

# ARID LANDS

NEWSLETTER

Fall/Winter 1987

Volume 25



Improving  
Agricultural  
Production  
in West Africa

The University of Arizona ♦ Office of Arid Lands Studies

*The cover photo shows women  
pounding sorghum in a  
Mauritanian village along the  
Senegal River. Such agricultural  
activities are of interest to the  
Mauritania Agricultural Research  
Project II, a farming systems and  
extension program working to  
improve agriculture in the Senegal  
River Valley. The AGRES II project is  
featured in this issue of the Arid  
Lands Newsletter.*

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The *Arid Lands Newsletter* is published semiannually by the Office of Arid Lands Studies, University of Arizona, and is distributed worldwide without charge. The purpose of the Newsletter is to inform readers of current activities of the Office of Arid Lands Studies and to present articles of interest to arid lands researchers worldwide.

We'd like to hear from you. Address letters of comment, requests for future mailing, and items about projects that may be of interest to our readers to:

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*This is the first issue of the Arid Lands Newsletter since the retirement of Patricia Paylore, the Newsletter's originator and editor for 11 years. We at the Office of Arid Lands Studies would like to express our sincere appreciation to Pat for the firm foundation she helped to establish and upon which we will continue to build.*

*Most of you, the Newsletter's readers, know about the Patricia Paylore Fund. This is an endowment that was established in honor of Pat to help support the publication of the Arid Lands Newsletter. We would like to thank you for an enthusiastic response to the Fund. It is further confirmation that the Newsletter is appreciated throughout the world.*

*Perhaps this letter best expresses the thanks we all would extend to Pat.*

Dear Patricia:

I was delighted to hear of the establishment of an endowment fund in your honor to support the *Arid Lands Newsletter*.

It seems a fitting tribute that you should be recognised in such a lasting and very practical way. The Newsletter has been of great value in communicating with arid land scientists in many parts of the world and I am sure has given stimulus and focus to a great deal of the valuable work now being done.

Apart from the Newsletter, your publications stand as an outstanding monument to your work on arid land environments. But probably even more important, though less visible, are the personal friendships and associations with scientists and institutions that have led to many ideas and a great deal of fruitful collaborations. I am honored to have been part of that wider circle.

I know that retirement in your case represents only a transition in your working life. But it is an appropriate time to say congratulations on outstanding work.

All the very best for the future. I hope to see you again soon.

Kind personal regards,

Abdulbar A. Al-Gain  
Vice-President

Meteorology and Environmental  
Protection Administration  
Kingdom of Saudi Arabia

From all of us at the Office of Arid Lands Studies who are honored to have been your colleagues—Thanks, Pat, and all the very best for the future!

Kennith E. Foster  
Director  
Office of Arid Lands Studies

# Improving Agricultural Production in West Africa

*F*atimata is a woman in her thirties who recently has been widowed. She lives with her four young children, all under the age of 13, and her widowed and sick mother. Her eldest son, who is 12, goes to school and so cannot help very much with his mother's farming. Fatimata inherited a field in the dieri (rainfed agriculture area) as well as one in the waalo (recession agriculture area). She does not have the labor to farm the waalo field so she sharecrops it to a neighbor. The waalo received virtually nothing from its harvest. She planted her dieri field this year in melons and cowpeas, but the crops received too much water and rotted, leaving nothing to harvest. Fatimata has no rice parcel of her own but worked on two relatives' parcels in return for a portion of the harvest. She helped with transplanting and harvesting and received from 8 to 12 kilograms of rice a day, although she had to wait until the harvest was complete to receive her share. She uses this rice both to exchange for other foods and for consumption.

*Fatimata has few other sources of income and depends primarily on the help of her relatives. She has already sold all her jewelry and other personal items of value, and owns no livestock. She collects wild foods when she has time, and works in the village vegetable garden with the help of her children. The family eats only one to two kilograms of cereal a day, and on some days when there is no grain, they "simply sit with crossed arms."*

Women and children like Fatimata and her family desperately need food. They lack reliable access to food supplies, and have few options open to them for generating income in the rural areas.

This is typical of the situation in Mauritania, West Africa. Four-fifths of this country receives less than 100 millimeters of rainfall per year. The majority of its inhabitants are nomadic herders or settled farmers who live within a subsistence economy and only occasionally supplement their incomes by working for wages or selling produce in local markets. Dependent on seasonal floodwaters for most of its agriculture, Mauritania is a country that could ill afford to be hit by a severe drought, yet in the 1970s that is exactly what happened. The nation is still recovering from the setback.

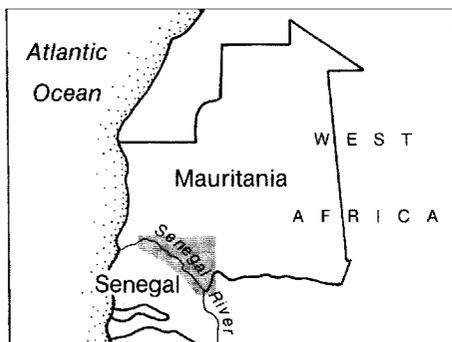
The drought was devastating to agricultural production in Mauritania. Production of rice and other cereals declined from a total of 77,000 tons in 1980-81 to 20,950 tons in 1983-84. Mauritania currently produces only seven percent of its total food consumption.

*In the farming systems research approach farmers and pastoralists are viewed as the ultimate source of information.*

The Mauritania Agricultural Research Project II (AGRES II) is a multidisciplinary farming systems research and extension program whose goal is to improve the agricultural and farming systems now operating in the Mauritanian portion of the Senegal River Valley. A cooperative venture between the Mauritanian Centre National de Recherche Agronomique et de Developpement Agricole (CNRADA) and the University of Arizona, the project is funded by the U.S. Agency for International Development and is administered by the University's Office of Arid Lands Studies for the College of Agriculture.

The primary goal of the AGRES II project is to improve the standard of living of farm households by: 1) increasing agricultural production, especially of staple foods, and 2) arresting the deterioration of the valley environment.

AGRES II plans to achieve its goals in the following ways: by assisting CNRADA in establishing itself as an effective research institution so that it may reach its goal of meeting Mauritanian farming needs; by helping to develop cooperation among Mauritanian agricultural organizations and institutions; by introducing farming systems research and extension as a method to improve Mauritanian agriculture; and by providing training opportunities for CNRADA researchers to assure the project's continuation as a Mauritanian program.



*The study area includes four major agroecological zones. In the Delta and Lower Basin, irrigation and some recession agriculture is practiced; in the Central Middle Valley, recession, irrigated and rainfed agriculture are important; and in the Upper Middle Valley agriculture is primarily rainfed.*

AGRES II unites researchers from the UA with counterparts from CNRADA in Kaédi, Mauritania. The project team in Kaédi consists of a chief-of-party and an administrative manager, both from the UA. A project coordinator from CNRADA and two other part-time Mauritanian researchers complete the team. Specialists with expertise in soil science, fisheries, and other critical areas, supplement project members on a short-term basis. The project is administered by researchers from the UA's Office of Arid Lands Studies who provide logistical and fiscal support for the Kaédi team.

CNRADA, an autonomous research organization within the Ministry of Rural Development, is responsible for overseeing all agricultural research in Mauritania. The eight divisions of the organization focus on grain crops, irrigated rice, vegetables and fruits, soils, pre-extension, crop protection, agro-climatology and forage. CNRADA has obtained promising results with experiments on irrigated rice, irrigated vegetables and fruit trees.

Some of the technologies developed by CNRADA are ready for on-farm testing. However, budgetary constraints and weak linkages between research and extension have limited testing and transfer of technology. This issue will receive much more emphasis from AGRES II. Another major objective of the AGRES II project is to strengthen research-extension linkages. Toward this end, regional workshops focusing on farming systems/extension have been instituted. And to assure permanent technical competence, five researchers from CNRADA are pursuing degrees at the UA in agriculture.



*The Mauritanian portion of the Senegal River Basin has been particularly hard hit by the Sahelian drought. This region forms the study area for the AGRES II project.*

**A**GRES II is designed as a farming systems project. In the farming systems research approach farmers and pastoralists are viewed as the ultimate source of information. Information provided by the agriculturalists themselves is vital in directing the work of researchers whose objective is to relate their work more precisely to the actual problems and resources of the farmers. This avoids the problem of disconnectedness between agricultural research and on-farm needs.

In addition to establishing contacts with farmers, the farming systems approach helps foster connections among organizations involved in development work. Organizations involved in the AGRES II project include the Mauritanian Ministry of Rural Development, the Health Ministry, SONADER, the U.S. Peace Corps, and the University of Leiden in the Netherlands.

Prior to conducting their surveys with farmers, researchers conducted an aerial survey of the region. (See related article, page 10.) By gathering data from the air, they were able to determine the best locations in which to interview farmers. Population density, relative village wealth, types of crops grown and other valuable data all were gleaned from the preliminary aerial survey.

Once appropriate locations were determined, teams of physical/biological scientists and social scientists conducted extensive surveys. Interviews were conducted in the fields away from the village. Team members collected data in 34 villages on general village characteristics,

*Unless steps are taken to lessen environmental degradation, crop production improvements will not have much long-term impact.*

cropping patterns, animal husbandry, off-farm employment and marketing. In addition, the survey focused on consumption patterns. (See related article, page 9.)

Surveys reveal the following general characteristics of farming systems along the river:

**Four cropping systems** exist in the Senegal River Basin: traditional rainfed agriculture, traditional recession agriculture, small irrigated perimeters and large irrigated perimeters.

**Livestock rearing** remains an important activity carried out by all ethnic groups along the river.

**Complementary and competitive relationships** exist between pastoral groups and sedentary farmers.

**Charcoal production** is a short-term economic alternative for farmers who need to supplement their food supplies and income.

**Off-farm income-generating activities** are pursued by many farmers to diversify their income sources (e.g., farm labor, milk and product sales, herding, construction work, mill operation).

**Young men permanently migrate** from villages and send remittances back to their families.

**Many farmers migrate seasonally** to urban areas, agricultural settlements, or to Senegal to supplement their income.

Farmers combine various economic strategies to meet their families' basic needs. They may be involved in rainfed agriculture, recession agriculture, and irrigated agriculture at the same time. They may also pursue other economic activities to supplement their income and reduce their vulnerability to crop failures. If improvements are to be made in existing systems, it is essential to understand each of the components in the farming system and how they interrelate.

A variety of factors limit agricultural production in the Senegal River Valley. The environment is degrading rapidly; farmers lack access to land, to transport, and to appropriate technology; the market infrastructure is inadequate; extension is ineffective; animals are destroying crops; young men are migrating at a rapid rate; and there is potential competition among agricultural activities and some cultural traditions.

In response to these constraints, farmers have adopted compensatory strategies which, in some cases, may exacerbate the problems. The case of environmental degradation provides a good example of adaptation. Lack of available resources has caused some farmers to turn to wood cutting and charcoal production which provides money to meet immediate food needs. This, unfortunately, contributes to deforestation and, in the long run, accelerates the process of degradation.

Unless steps are taken to lessen environmental degradation, crop production improvements will not have much long-term impact. One recommendation involves integrating tree cultivation more effectively into agricultural production. Suitable trees could be planted as shelterbelts to reduce wind erosion and sand encroachment. These trees could also provide firewood, building materials and fodder. Trees that might be suitable are mesquite (*Prosopis spp.*) or any of a number of *Acacias*.

As the above example illustrates, an emphasis on long-term objectives is essential if agricultural production is to be improved in the Senegal River Valley.

Researchers have identified a number of areas that warrant further investigation. Among these are: irrigated agriculture, cultivation of grain crops and vegetable crops, crop protection, livestock production, soil analysis, climatological patterns, and pre-extension and farming systems activities.

Research options include:

- comparing the performance of rice, maize and corn on various soil types
- investigating alternative crops that use less water
- investigating the potential of sesame as an oil seed crop
- developing vegetable varieties adapted to different seasons and possessing varying maturation periods
- improving cultivation through better water management, cultural practices and input use
- improving vegetable varieties
- improving transport, storage and preservation of vegetables
- developing pest-resistant varieties
- introducing cropping strategies that minimize damage by birds
- incorporating forage crops more directly into cropping systems
- improving livestock production
- producing accurate soil maps



- developing land use assessment methodologies for determining appropriate use of land resources
- analyzing climatological, environmental and hydrological patterns

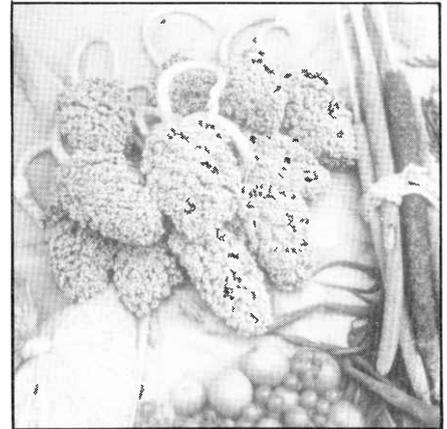
A key to the viability of research in many of these areas is conducting on-farm trials to test technologies and new cultivation techniques under actual conditions.

The goal of the AGRES II project is to improve the quality of life for Mauritanian farm households. To achieve this goal, development specialists are implementing changes that regional institutions will be able to sustain. Their work includes institutionalizing effective research methodologies, improving research-extension links, enhancing CNRADA's administrative effectiveness, and maximizing training opportunities for Mauritanian researchers and administrators. ◆

Sources:

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2. Stone, M.P., B. Gaye and T.R. Frankenberger. 1986. Food Consumption in the Senegal River Valley: A Rainy Season Farming Systems Reconnaissance Survey in the Middle Valley Between Podor and Matam, Senegal. Senegal Agricultural Research Project II. Office of Arid Lands Studies, University of Arizona, Tucson.
3. N'Gaide, H., M.B. Lynham and T.R. Frankenberger. 1986. Farming Systems Along the Senegal River Valley: Agricultural Research Alternatives. Report No. 2. Mauritania Agricultural Research Project. Office of Arid Lands Studies, University of Arizona, Tucson.

To obtain further information on the Mauritania Agricultural Research Project II contact: Michael E. Norvelle, Project Director, AGRES II Project, Office of Arid Lands Studies, College of Agriculture, University of Arizona, 845 North Park Avenue, Tucson, Arizona 85719, USA.




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## SISTER CITIES

Nouakchott, Mauritania, and Tucson, Arizona—what do these two cities have in common? Well, for one, they are newly established Sister Cities under a program founded to initiate personal relations between people in different countries. The philosophy of the program is that once people have established contact with one another, then economic, technological and cultural exchange can occur and each community can benefit.

Nouakchott is the capital of Mauritania. With a population of 600,000, and combatting conditions imposed by the drought of 1973, Nouakchott is working to surmount some of the same obstacles as Tucson. Both cities are faced with diminishing groundwater supplies, transportation problems and urban sprawl. Hopefully the exchange between the two cities will provide a framework for solutions to some of their shared problems.

# Nutrition in Agriculture

Food preferences play an important role in farmers' acceptance of new and improved cultivars. To better understand these preferences along with the farmers' current cropping strategies, researchers interviewed farmers in Mauritania and Senegal for the Mauritania Agricultural Research Project II (AGRES II).

In conjunction with the farming systems reconnaissance survey, a food consumption survey was conducted in 27 Mauritanian villages in February 1986. Both surveys provided information for establishing research priorities for farming systems in the Senegal River Valley.

Food preference is affected by a variety of factors including supply, cost, preparation time, variety of dishes and cropping strategy. Supply involves not only what the farmers grow, but also the extent of imports from outside the region and their availability for purchase. It appears that sometimes the less available a foodstuff is, the more it is preferred. Millet, for example, is commonly preferred, although it is the grain in scarcest supply.

One of the primary goals of farmers in this region is meeting family consumption needs; food consumption information is therefore considered to be of primary importance in any proposed intervention.

Incorporating nutritional concerns into agricultural

development projects is the focus of a cooperative agreement recently established between the University of Arizona and the University of Kentucky with the Nutrition Economics Group, Office of International Cooperation and Development, U.S. Department of Agriculture.

the food consumption needs of people in the project area. Development projects typically emphasize production of agricultural products with little or no idea of local food consumption habits and needs. There is a current need for research and provision of methods for



*Food consumption surveys include information on food preferences, preparation techniques, purchases, prices, and specialty foods for childbearing women and their infants.*

The objectives of the agreement are: 1) to establish a cooperative framework for technical and research support of a program for applied and technical assistance designed to assist developing countries improve the food consequences of their agricultural projects and 2) to increase the capabilities of U.S. educational institutions to develop or increase expertise in this field.

Agricultural development projects frequently fail to meet

incorporating nutrition and food consumption needs in these projects. The agreement is a first step toward that end. ♦

To learn more about incorporating nutritional concerns into agricultural development projects contact: Timothy R. Frankenberger, Office of Arid Lands Studies, College of Agriculture, University of Arizona, 845 North Park Avenue, Tucson, Arizona 85719, USA.

# Aerial Perspective Adds a New Dimension to Agricultural Surveys

Remote sensing, a method to study landforms from images gathered by aircraft or satellite, provides a look from above. And by giving a different view of the land, remote sensing is a useful tool for University of Arizona and Mauritanian researchers who are working together to study Mauritanian farming practices.

The researchers are involved in the Mauritanian Agricultural Research Project II (AGRES II). A farming systems research effort, AGRES II has been collecting extensive information about Mauritanian agricultural production, including information about farm household activities, water sources, soil conditions, transportation and marketing. Remote sensing helps researchers collect this information.

"Remote sensing has been used mostly for what we call 'wall-to-wall' surveys where total satellite coverage of a large area is achieved and a map is produced," says Charles F. Hutchinson, Director of the Arizona Remote Sensing Center (ARSC) in the UA's Office of Arid Lands Studies. However, "what we are interested in doing in Mauritania is gathering very detailed information about what is going on on the ground at selected spots along the river."

A technique new to farming systems research, remote sensing adds information to what the research team collects through surveys, interviews with farmers, and observations of agricultural practices. Remote sensing information also helps researchers plan their ground reconnaissance strategy and documents conditions at the inception of the project to measure future progress.

"We are trying to get information that will complement or supplement or enhance the kinds of information they get on the ground," says Hutchinson.

Through remote sensing, for example, the density of plants within any field or sample of fields can be determined, Hutchinson says. "You can measure plant density on the ground, but it would take you quite a long period of time to do that in a village, and we can do it with just two or three photographs."

Also the relative wealth of a village can be estimated through remote sensing because of the many details that are revealed. "You can't just look at one indicator to determine if a village is well-off or not," Hutchinson

says. "We have to look at a number of things. For example, we found that the percentage of roofs with metal or tile is a good indicator of village wealth.

Another seems to be garden area. It seems that villages that are better off have more areas planted in gardens. If we find both indicators in one village, we can be reasonably sure that the village is well-off."

Information acquired by remote sensing can sometimes be interpreted by researchers to help plan the kind of assistance to provide to Mauritanian farmers. A study of plant density provided such clues.

By demonstrating the decrease in plant density as distances increase from the river, it was shown that farmers understood the relationship between soil texture and its water holding capacity, Hutchinson says. Further, this finding indicates that farmers understand that plants have different water requirements.

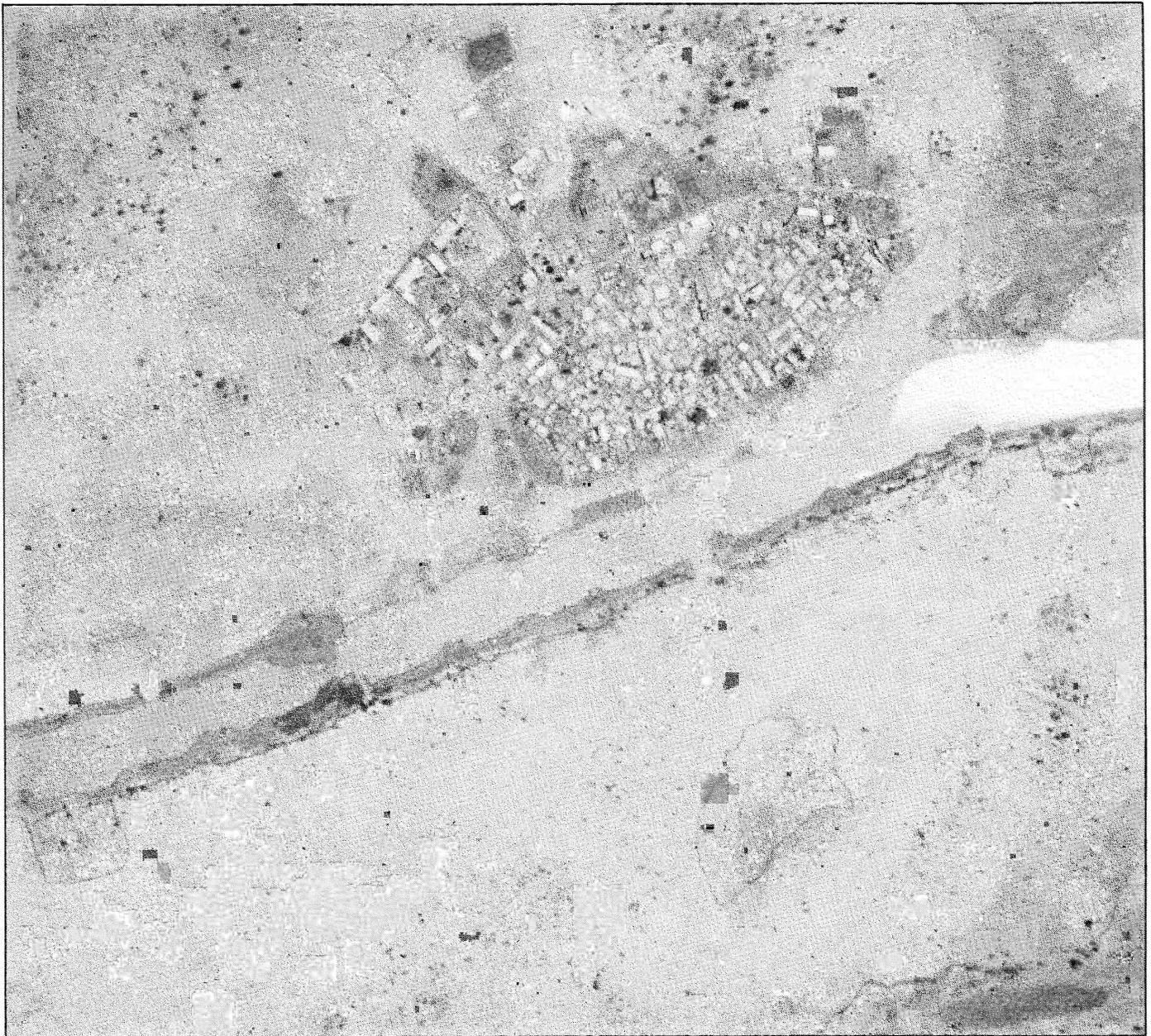
Researchers now feel confident that they can suggest a new crop to farmers, and they will understand that its water requirement and its growth per unit area may vary from what they currently grow. "Prior to this there was some concern that farmers might be too bound by tradition to change the ways they plant," Hutchinson says.

Remote sensing is an eye in the sky and, along with documenting the labors and projects of farmers, it has brought to light illegal activities occurring in forest reserves.

Although forest reserves are off limits to wood cutters, remote sensing pictures show that trespassers are, in fact, cutting wood in the remote inner sections of the reserves that are difficult to patrol. "In our photographs you can see that there are large charcoal pits in the middle of those areas," Hutchinson says. "Remote sensing may prove to be a useful tool to monitor that kind of activity."

Remote sensing for AGRES II is done in two phases. Oblique video imagery is carried out first to get a broad reconnaissance view of the land. The oblique video imagery is then examined by the research team which selects villages to be photographed more closely during future flights.

A Piper aircraft was used for the Mauritanian photographic missions. The rear cargo door was



*Remote sensing provides information about villages and their agriculture that cannot be easily acquired on the ground. Combining 35-mm aerial photography with*

*oblique and vertical video proved to be an effective and inexpensive alternative to conventional aerial photography and satellite data.*

removed and a camera mount fixed to the floor to allow a camera to extend out the open door. A color video camera and 35-mm cameras were used.

ARSC's methods and activities in Mauritania reflect a primary concern of its applied research program which is the development of low-cost remote sensing systems, such as 35-mm photography and video. The United States Department of Agriculture has supported ARSC's research in this area.

Prior to the Mauritanian project, ARSC conducted mapping projects in the Grand Canyon and Organ Pipe

National Monument in Arizona. The center was also involved in a project in Senegal. ◆

Further information on OALS remote sensing capabilities can be obtained by contacting Charles F. Hutchinson, Director, Arizona Remote Sensing Center, Office of Arid Lands Studies, College of Agriculture, University of Arizona, 845 North Park Avenue, Tucson, Arizona 85719, USA.

*Joe Gelt*

# Second International Conference on Desert Development

Cairo, Egypt, was the setting for the Second International Conference on Desert Development January 25-31, 1987. The Desert Development Center of the American University in Cairo and the International Center for Arid and Semi-Arid Land Studies at Texas Tech University, Lubbock, Texas, sponsored the conference.

Attending the conference were specialists in desert agriculture, renewable energy, community development and economics.

Following are some of the recommendations of the advisory committee, the scientific program committee and session chairpersons.

- Continue the impetus gained during the present conference and convene regular meetings among arid lands scientists.

Recommend establishment of an organizing group that will plan the convening of the next conference in two or three years. Countries proposed to host that conference include China, Australia, India and Pakistan.

- Strongly encourage greater active international and regional cooperation in arid land and desert development among both organizations and individuals.
- Believe that assessment of desert natural resources and evaluation of existing ecosystems should be the basis for development.
- Emphasize need for sustainable development and the avoidance of land degradation.
- Strongly support an integrated approach to arid and desert land development and the adoption of appropriate short-term and long-term strategies.

An International Committee for Arid Land Development was organized at the conference and approved by vote at the closing plenary session. Committee members are:

Adli Bishay, American University in Cairo (Chairman)  
Harold Dregne, Texas Tech University (Co-chairman)

Adel El-Beltagy, Minister of Agriculture of Egypt (Secretary General)

Idris Traylor, Texas Tech University

Jimmy Hillman, University of Arizona

Kennith Foster, University of Arizona

Gerald Thomas, New Mexico State University

M. El-Kassas, Cairo University

Gerald Wickens, Kew Gardens, England

Di Xinmin, Institute of Desert Research, People's Republic of China

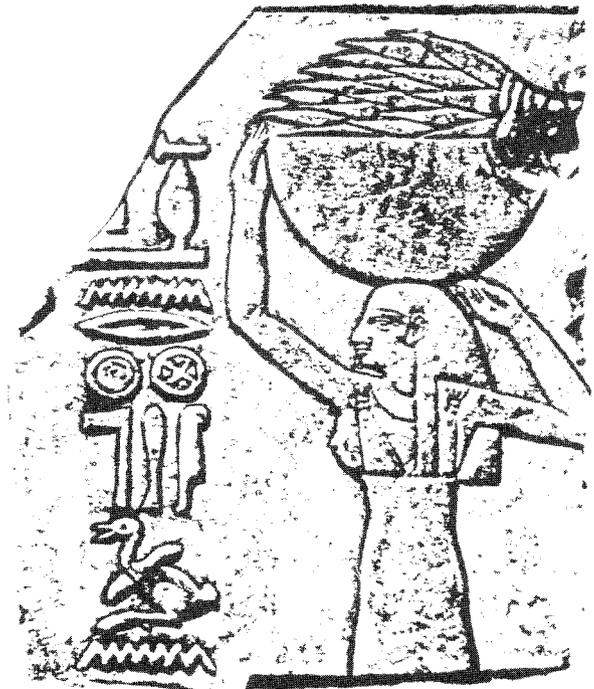
Mulugetta Mekuria, Institute of Agricultural Research, Ethiopia

Alberto Rodrigues, Ministry of Agriculture, Mexico

Benjamin Figueroa, University of Chapingo, Sandoval, Mexico

M.I. Sheikh, Forest Institute, Pakistan

David Nygaard, Winrock International



# Consultants Visit Arabian Gulf University

The Arabian Gulf University (AGU) was established in 1980. A creation of seven Gulf States—Bahrain, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates—AGU is located in Bahrain and serves all member states.

AGU is intended to serve as a center for graduate training. Ultimately, it is envisioned that 70 percent of AGU students will be enrolled in various graduate programs. There are now three colleges that comprise AGU: Medicine, Education and Applied Sciences. The College of Medicine began operation in 1984 and currently has 194 students. The Colleges of Education and Applied Sciences were established in 1986. The College of Applied Sciences contains the Departments of Biological Sciences, Physical Sciences, and Social and Economic Sciences.

The principal program administered by the College of Applied Sciences is the interdisciplinary Desert and Arid Zone Sciences (DAZS) program. There are now six students enrolled in the program. In addition to departments, a remote sensing center has been proposed that would train students in remote sensing, photogrammetry and cartography and provide support to AGU research activities.

All AGU programs are now housed in a modern facility at Sulmaniya Campus in Manama. In late 1987, the main campus will

open at Sukhrir, 25 kilometers south of Manama, and then only the Medical College will remain at the Sulmaniya Campus in Manama.

In February 1986, AGU convened a meeting of international experts to assist in the development of the DAZS program curriculum. The University of Arizona (UA) Arid Lands Resource Sciences (ALRS) program was represented by Michael Bonine of the Department of Oriental Studies and the Department of Geography and Regional Development.



*Faculty members of the College of Applied Sciences, Arabian Gulf University and participants in the training course on "Assessing International Information Sources."*

In April 1986, Charles Hutchinson, from the University of Arizona's Office of Arid Lands Studies, visited AGU as Director of the Arizona Remote Sensing Center and Chairman of the ALRS committee. Hosting the visit was Professor Ahmad A. El-Aaghib, now Dean of the College of Applied Sciences. During this

visit, Professor El-Aaghib and Hutchinson outlined a framework for cooperation between AGU and the UA.

Building on this agreement, Charles Hutchinson and Barbara Hutchinson, Manager of the Arid Lands Information Center at the Office of Arid Lands Studies, were invited to AGU for a month-long consultancy in the spring of 1987.

During their stay, Charles Hutchinson presented three series of lectures on: 1) arid lands research at the UA; 2) how to prepare a master's thesis; and 3)

remote sensing (four-day workshop). The latter series of lectures included a review of remote sensing fundamentals, principles and techniques of image interpretation and digital image processing.

In addition, to provide background information for a report on remote sensing at AGU,

# William G. McGinnies Scholar

Charles Hutchinson met with various AGU faculty members, and staff members of the Ministry of Foreign Affairs, the Ministry of Housing and the United Nations Development Programme regarding the upcoming regional program in remote sensing. The final report included recommendations for equipment, staffing and a course curriculum outline.

Barbara Hutchinson presented a five-day training course on accessing international information sources to 24 participants from various organizations and university libraries in the Gulf. Represented were the countries of Bahrain, Qatar, Oman, Kuwait and Saudi Arabia. Included in the workshop series was a discussion on accessing computerized databases, strategies and techniques for performing computer searches and an introduction to the major scientific databases available through the DIALOG information retrieval system.

In addition to the workshop, Barbara Hutchinson evaluated the College of Sciences Library, focusing on the status of the existing facility, collection and operating procedures and policies. The evaluation and subsequent report also reviewed plans and made recommendations for the College of Medical Sciences and Main Campus libraries.

It is hoped that the ties between AGU and UA can be strengthened in the future through joint research projects and faculty exchange. ◆

In 1985, the Office of Arid Lands Studies established a scholarship to honor William G. McGinnies, the founder and Director Emeritus of the office. The scholarship is awarded annually to an outstanding graduate student whose work focuses on arid lands and is consistent with the goals of the Carnegie Desert Botanical Laboratory.

perform their functions under the extraordinary conditions existing in world deserts.

The 1986 scholarship was awarded to James Malusa who is a doctoral candidate in the Department of Ecology and Evolutionary Biology at the University of Arizona. He is working on the origin and migration of three species of piñon pine in the Southwest.



*James Malusa (second from left), recipient of the 1986 William G. McGinnies scholarship, with his parents Pat (left) and Rudy Malusa (center), William G. McGinnies (second from right) and Charles Hutchinson.*

The goals of the laboratory are to study the life history of plants under desert conditions with special reference to absorption, storage and transpiration of water, temperature inversions and soil moisture relationships, runoff-percolation, rainfall-soil moisture; and to ascertain how plants

Ultimately, this work will help us to better understand how the pines have evolved to deal with drought.

Malusa has published several professional papers and will undoubtedly continue to contribute to our understanding of arid lands. ◆

# REVIEW



## Gathering the Desert

1985. By Gary Nabhan.  
Illustrated by Paul Mirocha.  
University of Arizona Press,  
Tucson, Arizona.

Many books have been written about the Sonoran Desert, but none explore the subtleties of its complex, intertwining relationships as this one does. Gary Nabhan has gleaned fascinating details of the life cycles and ethnobotany of twelve native Sonoran Desert plants from a variety of sources, and has distilled their essence into this fine book. Through Nabhan's skillful prose we see anew the many faceted interactions of plants, animals, man and climate, in an unusual combination of science and mysticism.

We hope that these sketches will encourage arid-land dwellers to feel more at home with the desert's bounty, a richness that cannot be understood simply in utilitarian terms. Even if you were never to eat a carob-like mesquite pod, or treat a cold with creosote-leaf tea, these plants have something to offer. It may be just the music heard when standing beneath a spring flowering mesquite canopy, alive with five thousand solitary bees, or the smell of a creosote bush releasing fifty volatile oils to the ozone-charged air during a summer storm.

Paul Mirocha's expressive drawings, a union of botany and art, enhance the ideas of time and place, people and plants, that the author brings to us. More than

scientific illustrations, they probe the mystery of life's continuing regeneration.

The book is divided into four major sections, corresponding to the seasons of the year. Three plants are intimately described for each season in articles of 10 to 15 pages. These articles discuss the plant and its life cycle, as well as its relationship with native peoples, and in some cases,



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*"The Milky Way is said to be the white bean. He lives clear across the sky. Beans grow in abundance and we see them scattered across the sky."*

*"... so that is why the white tepary bean is the child of the Desert People. It was born here and endures dryness. When it doesn't rain enough, the white bean still comes up. The Desert People will always eat it and live here."*

---

current residents of the Southwest. Each article is accompanied by a bibliographic essay. These annotated bibliographies provide a brief, lively, discussion of information sources, with a special designation for items of interest to the lay person.

Nabhan's approach is direct. His research is not conducted in walled laboratories, but in the expanse of rocky hills, lava fields and sandy bottomlands. Whether seeking mescal stills or caches of ancient seed his delight and enthusiasm is strong and contagious. Only the most blasé of readers could resist the pull of these adventures.

For all its prickly harshness, a desert is fragile and its thin veneer of life is precious. The arid regions of the world are under increasing pressure as population growth places new demands on their limited resources.

Continuing appreciation and understanding of the ecology of arid lands is essential if we are to live in them harmoniously. This book brings together the basic survival needs of plant and man, and in doing so, illuminates the wonderfulness of the Sonoran Desert. ◆

Susan Husband

Gathering the Desert is available for US \$14.95, soft-cover, from the University of Arizona Press, 1615 East Speedway Boulevard, Tucson, Arizona 85719, USA.

# PUBLICATIONS



## **Tree Planting in Semi-Arid Regions.**

*Proceedings of a Symposium on Establishment and Productivity of Tree Plantings in Semi-Arid Regions, Texas A & I University, Kingsville, Texas, April 19-May 2, 1985. 1986. Edited by P. Felker, Texas A & I University. Elsevier Science Publishers, Amsterdam, The Netherlands. 444 pages, US \$109.00.*

This symposium attracted participants from 20 countries, including Latin America, The Caribbean, French and English speaking Africa, Israel, India and Australia. Presented in this volume are papers on reforestation, fuelwood production, soil management and livestock production on the semiarid and arid lands.

## **Forage and Fuel Production from Salt Affected Wasteland.**

*Proceedings of a Seminar held at Cunderdin, Western Australia, 19-27 May, 1984. 1986. Edited by E.G. Barrett-Lennard, C.V. Malcolm, W.R. Stern and S.M. Wilkins. Elsevier Science Publishers, Amsterdam, The Netherlands. 460 pages, US \$74.00.*

Growing highly salt-tolerant plants under natural rainfall on salt-affected soils was the topic of this research and development conference that was attended by scientists from 20 countries. The papers included in the proceedings provide an

information base for new initiatives in this little-researched area. Included in the proceedings are country reports that graphically illustrate the extent and nature of the salinity problem and the lack of knowledge concerning potential productivity of salt-affected land. It is clear that salt-affected land need not be regarded as wasteland; the challenge to make better use of this resource now needs to be grasped.

## **Let there be forest.**

*1986. Arnold and Connie Krochmal. Pudoc, Wageningen, Netherlands. 96 pages, US \$12.50.*

Policy makers, development planners and students are acquainted with the many important functions of tree plantations and the pressing need to increase the rate of tree planting. Subjects are treated in a popular and instructive manner to stimulate the reader to support efforts to reforest our globe.

## **The Agricultural Dilemma in Africa.**

*Papers of the 1985 ODA Natural Resources Advisers' Conference. 1986. Overseas Development Administration, London, England. Free-of-charge.*

In July 1985, the ODA Natural Resources Advisers held an in-house conference at Wye College. Attending the conference were

advisory groups and administrative staff within ODA and its scientific units and professionals from non-governmental organizations, consultancy firms, university and research institutes and other donor agencies. This publication discusses ways to improve Africa's agricultural performance and to ensure higher levels of food security.

## **Guayule: A Natural Rubber Source.**

*Proceedings of the Fourth International Conference on Guayule Research and Development, October 16-19, 1985, Tucson, Arizona. 1986. Edited by D.D. Fangmeier and S.M. Alcorn. Guayule Rubber Society. 443 pages, US \$40.00.*

This volume contains papers presented at the Fourth International Conference on Guayule Research and Development which was held in Tucson, Arizona, in October 1985. Researchers explored a wide range of topics from guayule establishment to its processing and utilization. Their work advanced the understanding of guayule as a potential, commercially-viable crop.

The proceedings is available from: Publications, Office of Arid Lands Studies, University of Arizona, 845 North Park Avenue, Tucson, Arizona 85719, USA. (Price includes postage and handling; international orders add \$5.00 for postage and handling.)

### Land Use Policy.

#### Special Issue: Land Use in

**Africa.** *Volume 3, Number 4.*

*October 1986. Guest editors: Asit*

*K. Biswas and L.A. Odero-Ogwel.*

*Butterworth Scientific Ltd., Surrey, England.*

- Population growth in Africa is the highest in the world and is accelerating.
- In nearly all African countries 50%-75% of the population subsist in absolute poverty.
- The number of severely hungry and malnourished people is estimated to have increased from close to 80 million in the early 1970s to over 100 million by 1984. By 1979-81, on a global basis, the percentage of population undernourished was highest in Africa.

So states Asit K. Biswas in his article on Land Use in Africa.

This special issue of *Land Use Policy* focuses on problems of land use in Africa and emphasizes the need for appropriate policies to deal with these problems.

Subjects examined include land use policies and farming systems, desertification, irrigation, climate, agricultural projects, apartheid, and innovative uses of land.

## Arid Lands: Today and Tomorrow

### *Proceedings of an International Research and Development Conference*

*October 20-25, 1985*

*Tucson, Arizona USA*

The international conference, "Arid Lands: Today and Tomorrow," was held in Tucson, Arizona, in October 1985, commemorating the 25th anniversary of UNESCO's Arid Lands Major Project. More than 400 registrants from 40 countries attended the conference.

Included in this volume are papers by more than 125 arid lands scientists covering a broad range of topics on critical arid lands issues. Chapters include:

<b>animal resources</b>	<b>general geography</b>
<b>biosphere reserves</b>	<b>halophytes</b>
<b>climate</b>	<b>irrigation and water management</b>
<b>crop physiology and agronomy</b>	<b>land intensification</b>
<b>culture and demography</b>	<b>new crops</b>
<b>desert ecology</b>	<b>range management</b>
<b>desert riparian systems and reclamation</b>	<b>reclamation</b>
<b>desertification</b>	<b>small-scale water management</b>
<b>ecology of nomadic pastoralists</b>	<b>soils</b>
<b>economic development</b>	<b>underutilized plants</b>
	<b>urban environments</b>
	<b>water policy</b>

Published by Westview Press, Boulder, Colorado, and Belhaven Press, London, England, in cooperation with the Office of Arid Lands Studies, University of Arizona, *Arid Lands: Today and Tomorrow* may be purchased for US \$85.00 from Westview Press, Central Avenue, Boulder, Colorado 80301, USA.

## Arid Lands Research Institutions: A World Directory

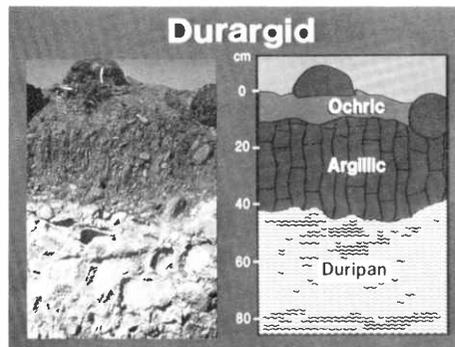
A third revised edition of *Arid Lands Research Institutions: A World Directory*, edited by B.S. Hutchinson and R.G. Varady, will be published in early 1988 by the Office of Arid Lands Studies. First published in 1967 and again in 1977, this work was originally based on UNESCO's 1953 *Directory of Institutions Engaged in Arid Zone Research*. Each of the editions contributed to the call of UNESCO's Advisory Committee on Arid Zone Research "to promote and stimulate research in the various scientific disciplines which have a bearing upon problems of arid regions."

Since 1953, numerous research and development organizations have formed around the world to address the issues faced by countries in dry regions. Communication between these organizations permits the free exchange of information and assures long-term progress toward mutual goals. During the past twenty years the directory has been an invaluable tool for promoting organizational contacts and linkages. The new volume will include nearly twice as many entries as did the previous edition, and coverage has expanded to include virtually twice as many countries.

Copies of the directory will sell for US \$20.00 and may be purchased from: Publications, Office of Arid Lands Studies, College of Agriculture, The University of Arizona, 845 North Park Avenue, Tucson, Arizona 85719, USA.

## Classification, Properties and Management of **Aridisols**

This slide-tape presentation contains 96 color slides depicting the classification, characterization and utilization of arid soils. Designed to be used as a teaching aid the presentation is accompanied by a program guide and 31-minute cassette narrative.



Produced by the University of Arizona and the Soil Management Support Services, U.S. Agency for International Development, the program is available for US \$90.00. To purchase the program, or to obtain further information, contact:

Chris Mack  
Office of Arid Lands Studies  
University of Arizona  
845 North Park Avenue  
Tucson, Arizona 85719 USA  
(602) 621-7896

(Orders should be accompanied by a check or money order for US \$90.00 made payable to the University of Arizona.)

Topics include:

**Global importance  
and extent of Aridisols**

**Introduction to  
Soil Taxonomy**

**The aridic soil  
moisture regime**

**Diagnostic  
soil horizons**

**Aridisol  
Great Groups**

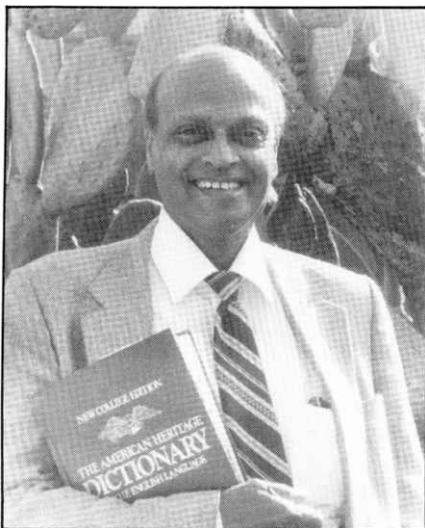
**Management of Aridisols  
for agriculture**

# OALS VISITORS



In conjunction with the Mauritania Agricultural Research Project II, Alex Cunard of the Organisation pour la Mise en Valeur du Fleuve Senegal (OMVS) traveled from Senegal to Tucson to visit the Office of Arid Lands Studies.

OMVS is overseeing the development of the Senegal River in Mauritania, Senegal and Mali. As the Agricultural Research Planner for OMVS in the Division of Integrated Research, Cunard coordinated research on the Senegal River among the three organizations involved in the effort: the National Agricultural Research Institute for Senegal (ISRA), the West African Rice Research Development Association (WARDA), and the



Societe Agricole Economic Development (SARD). Part of his work involved providing information to researchers in these organizations—his efforts included institutionalizing the

process by providing computerized data. OMVS is developing a database of research that will be housed on an IBM AT at its documentation center in St. Louis. The initial database will be comprised of 70,000 documents now on microfiche. Much of the data has very practical applications. For example, researchers have identified a fungus that attacks nutgrass in rice fields but does not harm rice—this information will be made available to farmers.

Cunard has a long history of international involvement. He has worked as a state agronomist in Malaysia, as the science director for Rodale Press, and as a research agronomist in Niger. He has also worked in the Central African Republic and Tanzania. Cunard is currently in Mali with the U.S. AID Farming Systems Research and Extension Support Project.

Matthias Bartels, who works for the German Agency of Technical Cooperation in Frankfurt, visited the Office of Arid Lands Studies in July and August of 1987. Bartels came to Tucson to learn more about the work that the University of Arizona is conducting in arid lands. He will soon be leaving for Egypt to conduct an environmental management project there on the northwest coast.

Bartels will take with him information that will help with his upcoming project involving

conservation and development of agricultural resources on the northwestern coast of Egypt. This is a long-term rural development project administered by the Agency for Technical Cooperation and its Egyptian counterpart in the project, the Egyptian Environmental Affairs Agency. The project will support the Bedouins in the establishment of appropriate farming systems.



The Bedouins have recently become a more settled people. Faced with problems such as overgrazing, erosion and soil salinity, the Bedouins are in need of learning more efficient ways to use water for permanent plant production and ways to improve grazing and livestock production in an environment with marginal resources and a fragile ecosystem.

Bartels and other project members will assist the Bedouins in making optimal use of natural resources.

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If you would like to make a contribution to the fund, please make your tax-deductible check payable to the University of Arizona Foundation and request that it be deposited in the Patricia Paylore Fund for the Arid Lands Newsletter. Contributions should be sent to: Mr. Julius Humphrey, The University of Arizona Foundation, 1027 East Second Street, Tucson, Arizona 85721, USA

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