced 36 droughts; 13 of which have been classified as severe. There is a total absence of surface water in the region and most of traditional water shortage structures (nadies, tankas, khadins etc.) dry up before the onset of summer during drought years.Drought also tends to affect the livelihood of people due to livestock mortality, as well as distress sale. Women are amongst the worst sufferers, as they are forced to work as labourers in Government relief works, and carry the full burden of domestic duties as menfolk go out looking for livelihoods.

During droughts, the State Government and non-profit organisations provide succour to the affected people through relief works such as: (i) distribution of essential commodities -water, fodder and food at subsidised rates; and (ii) by creating direct and indirect wage employment. These measures provide emergency relief, but do not in any way solve the problem. The Trust with its partner organisations have launched the initiative "Drought Proffing in West Rajasthan" to create lasting solutions by evolving technological and organisational innovations for integrated development of drought prone areas.

The projects objective is to develop a sustainable model of drought proofing for replication in other parts of the region. The cluster selected is a watershed, which lends itself to efficient management of land and other resources, as integrated waterhsed management is the first step towards drought proofing. Initially, a study along with a baseline survey would be undertaken to: (i) assess to land's capacity including hydrology, vegetation, socio-economic; and (ii) site specification to ascertain the existing status of human and livestock pressure on it. Based on the survey, interventions and corrections will be planned and applied. These would include: (a) ground water recharging; (b) supplementing drinking water; and (c) diversifying and sustaining livelihoods.

Project Structure and Finances:

The proposed three-year project (2002-05) is to be steered by a team of professionals, support staff and social workers. A Project Advisory committee comprising of the General Manager of the Trust, represnetatives of Founders Aga Khan Rural Support Programme (1), representatives of Central Govt/State Govt institutions /departments; will lay down the policy guidelines and monitor the project.

GRAPE CROP PRODUCTION AND DROUGHT TOLERANCE

The drought that has plagued the West Texas area for the past several months has caused great losses of cotton, corn, wheat and other crops. However, grapes grown for wine are one crop that is not as greatly affected by the drought as other crops grown in this area.

Country to most crops that are unable to survive extreme heat and high temperatures, grapes are threatened by cold weather, according to Richard E. Durham, Texas Tech Assistant Professor of Horticulture.

"The biggest problem that we see with grape production on the High Plains is cold damage," he said. "If we have extreme cold temperatures in mid-winter and/or a late frost in spring, it will kill the buds so you can't get a crop produced. Also hail storms can be devastating to grape production. Those things combined make our yields on the High Plains relatively low. We produce one or two tons of grapes per acre versus California, which produces five to six tons per acre or more."

Texas Tech University is the home of the Texas Wine Marketing Research Institute, and statistics provided by Director Tim H. Dood reveal the importance of grape production ot the Texas economy.

The Texas wine industry began in the early 1970s, and nearly 20 years later, Texas was the fifth largest wine producing state in the nation. There are more than 3,000 acres of vineyards, and several large wineries have developed state, national and international markets for texas wines, according to the Institute.

Durham said there are about 1,000 acre of grapes in the Lubbock region, and said that the arid climate is favorable for grape growing.

"The grapes that we drink wine from are naturally adapted to hot, dry climates," he said. "Our climate is ideal in that regard. We have hot days and cool nights, and those tend to get the best sugar accumulation with acid levels. so grapes really do not need a lot of rain especially during the fruit ripening period."

Despite the favorable climage, the environment can cause some problems for grapes, which can be affected by insects and other pests. Therefore, Durham and his students are examining wild grapes to held grape producers overcome these potential hazards.

"We examine the potential for using native grapes as rootstocks because they can help different varieties of grapes to adapt to particular soils or other environmental systems," he said. "There are 13 species native to Texas. Historically grapes that have been collected from Texas have been very useful as rootstocks worldwide. We have sent grape cuttings from here to Europe to get rid of pests in the past."

He added that grapes grown in West Texas do not necessarily have the same obstacles as those grown in other areas of the state.

"The High Plains is a very good area to grow grapes and we have had very few bad problems other than the cold to encounter," he said. "However, the Hill country of Texas is having problems with Pierce's Disease, an organism that lives in the vascular system of the grape and causes the vines to die. this is also a problem in California. the disease is spread by a particular insect, but it may be temperature related for we have the same insect here but our grapes are not affected with the same problem that they have."

According to the Texas Wine Marketing Research Institute, 1.76 million gallons of Texas wine was produced in 1997. It is expected that the demand for texas wines may exceed two million gallons within the next five years. In order to keep up with the production, the work that texas Tech researchers are doing with wild grapes will help grape producers overcome environmental hazards that affect their crop.

"Grapes are never going to replace cotton here as a cash crop, but they are a way for our agriculture to diversify," Durham said. "right now the 1,000 acres of grapes we have doesn't meet the demands of the wineries for grape production. If we could get a good handle on how to deal with the cold situation and other problems facing the grape industry, there's potential for the acreage to substantially increase."

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RESEARCH PROVIDES NEW METHODS TO FARMERS TO COMBAT DROUGHT

For years farmers in arid and semiarid regions of the world have had to contend with unfavorable weather conditions while trying to raise crops. However, some years, such as this one, have proved to be more challenging than others due to the drought, which has heavily impacted yields in West Texas. To combat this problem, researchers are working with the agriculture industry to develop methods that will assist farmers during periods of severe drought to reduce their losses.

John R. Abernathy, Dean of the College of Agricultural Sciences and Natural Resources, said this year's drought has been costly and has affected all industries of agriculture production, but he stressed that had it not been for the advances made in new technology during the past 15 years, the losses of crops would be even more devastating.

"We're changing irrigation technologies and cultivation practices," he said. "Also forecasters are predicting weather patterns more accurately and this weather notification management has indicators that would predict certain weather patterns like El Nino."

However, even armed with this helpful information, farmers are unable to dictate weather conditions. therefore, researchers are developing plant species that can adapt to dryland conditions.

"The new USDA-ARS Plant Stress Laboratory will provide cutting-edge research technologies to develop plant species that can utilize their surroundings," he said. "Researchers from Texas Tech will collaborate with scientists from the USDA working at molecular levels in all crops so they can adapt to semiarid environments."

Abernathy said that other technologies, such as better yield monitoring systems, have been developed to show farmers the yields on their fields.

"These can determine if some areas of the field have lower yield than others," he said. "Once a particular area is identified as low-yielding, they can look at the fertility of the soil or see if there is a disease or weed problem, if the irrigation system is not evenly spreading water, or if it is a different soil type from the rest of the field and correct the problem."

He said that farmers are also involved in communication networks so they can exchange useful information to one another via computer.

"The perception of agriculture by many people is the same as it was 50 years ago," he said. "They do not realize that we are involved in a high-tech industry. We are interested in attracting people to this field because there are many opportunities in management, communication and technology skills."

Abernathy said with technological advances, the outlook for agriculture is bright.

"Agriculture is exciting," he said. "It affects everyone. We are truly in a global economy and what happens in China and Russia, as well as other areas of the world, impacts us. Texas Tech University is interested in linkages with other countries so that we can exchange information with one another."

ICASALS Fall 1998 Vol. 28 No. 2

A learned person who is detrimental to a pond, well, tank, garden and temple without hitch may be considered as stupid.

CONFERENCES

Earth Summit 2002
Johannesburg, South Africa: 02-09-2002 to 11-09-2002

The World Summit on Sustainable Development or Rio+10 as it is otherwise known will review that progress which has been made over the past decade since the Rio Summit. Regional and sub-regional preparatory meeting will take place ate 2001. These Prepcoms will cover the South Pacific, held in Samoa, South Asia, held in Sri Lanka, Southeast Asia, held in the Phillppines and a regional meeting to be held in Cambodia. **Details:** Charles Nouhan. UNED UK, 3 Whitehall court, London SW1A2EL, UK. Fax: +44-20-7-9305893. E-mail: cnouhan@earthsummit 2002.org.

International Conference on sustainable Agriculture for Dry Areas for the 2nd Millennium
Shijiazhuang, PR China: 15-09-2002 to 19-09-2002

Participants from many disciplines will consider how to integrate sound crop production technologies, water saving and irrigation, tillage method, optimum fertilization and reduction of agro-chemicals in the environment for the dry regions of the world. Aims to formulate recommendations for innovative procedures for research and technology transfer in sustainable agricultural management. **Details:** Catherine Vachon, Lethbridge Research Centre, Agriculture & Agri-Food Canada, Lethbridge, Alberta T1J 4B1, Canada. Fax: +1-403-3823156. E-mail: vachonc@em.agr.ca. Web: http://res2.agr.ca/lethbridge/hebei/confindex.htm

Sixth International conference on Greenhouse Gas Control Technologies
Kyoto, Japan: 01.10.2002 to 04.10.2002

Main aim of the conference is to provide a forum for the discussion of latest advances in the field of Greenhouse Gas Control Technologies, including capture, storage and utilization of carbon dioxide. Will also include discussion on mitigation options such as efficiency increase, use of renewable sources of energy and social impacts. **Details:** GHGT-6 Secretariate, Norifumi Matsumiya, Planning and Survey Dept. RITE, 9-2 Kizugawadai, Kizu-cho-soraku-gun, Kyoto 619-0292, Japan. Fax: +81-774-752314. Email: ghgt@rite.or.jp Website:www.rite.or.jp/GHGT6/.

Water 2002 Exposition, 27-29 November 2002, New Delhi

Water 2002 Exposition is planned as a technology showcase on Water Resources Management in the 21st century for three days on 27-29 November, 2002, in Hotel Taj Palace, New Delhi in conjunction with the international Regional Symposium on Water for Human Survival, also being held at New Delhi. There is a vast scope for water development organisations within as well as outside the country to project the state of art technology by demonstrating their capability, either in providing services or equipment by taking part in the exhibition. For booking a stall in exhibition, contact the Exhibition Manager at the address given below: Mr. sandeep Joshi, Manager Conferences & conventions, Cox and Kings (I) Limited, Indira Place, H-Block, Connaught Circus New Delhi-110001, Phone : 3738398 / 3738811 , Fax - 3752616 / 3317373, E-mail : sandeep@coxkings.com

The 2nd International Conference on "sustainable Agriculture, Water Resources Development and Earth Care Policies", 18-20 December 2002, New Delhi.

This conference is being organised by bhoovigyan vikas foundation (BVF). World Summit on Sustainable Development (WSSD), is meeting in August 2002 at Johannesburg, South Africa. The summit aims to move from commitments to action, in five specific areas - Water, Energy, Health, Agriculture and Bio-diversity. Above conference, closely following on the heels of the WSSD, proposes to discuss issues pertaining to sustainable agriculture, Water Resources Development and Earth Care Policies.

For details contact: Mr. M. Moni, DDG, National Informatics Centre, Secretary General, Bhoovigyan Vikas Foundation, Room No. 626, NIC, A-Block, CGO complex, New Delhi-110003, E-mail: bhoovigyan@rediffmail.com , WebSite: www.bhoovikas.nic.in

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ALN Abstracts

Geospatial technologies: Tools for understanding complex systems - Katherine Waser

Within the past decade, there has been an explosion in the availability and use of geospatial technologies such as Remote Sensing (RS), Geographic Information systems (GIS) and Global Positioning Systems (GPS). These tools have greatly aided human efforts to understand the world's complex, large-scale processes (such as the EI Nino-southern Oscillation phenomenon); to monitor and even predict the efects of human activities on surrounding ecosystems (for example, effects of land use change or the impacts of urban growth); and to begin to design methods for managing resources in a more sustainable way (as in the case of Famine Early Warning Systems). In this issue of the *Arid Lands Newsletter*, we being to look at some of the ways in which these technologies are being applied to the world's drylands.

Remote Sensing of urban ecology at the Central Arizona-Phoenix Long term Ecological Research Site- William L. Stefanov

The ralization that virtually all ecosystems on earth have experienced some degree of human alteration or impact has highlighted the need to incorporate humans (and their environmental effects) into ecosystem models. This change in ecological thinking is well demonstrated by the incorporation of two urban sites (Phoenix, Arizona, and Baltimore, Maryland) into the U.S. National Science Foundation's Long Term Ecological Research(LTER) network in 1997. This article focuses on Phoenix, a rapidly expanding urban center in a semiarid to arid climate. The large areal extent of the Central Arizona-Phoenix Long Term Ecological Research (CAP LTER) site (~ 7,900 km2 centered on the Phoenix metropolitan area) necessitates a significant remote sensing component to many research activities, due to both the size of the study region and the ruggedness of the terrain in some areas. The use of remotely sensed data is crucial for scaling up detailed site-specific investigations, as well as for providing synoptic spatial and temporal information on urban/exurban surficial materials, patterns, and processes. Remote sensing is currently used in such areas of CAP LTER research as land cover characterization and change, vegetation dynaimcs, urban climatology, and geological/geomorphological studies. This article presents some of this research to provide a general overview of the types of studies taking place within the CAP LTER project.

Monitoring playa systems using remote sensing: Methods and applications- Robert G. Bryant

Within most dryland regions, perennial lakes are rare; playas (arid, ephemeral lakes without surface outflow) are more common. Closed basins containing playas are very sensitive to regional changes in rainfall patterns. However, as playa systems operate under a low-precipitation/high-evaporation regime (often <1:20), hydrological changes resulting from changes in precipitation and evaporation are not generally a simple volume/area response. Instead, playas demonstrate changes in the timing, magnitude, frequency and residence time of specific ephemeral flooding events; generally a much more complex response that is less well understood.

Nevertheless, flood inundation records from these environments, if monitored properly, could play a role providing both contemporary and past information relating to regionally synchronous changes in P/E for specific dryland regions for which climate data are either sparse or unreliable. This, in turn, would be helpful for understanding climatic trends within specific drylands and would aid the understanding of sedimentary processes within playa basins. The author's research examines the application of time-series remote sensing data to monitor and understand inundation regimes of large, climatically sensitive playas in Africa. More recently, the effects of

inundation on dust emissions from specific playas has also been explored. A case study from Etosha Pan, Namibia, outlining both approaches is presented here.

Mapping groundwater recharge and discharge zones in the Kalahari: A remote sensing approach - Heike Klock and Peter Udluft

Drylands populations rely on groundwater almost exclusively as a source of drinking water. Thus, for sustainable groundwater management it is essential to estimate the groundwater recharge reliably. This task is complicated by the fact that groundwater catchments in arid areas are very large due to a lack of discharging streams. Not only that, surface properties vary remarkably in these large catchments, and they influence the recharge amount significantly. This makes detailed surface mapping an essential component of regionalization of groundwater recharge. In this case study from namibia, three sources of mapping data were considered before satellite images were chosen as the only appropriate input parameter for automatic classification, such as feature mapping. Use of such images also allowed accurate characterization of vegetated areas, important for estimating groundwater discharge amounts. Combining recharge and discharge data resulted in a complex distribution image with small-scale recharge-discharge systems within a larger catchment for the northeastern Kalahari of Namibia. The detailed distribution map also led to an improved understanding of the total groundwater balance for this area.

Using remote sensing and indigenous knowledge for management of ephemeral surface water - Eric Patrick

Two approaches are described for identifying suitable areas for water harvesting in a semi-arid area of Kenya and an arid area of Jordan, both using satellite imagery but in the latter case as interpreted by land users. Experiences of each approach in the context of applied research are described in order to present them as real world tools for assisting agents of development t understand the spatial distribution of surface water flows in environments where large rain events are relatively rare and therefore difficult to observe directly.

Monitoring dust storms and mapping landscape vulnerability to wind erosion using satellite and ground-based digital images - Pat S. Chavez, Jr., David J. Mackinnon, Richard L. Reynolds, and Miguel G. Velasco

Wind-induced dust emission in the southwestern United States is important regionally because of its impact on human health and safety and its influence on ecosystem dynamics. Wind velocity, sediment availability, and surface conditions are important factors that determine landscape vulnerability to wind erosion. The project described herein entails investigating remotely sensed satellite, airborne, and ground-based image data to detect and monitor active dust storms, as well as to map areas vulnerable to wind erosion in the Mojave Desert of the southwestern United States. Data collected by various satellite imaging systems, a ground-based digital camera station, and several in-the-field instruments during several dust storms are being used to correlate landscape characteristics to wind erosion vulnerability. Multispectral satellite images were used to generate a wind erosion vulnerability image that represents a first-order vulnerability image map, with field data and observations being used to validate the results. The GOES satellite imaging system is the only one available that has the required temporal resolution to detect and monitor active dust storms; however, its spatial and spectral resolutions are low, and only very large dust storms can be detected. A satellite imaging system with three to five spectral bands and approximately 100 m spatial and 15 to 30 minutes temporal resolutions is needed to effectively monitor short-lived events.

Using geospatial technologies to understand prehistoric human/landscape interaction in arid Australia - Patricia C. Fanning and Simon J. Holdaway

Surface scatters of stone artefacts are ubiquitous across arid Australia. They are the most common feature of the Australian archaeological record, but they remain difficult for archaeologists to interpret. Among the many reasons for this are the lack of understanding of geomorphic processes that have exposed the artefacts at the surface, and the lack of suitable technology for documenting and analyzing this vast record. the Western New South Wales Archaeological Programme, a collaborative venture between archaeologists, geomorphologists and cultural heritage managers, was established in 1995 to address these limitations. In this paper, we describe geospatial survey protocols and chronological frameworks developed to accommodate the dynamic geomorphic setting of surface artefact scatters in arid Australia. Differential GPS, total station survey, and GIS are used to survey, document, display and analyze artefact data in their landscape settings. Examples from two different locations show that the landscape, and the archaeological record it preserves, is spatially and temporally disjointed. Models of settlement behavior in hunter-gatherer peoples, and cultural heritage mangement plans, must take account of these discontinuities.

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ARID LANDS NEWSLETTER May/June 2002, No. 51

Rio to Johannesburg-1

The UN Conference on Environment and Development (UNCED) known as Earth Summit was held at Rio 10 years ago from 3-14 June 1992. It was held on the 20th anniversary of the first conference on Human Environment held at Stockholm by UN, focussing world attention for the first time on environmental degradation. During these 20 years, the world community increasingly came to recognise that environmental protection with better natural resource management is possible only if integrated with socio-economic issues of poverty and underdevelopment. but the last ten years saw unprecedented activity and concerns cropping up, on the front of development for sustaining human and eco-systems, the two sides of the same coin.

At the end of the earth Summit, the representatives of governments and NGOs of 178 countires adopted Agenda 21 to lead the world into the 21st century, through a declaration on environment and development comprising 27 principles. the agenda was elaborated through a blueprint for action for global 'sustainable development', running into as many as 40 chapters. The 1st principle of the declaration proclaimed that the human beings were at the centre of concerns for sustainable development and the 2nd reiterated that the States have the sovereign right to exploit own resources pursuant to their own environmental and developmental policies.

Chapter 18 of the Agenda 21 was devoted to 'Freshwater' which constitutes the basic rationale for ICID. Chapter 1 gave a preamble, chapters 2-8 provided social and economic dimensions. Chapters 9-22 covered conservation and management of resources for development; chapters 23-32 to strengthening the role of major groups comprising women, children, youth, indigenous people, **NGOs**, local authorities,

workers and trade unions, business and industry, **S&T community and farmers**. chapters 33-40 covered menas of implemenation. **ICID's mandate is related to several of these chapters besides chapter 18 and is concerned with the major groups highlighted.**

Besides the Agenda's main message of sustainable development, the chapter 18 listed 7 programme areas, the first one being '**Integrated Water Resources Development and Management (IWRDM)**'. It also laid down: water resources assessment, protection, provision of drinking water and sanitation, water for urban, and **rural development with sustainable food production** and impacts of climate change. ICID has recognised that for unknown reasons and wrongly, **IWRDM has been shortened to IWRM** during the decade. continued importance of **development** needs to be emphasised, particularly for the developing countires. ICID has worked on many of the issues of concern during the decade.

It is however much less known as to who is charged with monitoring and implementation of Agenda 21. The UN Economic and Social Council (ECOSOC) established a 'commission on sustainable Development' (CSD) in December 1992 for this purpose. Over 50 members and more than 1000 NGOs contribute to the work of this functional commission of the ECOSOC, of which **ICID is an accredited NGO** which is playing its due role. The CSD has been meeting every year for the last ten years, in which ICID has participated when and where called for.

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