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# ARID LANDS NEWSLETTER

No. 2  
July 1975

UNIVERSITY OF ARIZONA  
Tucson, Arizona 85721, USA

Southwest Asia . . . Wind Power . . . Remote Sensing . . . Africa . . . Watersheds . . . United Nations . . . AID

Geothermal . . . ALIS . . . Desertification . . . Economic Plants . . . Research

**ARID LANDS NEWSLETTER\***

No. 2, July 1975

Published by the University of Arizona, Arid/Semi-Arid Natural Resources Program, for a U.S.AID 211(d) institutional grant.

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Distributed worldwide without charge. Address correspondence relating to contents, or requests for future mailing, to the Editor.

\*Originally issued (No. 1, March 1975) as Arid/Semi-Arid Natural Resources Program Newsletter.

## AN INTERVIEW WITH DR. MOHAMED N. EL-KHASH



Mohamed N. El-Khash

— Patricia Paylore (1975)

A unique supranational research organization, The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), with its headquarters in Damascus, was described for the staff of the University of Arizona's Office of Arid Lands Studies when its Director visited the Arizona campus on May 2, 1975, and graciously granted the Editor of *Arid Lands Newsletter* an interview.

Dr. Mohamed N. El-Khash acknowledged that Tucson was in a sense a second home for him, since he received two graduate degrees from the University of Arizona, the M.S. degree in 1965, for his work on "The Relative Susceptibility of Certain Cotton Plants (*Gossypium* Spp.) to Fungus *Verticillium albo-atrum* Reinke and Berth"; and the Ph.D. degree in 1969 for work on "Some Rhizoctonia solani Kuehn-Alfalfa (*Medicago sativa* L.) Relationships." Since cotton is one of Syria's main industrial crops and commodity exports, with an estimated half a million plus tons produced annually, his earlier work in Arizona served him well when he returned home after his studies at the University to be Director of Agricultural Research in Syria,

and later General Director of ACSAD following its establishment in Damascus. Syrian cotton, most of which is long staple, has a reputation on the world market for high quality, and ginned cotton represents between two-fifths and one-half of Syria's total export earnings.

But despite our mutual interest in cotton, Dr. El-Khash likes most of all to talk about the Center. He described it from its formation in late 1971 as a regional research center for member states of the Arab League and other Arab countries, with particular attention, as its name implies, to studies of arid zones and dry lands. The Center functions within the framework of the Arab League, and its present membership of twelve Arab states is up from the original six, with the expectation that North African Arab states joining during the coming year will swell the total further. Dr. El-Khash emphasized that the Damascus headquarters serves as the administrative focus of the Center's far-flung activities, but that research units dealing with specialized field work either are or will be established in each member country.

When I asked him about his staffing in Damascus, he spoke with some pride of the specialists he has recruited from member countries, seeking to find the best in the Arab world for the major studies to be undertaken. Such outstanding scientists as Dr. J.S. Dougramahji, a soils expert with experience at the Institute for Research on Natural Resources, Abu Ghraib, Iraq; Dr. Jamil Quhaiwy, a field crops expert from Jordan; Dr. John Houry, a hydrogeologist from Syria; and Youssef Ghanem, livestock expert formerly with the Desert Institute, Cairo, were cited as examples of the type of person he wants to develop the specialized divisions of the Center and to build the divisional staffs with competence to deal with the problems of the Arab world relating to the environment, natural resources, and agricultural development, many of which are common to all.

The establishment of field stations in each member country is proceeding from this base, with the emphasis on studies of water resources, both surface and underground and the hydrologic balance of the region's various basins; economic utilization of the area's desert lands through investigations into agricultural projects suitable for the resources available; soil studies, with emphasis on erosion, salinity, and conservation; and irrigation and drainage. All these problems, he reminded me, are old problems, nor are they unique to the Arab world, but are endemic throughout the arid world.

We talked at some length about aspects of range degeneration as it relates to livestock activities. Syria, with ninety percent of its livestock population consisting of sheep and goats, depends heavily on the associated products of meat, milk, and wool or hair, and is very likely typical of most Middle East countries with similar livestock traditions. The necessity to balance the advantages of this "industry" against the damage to the environment is one to which the Center is devoting much time and effort, as it is recognized increasingly that the seasonal migrations, often without respect for national boundaries, have in addition a generally debilitating effect on the flocks themselves because of insufficient water and feed and inadequate shelter along migratory routes. With an extension of agricultural activities into formerly uncultivated areas, the historic grazing

lands are being reduced to areas more marginal and of less carrying capacity. I agreed, having just had occasion to document this same phenomenon for the Sahel of Africa. Dr. El-Khash then pointed out that such common problems give the Center the greatest impetus for its regional attack on their solutions.

Perhaps somewhat selfishly, I asked Dr. El-Khash if he had any plans for a documentation center within the Center. His brown eyes lighted up as he replied with some excitement that he did indeed, in the expectation that a great documentation resource in one place, with on-line capabilities to each of the member countries and the Center's field stations, would speed up the transfer of information and technology immeasurably. We talked about the Arizona system in use here, about the need to devise effective ways to share our common pool of information, about how fortunate we were to live in an era where the technology already exists for the execution of tasks that would have seemed impossible a generation ago. Satellite transmission is a dream we both share, and while jokingly reminding each other of my silver hair and his balding head, we insisted we felt young in heart, believing optimistically that we would live to help such miracles come to pass.

In a more practical vein, I inquired about training programs initiated by the Center. He described the seminars held in Damascus on specialized topics conducted by the most competent specialists he could identify for the discussions, and predicted that actual training programs such as short courses and workshops were imminent.

As our hour drew to a close, I asked him if he was pleased that our two countries had re-established diplomatic relations. He replied that he was, and that he expected that our institutional relationships would flourish therein, with mutual benefits deriving from each other's activities. "Extend the Center's philosophy," he suggested as we parted, "to the whole arid world. Why should we not help each other and thus achieve what no one of us can do alone?" And on that friendly philosophical note, we said goodbye.

— PP

ON BELIEVING

What can a man do in a thousand days? Can he change the world? Change a village? Change himself? How much time does a man have to do what he is uniquely equipped to do? A lifetime? Tomorrow? A thousand days?

These thoughts are present because time seems shorter and shorter as the earth spins on its axis faster and faster, abstractly speaking. This concept of acceleration, perceived or imagined, creates restless scientists, impatient planners and legislators, and dissatisfied citizens—in Arizona or in Mali. The great international organizations talk their way through countless agendas, meetings, conferences, committees. The university teams visit, inspect, make notes, write reports, recommend further studies. The information specialists compile, index, store, retrieve, disseminate. And the people? They work, go their appointed rounds, living numbly in a vacuum, waiting, waiting for something to happen. In places, some things *are* happening: drought, starvation, decimation of herds, failure of crops—and beyond: revolution and anarchy.

So?

Mistakes are made in haste, as they are also in leisure. But somewhere along the line is the necessity to conceive plans in which all the elements for success coalesce: knowledge (it is available, and we know how to put it in your hands), mutual understanding of each role to be played (have we sent the wrong people to do the right job, or the right people to do the wrong job, in past time?), a sense of urgency (there are those willing to work thirty-six hours a day, and we can identify them for you) that recognizes how short the time, how frightening the speed with which a thousand days can pass; and finally no less than a new worldwide commitment to share our finite resources. Such plans can overlap the generation or two or three we have come to think of as required to make the changes that will save us from ourselves.

We need people who believe it can be done. We need these believers on scientific and administrative levels, we need believers among our counterparts abroad, we need believers with the political clout to cut through the miasma of red tape, delay, lack of funds, and apathy on the part of those with whom they are interacting.

Some of the skills our working believers can use in achieving their purposes are extremely sophisticated, technical beyond the capacity of an ordinary person to grasp. For instance, how are remote sensing data transmitted from space, how are these data interpreted, and do we know enough to use them without ground correlations? How are computer models constructed to simulate thirty or three hundred years of tree growth? The chances are that our believers know, and that they will employ these dramatic tools to speed up the former tedious surveys and inventories on which development planning should be based.

My question is addressed rather to the nagging uncertainty that perhaps too often such fascinating techniques will be looked upon as gimmicks, *au courant*, “in”: I’ll jump aboard to show that I’m “with it” because this will impress everybody that I’m clever and capable. While all the time there is that nagging uncertainty that perhaps he does not really have the background, training, experience, knowledge, understanding to make it work. It is one thing to sit comfortably in Tucson and watch with nervous curiosity a television commercial on the use of very sophisticated equipment to create the forestry model referred to. It looks so easy, and so much fun, all the pretty girls smiling and punching buttons, and the handsome mod men explaining in such elementary language how to read the fascinating computer drawings of trees growing and being cut down—does it really work? And can one believer do it alone? And if he cannot, how train a counterpart in some faraway LDC to make the transition from the laboratory here to the field there?

Reversely, can our believer leave behind him everything but his willingness to work on a simple level of practical indigeneous technology, doing his homework before he drops out of the sky in a big 707, leaving behind him the big cities, stashing his bedroll in a corner of whatever shelter is offered him (or better yet, out under the desert stars), and hunkering down with the chief to learn the local ways? What good will this do? Will this low-keyed approach increase crop yields in marginal lands, purify the scarce water, provide fodder for the emaciated livestock, arrange for transportation of surplus (surplus?) to market, build schools, train teachers, supply paramedics to elevate the quality of health care?

But the essence of belief and believers is that faith works miracles. A thousand days is two years and ten months, enough, we think, to go away, though others may have to take up the burden behind you. But for now, step out boldly, unashamed to say clearly and unmistakably, “I believe!” Others, whatever their level of competence, will follow, and so we can begin, in small personal individual ways to substitute belief for cynicism, faith for skepticism, demonstrating that we are willing to learn as well as teach, that science and technology in themselves are not bad—and that heroes have not really gone out of style.

If we lose that capacity to believe, perhaps we deserve what we shall surely get.

— PP

## THE DESIGN OF AN AGRICULTURAL/SOCIAL/ECONOMIC SYSTEM FOR THE MEDIUM-POTENTIAL LANDS OF KENYA

In March 1975, the University of Arizona sent a faculty team\* to Kenya to prepare a proposal for the design of an agricultural/social/economic system for the medium-potential lands of Kenya, wherein "medium-potential" is defined as "those areas where the production of annual field crops is limited severely by lack of available moisture, but where the use of out-of-the-ordinary conservation methods and specially adapted crop varieties [could] make crop production sufficiently reliable for an increased population to be carried." Pressures on land use as a result of a swelling population are evident in the medium-potential areas of Kenya, which in turn lead to farm and range deterioration, which in turn requires drought relief with increasing frequency.

Solutions to these problems rest in improvement of agricultural productivity in these medium-potential lands, requiring development of an agricultural/social/economic system suited to the complex set of physical resource-socioeconomic relationships existent and developing in these areas. Three of these relationships should be especially noted:

1. Present land use practices are of two main and contrasting types: (a) pastoral or ranching, and (b) subsistence cultivation.

2. In-migration to medium-potential lands of peoples with contrasting experiences in land use practices (e.g., migrants from wetter high-potential lands, or migrants from drier, low-potential lands) poses problems of adaptation.
3. Medium-potential lands generally experience highly variable seasonable rainfall, frequently in the form of short-duration high-intensity storms. In combination with the destruction of vegetal cover, poor soil management, and steep slopes, these storm characteristics produce an environment with high susceptibility to erosion and consequent deterioration of both land productivity and water supplies.

Long-term improvement of living conditions and development of sustained agricultural productivity will depend on the degree to which these medium-potential lands are able to absorb urban growth and sprawl, participate in the decentralization of urban functions now largely located in Nairobi, absorb unemployed and underemployed farm populations, and have ready access to agricultural labor during peak demands. The proposal defines the scope of work required within this framework as that which



Several members of the Kenya Team visiting a Government experimental plot from which grazing animals have been excluded by means of the brush fence. Northwest of Marigat, Baringo District.

— D.R. Altschul (1975)

\*Dr. Kenneth K. Barnes (Soils, Water, and Engineering), Chairman; Dr. D. Robert Altschul (Geography, Area Development and Urban Planning); Dr. Theodore E. Downing (Anthropology); Dr. Helen M. Ingram (Political Science); Dr. P.W. Jacoby (School of Renewable Natural Resources); and Dr. W.E. Martin (Agricultural Economics).

would increase food production consistent with social welfare and ecological stability incorporating these features:

### 1. PILOT ACTIVITIES WITH SPECIFIC LIMITED OBJECTIVES

The design team proposes to identify selected components of alternative strategies involving various combinations of water development, grazing systems, ratios of livestock production to crop production, cropping patterns, and cultural practices, and subject them to field tests and demonstration. These activities will be selected within the resource limits and cultural acceptance of the local population and outside assistance available. It is especially important to select pilot projects and field test/demonstrations of a size typical of operations necessary to support average family units.

### 2. LAND CLASSIFICATION

The design team proposes to assemble all available data and interpretations relating to soils, elevations, slope, degree of erosion, precipitation, potential evapotranspiration, surface water supplies, groundwater supplies, vegetation, land use, human population (composition, distribution, and ethnicity), animal numbers, distribution and species, transportation, and markets—all as a base description of the environment to which the design will be applied and from which a classification system will be developed. Specific output will be a map showing location and distribution of the medium-potential areas with overlays of ecological zones, land use capability, and other characteristics.

### 3. ANALYSIS OF REPRESENTATIVE FARM AND RANCH DECISION UNITS

A concept basic to farm management analysis is one in which a representative farm or ranch budget is described as a single production unit serving as a stand-in for analysis of a group of relatively homogenous units in a given ecological zone. Steps required for budget analysis include selection of the ecological zone for study, design questionnaire, pre-test questionnaire, revision of questionnaire and drawing of samples, conduct of survey, and analysis of data so as to construct a unit representative of the type or types of farms and/or ranges in the zone. Budgets are needed for both good and poor years, so that variation in production caused by variation in amount and distribution of annual precipitation is reflected. The unit shall be subject to detailed budget analysis of organization costs and returns, and the classification shall include description of both resource and capital availability, farm size, typical crops grown, and level of management ability.



Traditional beehive constructed from hollowed log suspended from a browsed tree. There is evidence of fairly heavy grazing, foreground, East northeast of Machakos.

— D.R. Altschul (1975)



Livestock kraals (white dots = goats), as seen from the air as the Kenya Team was coming in for a landing in the vicinity of Lake Baringo. Trails leading away from the enclosures indicate serious denudation.

— D.R. Altschul (1975)

#### 4. DEVELOPMENT OF ALTERNATIVE STRATEGIES

The design team proposes to identify alternative strategies for several representative farms and ranches in consideration of land use and capabilities, social patterns, family needs, aspirations, and skills; community customs and structure affecting production, and market opportunities. These are to be subjected to budget analysis involving various combinations of alternative practices in water development and use, crops and cropping practices, and livestock production patterns and techniques.

#### 5. EVALUATION OF ALTERNATIVE STRATEGIES

Criteria to be applied in such an evaluation include monetary, ecological, social and demographic, and implementation. Budgets must be developed for the selected alternative strategies for each representative farm or ranch and compared with those for existing management-cultivation strategies to estimate costs and benefits accruing to individual farmers and to the represented ecological zone if one or a mix of more than one alternative strategy were adopted.

#### 6. IMPLEMENTATION

Based on the various options now apparent, the design team proposes to select the "best" solution and proceed to implement it. As experience with this implementation can be applied to identify improved alternative solutions, the procedures employed in the original formulation of alternative solutions and their subsequent evaluation shall be repeated until the implementation of the new "best" solution may be completed.



Example of traditional crop storage for protection against various hazards. The corn stover in this tree is in an area east of Machakos, in the district of the same name.

— Kenneth K. Barnes (1975)

Preliminary to all the foregoing is the recognition that communications with all agencies of the Kenya Government and other organizations, directly or indirectly related to the design effort, will be established, as well as working relationships with Kenya counterpart personnel. When the geographic limits of the medium-potential areas are defined, criteria will be developed for the selection of those ecological zones within the medium-potential areas, and the collection of all relevant reference materials pertaining to all aspects will be organized as project working library. As a final note, it should be constant that the development of a cadre of Kenyan counterparts to the design team is necessary to provide a basis for effective continuity after the U.S.AID project is completed.

While the basic approach is a micro-economic study of representative agricultural decision-making units, the proposed design effort is multidisciplinary, one that is to be carried out by a team of agricultural scientists and engineers, agricultural economists, and other social scientists. The proposal recognizes that technical solutions are "easy" but that their successful application in the real world of culture, tradition, economics, and politics is difficult. The proposal seeks to provide a vehicle for bridging the gap between ideal technology and possible accomplishment in the real world of Kenya.

— Adapted from Kenya Team Report  
to U.S.AID



Lake Baringo, background, looking northeast. The heavy silt load carried in this lake, north of Nairobi, is interfering with the normal fishing activities here. Note also the heavy trampling of soil, foreground, by livestock on their way to the lake.

— D.R. Altschul (1975)



## FOREIGN STUDENT PROFILES

### I: Adai Hardan Al-Hadithi

One of six Iraqi graduate students enrolled at the University of Arizona, Adai Hardan Al-Hadithi brings to his work here an unusual background of training and experience in his homeland. Son of a petroleum worker, Hardan was born in Al-Haditha at the northwest edge of the Mesopotamian Plain on the Euphrates. While irrigation is practiced directly adjacent to the river valley, the great western desert of Iraq begins a short distance to the west, a relatively unpopulated area bisected by wadis, oil pipelines, and few tracks. The average annual precipitation of 150mm corresponds to the drier portions of the Sonoran Desert, though Hardan points out that Tucson, at its edge, is in its general aspect much less deserts than he would characterize the Iraqi desert, which differs also in its largely winter rainfall, with few of the violent monsoon-type late summer rains so familiar to his University of Arizona friends.

After receiving his B.S. degree in Civil Engineering from the University of Baghdad in 1965, Hardan spent seven years in the Ministry of Planning and Works and later in the Ministry of Petroleum, supervising construction projects, transportation development, and petroleum refinery maintenance. In 1973 he was assigned to the first of the Iraq Government's Desert Development Stations (see accompanying photographs), fittingly enough in the desert west of Al-Haditha, to take charge of establishing there a prototype facility that would demonstrate the feasibility of applying modern technology in the development of water supplies (see below), surveys of agricultural potential (see page 8), the demographic analyses necessary to future settlements, and what the requirements for afforestation programs would be to halt the degradation of the natural environment.



The first flow of new water, being allowed to spread in preparation for the planting. Bedouins come to watch, with some of their animals taking early advantage of a fresh drink.

— Adai Hardan (1974)



Small concrete reservoir with water piped in from new wells, to be drawn off as needed through a series of pipes to the sprinkler heads in the field beyond.

— Adai Hardan (1974)



First harvest of onions from adjacent experimental plot. This crop was irrigated by furrow with underground water pumped from nearby wells.

— Adai Hardan (1974)



Demonstration plot of wheat and barley grown under sprinkler irrigation. Background, left, is a large concrete reservoir, protected by earth embankment, filled during the night by pumping from adjacent wells. Water is piped during the day to sprinkler heads.

— Adai Hardan (1974)

The following year, he was encouraged by the Government to study for the doctorate, and chose the University of Arizona for his program in hydrology. He has just completed his first year, will return briefly to Iraq this summer to begin his dissertation field work, before coming back to Tucson for his second year of graduate work.

When questioned further about the newly-conceived DDSs, Hardan spoke of the additional four that have now been established since the first one with which he was associated in 1973. They average 400 dunams each of fenced enclosures, within which various types of agricultural crops are being cultivated on an experimental basis. Since the groundwater is of poor quality, with a salt content of as much as three to four thousand ppm, crops that are relatively salt tolerant are under review, including wheat and sorghum, various vegetables, and date palms. Different irrigation practices are being evaluated, wells are being drilled, and plans are being considered for settlement

of bedouins. At present only the scientific staff with supporting technical manpower are located at these stations, but when families move in later, schools and medical clinics will be provided. It is hoped that construction of various facilities, including dwellings, will incorporate not only modern conveniences but some of the ancient architectural beauty of Iraq as well.

When queried about the country's attitude toward natural parks and protection of vanishing wildlife and vegetation, Hardan expressed confidence that the Iraqis would be taking prompt steps to make sure that some still unspoiled areas would be preserved in their pristine state. Tourism is on the increase, and many increasingly environmentally sophisticated visitors are interested in the unusually beautiful natural areas that remain west of the two ancient river systems where our historic civilizations began.

## LONG-TERM DEVELOPMENT STRATEGIES FOR THE AFRICAN SAHEL-SUDAN REGION

Two University of Arizona faculty members, Dr. E. Lendell Cockrum, Professor of Biological Sciences, and Dr. W. Gerald Matlock, Professor of Agricultural Engineering and Coordinator of International Programs in Agriculture, participated in a one-year effort by a multidisciplinary team of analysts to establish a framework for evaluating long-term development strategies for the African Sahel-Sudan region. The problems of drought in the Sahel-Sudan region have been discussed extensively in the news media in recent years, serving to focus world attention on the seriousness of the region's problems and bringing new and renewed offers of emergency and technical assistance. The multiplicity of offers emphasizes the need for coordination among the donor agencies and the recipient countries themselves. While the region requires immediate assistance to meet the problems of drought relief, there is also need for long-range assistance for the region to become self-sustaining and begin an era of positive economic development and widespread improvement in the quality of life of its people.

The goal of the project was to develop a methodology for evaluating long-term development strategies for the region. The specific focus of the study was on the development of an effective framework within which to appraise

specific projects and programs. This framework will assist decision makers in the Sahel-Sudan countries and donor organizations in arriving at informed judgments concerning strategies for the long-term (20 to 25 years) social and economic development of the region. The study was carried out by a multidisciplinary group under the direction of the M.I.T. Center for Policy Alternatives.

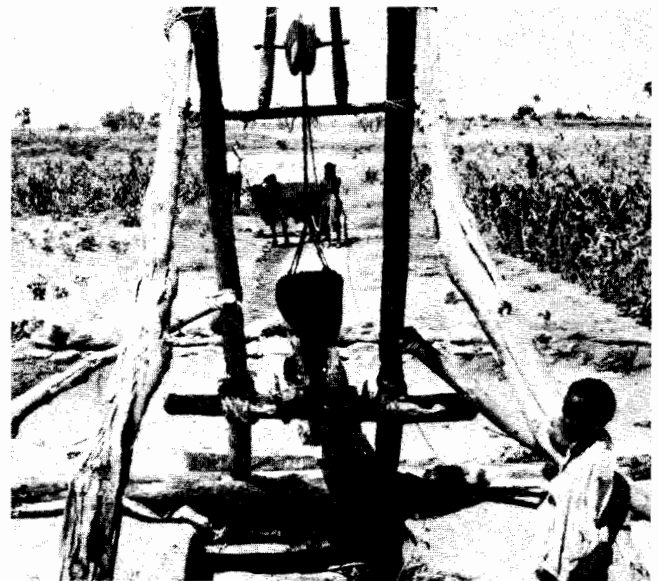
The agricultural sector analysis by Matlock and Cockrum was later selected for use as an example of the application of the methodology created by the project because:

1. Agriculture, the most important activity in the region from the standpoint of the number of people involved and the effect on the economy, will continue in that role over the next few decades.
2. The problem of drought is inseparable from agriculture.
3. The agriculture sector lends itself to a comprehensive, integrated approach, and data for the sector, although not always exact, are more available.
4. The resource base for extractive industrial development is extremely limited.
5. The educational and training level of the populace of the region does not provide a substantial basis for modern industry.



Grazing management is a high priority need throughout arid lands. This scene near Agadez, Niger, September 1974.

— Phil R. Ogden



Hand dug well and animal power for crop irrigation. Agadez, Niger, September 1974.

— Phil R. Ogden

A planning framework for Integrated Sustained Yield Arid Land Agricultural Production Systems, known by its acronym (ISYALAPS), based on limitations of natural resources was created and tested. The six-country region (Chad, Mali, Mauritania, Niger, Senegal, Upper Volta) suffers from a harsh, variable climate which, combined with the traditional agricultural system, has contributed to widespread ecosystem degradation in the past decade. From north to south, agriculture varies from oasis culture and nomadic and transhumant livestock production (camels, goats, sheep, and cattle) to sedentary cereal crop (mainly millet and sorghum) and export crop (cotton and peanuts) production.

The analysis procedure which constitutes the ISYALAPS planning framework involves a sequence of up to 25 steps depending on the complexity of the planning area. Included are disaggregation of the area into climatic zones, assumptions of land use, choice of activity levels (levels of implementation), selection of a strategy (arbitrary mix of activity levels for the segments of the agricultural sector), calculation of production, and conversion of production into human carrying capacity for the planning area.

Five east-west oriented climatic zones ranging from desert (less than 100mm annual rainfall) to woodland (over 900mm annual rainfall) were defined for the region. The irrigable and urban areas made up a sixth zone. Long-term average potential production from the agricultural sector was calculated under four optional activity levels:

- Level A = minimum activity (achieve ecologic balance)
- Level B = extensive management (increase producing area)
- Level C = intensive management (increase technology and management)
- Level D = maximum activity (apply all available technology)

An integrated strategy was selected for use in the example of the application of the ISYALAPS framework, emphasizing resource management, utilizing all possible productive capacity, capable of being implemented with low activity levels in the drier zones and higher activity levels in the wetter zones where potential for success is greater. Comparison of potential and existing production in the example showed that the strategy has the potential in an average year to increase available calories, cash and export crops, wood production, and human carrying capacity at a nutrition level greater than World Health Organization Minimums. Employment in agriculture would be reduced, but there would be increased employment opportunities in infrastructure occupations.

Necessary steps for implementation of the various activity levels were suggested in the report for governments, the private economic sector, individuals, and donor agencies. Needs for inputs, infrastructure, and trained personnel were identified. The time required for implementation and achievement of the potential production

discussed above cannot be exactly determined but would probably be from 25 to 50 years.

Impacts of implementation were examined. Benefits of the integrated strategy included increased food production, improved quality of life for rural families, ecosystems stabilization, increased exports, increased opportunities for industrial employment and entrepreneurship. Cost factors were discussed, but actual costs were not determined. Impacts on social-political, economic, water resources, and transportation sectors were discussed.

There is an impact from nonimplementation (the "do nothing different" strategy) because of the population-agricultural production-natural resources vicious circle existent in the region. Greater ecosystem degradation, starvation, and conflict between nomads and sedentary farmers were predicted. Support at present levels by governments and donors will not break that vicious circle.

Analysis and preliminary development of a planning framework for the agriculture sector of a region two-thirds the size of the United States is an immense task. Many people, including those working in technical assistance or agricultural development, are still "looking for a miracle," some breakthrough or dramatic solution to the problems of arid land agriculture. This is extremely unlikely. Little arid lands expertise has been applied to the Sahel-Sudan region. European or humid climate thinking has predominated. The French influence in the region is the most significant. Economic and agricultural policies have been shaped by it.

Many unresolved issues arose from the agricultural sector analysis, including need for grazing limitations, inadequate tenure for farmers, inequitable income distribution, weak or missing infrastructure, and reduced employment in agriculture.

There is no substantial evidence to support several sensational statements in the popular press concerning the plight of the region, such as the following, that: (1) vast reservoirs of easily available groundwater are waiting to be tapped for irrigation, (2) the region can be the breadbasket for half of Africa, (3) the Sahara Desert is "encroaching" at thirty miles per year, or (4) the nomads will not consent to reduce their herds.

Study conclusions were made as follows:

1. The climate will continue variable, but without major change.
2. The environment has been greatly harmed.
3. Wildlife potential as a food source is limited.
4. The existing agricultural system cannot continue to support the present human and animal population.
5. The region can be more productive.
6. Broadly conceived and adequately implemented programs will be required.
7. The ISYALAPS planning framework is workable for this and other arid regions.
8. Lack of data severely limits detailed analysis.

— W. Gerald Matlock

## VISITORS

February 1975

SEELY, Dr. Mary K.

Director, Namib Desert Research Station, Gobabeb, South West Africa, and Associate Editor of *Madoqua*, published by the Nature Conservation and Tourism Division of the South West Africa Administration. Dr. Seely, describing the Namib Station, some 100 km southeast of Walvis Bay, and 56 km inland from the Atlantic, pointed out that it has direct access to the three main desert biotypes: a wide area of large, mostly vegetationless sandy dunes, open flat gravel covered plains with rocky outcrops, and the dry river bed of the Kuiseb, whose underground water supports a riverine forest.

March 17, 1975

AGRAWAL, Dr. Krishna K.

Formerly an agricultural engineer at Haile Selassie University, Addis Ababa, Ethiopia.

March 26, 1975

SHAMIR, Abraham

Beer-Sheva, Israel. Shamir, formerly Manager of the Dead Sea Works, is a chemical engineer now serving as consultant to the Research and Development Authority of the Ben-Gurion University of the Negev. Shamir's son is a graduate student at the University of Arizona.

March 31, 1975

WEISS, Charles, Jr.

Science advisor, International Bank for Reconstruction and Development, Washington, D.C.

April 2, 1975

POGSON, Robert J.

Deputy Director, Center for Research on Economic Development, University of Michigan, Ann Arbor.

April 4, 1975

YELLOTT, Mr. and Mrs. John I.

Arizona State University, College of Architecture, Tempe. Yellott, a consulting engineer, is interested in studying adaptations of the traditional Navajo hogan to modern design as a part of ASU's graduate program in architecture devoted to Human Habitation in Desert Lands.

April 8, 1975

HACKETT, Dr. Clive

Research Scientist, CSIRO Division of Land Use Research, Canberra City, ACT 2601, Australia.

April 24, 1975

DAHIYAT, Dr. Ismail M.

A linguist with the *Voice of America*, Dr. Dahiyat is a graduate of the University of Baghdad, with a Ph.D. from the State University of New York, Binghamton. He was at one time an assistant professor, University of Jordan, Amman.

April 28, 1975

GIVONI, Dr. Baruch

Visiting Professor, School of Architecture and Urban Planning, University of California, Los Angeles. Givoni's permanent post is with the Technion, Haifa, Israel, where he is Head of the Department of Building Climatology. Best known for his popular textbook on *Building Climatology*, Givoni gave a public lecture while in Tucson on "Solar Energy Systems in Buildings" under the joint sponsorship of the University of Arizona's Negev Committee and the College of Architecture.

April 1975

MBITI, Mr. D.M.

Education Attache, Embassy of Kenya, Washington, D.C.

April 1975

KOROYE, Mr. Binje

Counsellor and Head of Chancery, Embassy of Nigeria, Washington, D.C.

May 12, 1975

GAGARA, Mr. Mayaou G.

Secretary-General, Inter-African Committee for Hydraulic Studies, Ouagadougou, Upper Volta, visited OALS under the auspices of the African-American Institute, Washington, D.C. While Gagara's personal interests as a hydrogeologist center on such widely diverse things as cloud seeding and drip irrigation, he also spoke at length about the activities of the Documentation Center of the Comité Inter-Africain d'Etudes Hydrauliques at Ouagadougou, and discussed implementation of exchange arrangements already initiated by OALS/CIEH earlier. The Center is planning its collection development so that it will become the central point in West and Central Africa at which all data bearing on water and land use can be processed for reference. Ground and surface water, climatology, livestock and range management, resettlement, rural health, and reforestation are some of the subjects covered. Contact: Mme. Mildred Balima.

May 12, 1975

LISS, Mr. Harvey

Rutgers University, New Brunswick, New Jersey. Former Peace Corps volunteer, West Africa, for four years.

May 29, 1975

BARNES, Mr. Eric

Formerly Clearinghouse Administrator, The Navajo Tribe, Office of Program Development, Window Rock, Navajo Nation (Arizona) 86515. Barnes described the new Navajo Research and Statistics Center, directed by Velma S. Rumley, and the Navajo Tribal Environmental Protection Commission, directed by Harold Tso, a chemist by training.

May 1975

FUNKE, Mr. Gwagilo

Regional Development Director, Dodona Region, Tanzania.

June 12, 1975

FUERTES, Dr. Ciro Hurtado

Professor of Geography, Universidad Nacional Mayor de San Marcos, Lima, Peru, discussed various species of *Amaranthus* that thrive on no more moisture than that derived from fog along the coastal Peruvian desert. He described the leafy plant's protein value as a food source for populations short on animal protein. *Portulaca oleracea*, a food plant with value as animal fodder, and *Chenopodium quinoa* were other species of possible economic value discussed.

July 1, 1975

AL-YUSUFI, Mushin Mhuammad

Director General, Security, Taiz Government, Yemen Arab Republic. M. Al-Yusufi is interested in water resources development and greenhouse agriculture.

July 1, 1975

GAKOU, M. Bandiougou

Director General, Institute for Productivity and Management Planning, Bamako, Mali. Visit under the auspices of the African-American Institute, Washington, D.C. M. Gakou studied in Beirut and in Dakar, where he obtained his doctorate in economics in 1970.

July 7, 1975

AUDIBERT, Mme. Andree

Chief, Social Action Bureau, Ministry of Cooperation, Paris. Mme. Audibert a visitor in Tucson under the auspices of the U.S. Department of State's International Visitor Program. With considerable experience in the Sahelian Zone of Africa, particularly Guinea, Mali, and Upper Volta, over a period from 1949-1963, she is interested in public health problems in developing countries.

## MEETINGS, MEETINGS, MEETINGS

AFRICAN DEVELOPMENT SYMPOSIUM: Food, Health, and Population in Arid Areas. University of Arizona, April 28-29, 1975.

A two-day analysis of causes of and potential solutions to hunger in areas where population is increasing and food supplies decreasing. Hardship years of drought in the Sahel have created problems that the University of Arizona faculty addressed, with anthropologists, agricultural economists, arid land specialists, and personnel from the Colleges of Medicine and Nursing contributing formal papers. From the U.S.AID Africa Bureau in Washington, D.C., came Dr. Samuel Adams Jr., Assistant Administrator; Charles Hanrahan, Agricultural Economist; Princeton Lyman, Director, Office of Development Services; Herbert Marshall, Health Program Division; Dr. Edward Fei, Regional Coordinator for Africa of the Bureau of Program and Policy Coordination; and David Shear, Director, Central West Africa Regional Office, each of whom offered his particular perspective on the issues raised.

The papers will be published. Contact: Ms. Marie Fasla, College of Nursing, University of Arizona, Tucson, 85721.

UNEP CONFERENCE ON DE-DESERTISATION. Tehran, Iran, February 26-March 5, 1975.

Working groups to deal with the familiar problems of water shortages, soil erosion and salinity, overgrazing, dune movement, afforestation, and nomad settlement were established to discuss specifically: (1) conservation of the natural environment, including national and regional projects, biosphere reserves, wildlife, reforestation, conservation of genetic resources; (2) animal husbandry and nomadism, including water problems, pasture rights, range management, and sedentary husbandry; (3) agricultural activities, including both traditional and modern rain agriculture, land tenure, irrigated flood agriculture, oasis cultivation, and soil conservation; and (4) other human activities, including environmental planning, effects of urbanization and siting of towns and villages, extraction and mining activities, tourism, and usufruct rights. Attendees toured Iranian sand dune fixation projects and the Dasht-e-Kavir biosphere reserve where great strides have been made in a six-year project to restore desert vegetation through severe grazing restrictions.

Dr. J.D. Johnson, OALS Director, represented the U.S. as an observer.

WATER REQUIREMENTS FOR LOWER COLORADO RIVER BASIN ENERGY NEEDS. University of Arizona, May 8-9, 1975.

Another two-day symposium devoted to providing the latest technical data on the management of water and energy needed to produce new energy sources in the Lower Colorado River Basin, analogous to many another such environmental situation throughout the arid world, and to relate this to the cost of maintaining the present environment. Cosponsored by the Arizona State Fuel and Energy Office and several University of Arizona departments, the papers presented by a variety of experts dealt with the requirements for such energy developments as oil shale, geothermal, coal gasification, nuclear, and solar fuels. Another session was devoted to a consideration of such topics as the potential for aquaculture utilizing waste heat from power plants, city waste water reuse for nuclear power plant cooling, and advanced processes for water desalting and reuse.

The papers will be published. Contact: Office of Arid Lands Studies, University of Arizona, Tucson, 85721.

### Forthcoming:

THE INTERNATIONAL GEOGRAPHICAL UNION WORKING GROUP ON DESERTIFICATION will meet in Cambridge on September 22-26, 1975, under the joint sponsorship of Cambridge University's Overseas Studies Committee.

Dr. A.T. Grove, Geography Department, Downing Place, Cambridge, is handling the program and arrangements. One of the topics for discussion will be the Working Group's bibliography on desertification, which will be published by the OALS with Assistant Director Patricia Paylore serving as its Editor. The bibliography will be prepared under the Arid Lands Information System (ALIS) conventions, in time for the 1976 International Geographical Congress Meeting in Moscow. Paylore will attend the September Cambridge meeting.

The University of Arizona will be sponsoring an international meeting on GUAYULE (*Parthenium argentatum*), a rubber-producing arid lands plant in which there is currently widespread renewal of interest. Dr. W.G. McGinnies, Director Emeritus of OALS, was deeply involved in the World War II program by the U.S. Government to develop extensive plantations in the southwest U.S. to overcome the loss of natural rubber (*Hevea*) imported from the Far East. Before any significant production could be achieved, the War ended, and activities lapsed. Now there is a significant volume of new interest being expressed worldwide in this economic plant, and the conference being planned will exploit some of these needs and potentials. McGinnies and OALS staff member Dr. E.F. Haase will be collaborating on a comprehensive bibliography on Guayule, to be issued as one of the OALS *Arid Lands Resource Information Papers* (comparable to No. 5, on Jojoba) in time for distribution at the meeting, scheduled for mid-November 1975.

In early February 1976, the OALS will host a meeting of the Consortium of Arid Lands Institutions (CALI), a group of southwestern U.S. institutions with substantial arid lands

research programs. Besides Arizona, CALI includes in its representation ICASALS (Texas Tech University), Lubbock; New Mexico State University, Las Cruces; Dry Lands Research Institute, University of California, Riverside; and the Desert Institute, Reno, Nevada.

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SYMPOSIUM ON WATER FOR ARID LANDS. Sponsored by Ministry of Energy, Imperial Government of Iran, Tehran, and the International Water Resources Association, December 8-9, 1975.

The main objective of this Symposium is to discuss the specific problems of water resources and the various technologies available for the use and conservation of water in arid regions. A wide variety of problems, including case histories, irrigation and drainage, desalting, weather modification, various other methods of water supply and conservation, energy related water problems, research needs and other topics of present interest will be discussed at two technical sessions: Hydrometeorology of Arid Regions, and Technologies for Water Use and Conservation. On the second day of the Symposium, there will be a study tour to visit the modern Karadj Dam near Tehran. Contact: Dr. Davoud Hariri, Director General, Center of Research and Laboratories, Ministry of Energy, Tehran.

## PAKISTAN SCIENTIFIC AND TECHNOLOGICAL INFORMATION CENTRE

PASTIC has now formally entered the University of Arizona's Arid Lands Information System (ALIS) under an agreement by which arid lands research publications originating in Pakistan will be abstracted by PASTIC and the information submitted to Arizona for final selection, editing, and computerizing as input to ALIS.

An exchange of correspondence relating to this arrangement has been going forward for several months between the OALS and Dr. A.R. Mohajir, PASTIC's Project Director. The University of Arizona's AID 211(d) institutional grant on Natural Resources will be funding the first year's costs to ALIS. PASTIC has agreed to maintain a collection of all documents at its headquarters in Islamabad (P.O. Box 1217), available for photoreproduction should users of ALIS so require. It is expected that PASTIC's input will be reflected in forthcoming issues of *Arid Lands Abstracts*.

PASTIC is sponsored by the Pakistan Science Foundation, Islamabad, with sub-centers in Karachi and Lahore.



## POTPOURRI: PUBLICATIONS NEW AND NOT-SO-NEW

**AFRICA SOUTH OF THE SAHARA**, 5th ed., 1975. Europa Publications, Ltd., London. 1170 pp.

One of the publisher's several series (others are on the Middle East and North Africa, and the Far East and Australasia), updated regularly, and covering details of governments, constitutions and political parties as well as current statistics on population, imports, exports, agriculture, industry, finance, transport and education, together with directories of companies, industries, and trade associations. Separate chapters on individual countries cover physical and social geography, agriculture and forestry, fisheries, and mining, as well as economic and political information. There is a section of biographical information on outstanding persons in the region.

Boserup, Ester. 1970. **WOMEN'S ROLE IN ECONOMIC DEVELOPMENT**. St. Martin's Press, London. 283 pp.

This Danish economist calls our attention to the evidence of the historic role of women in parts of southeast Asia and Africa, where shifting cultivation was practiced by women as farmers. In some respects the current "contribution" of the western developed nations through various programs of assistance in reversing this more traditional pattern has done the Third World a disservice, since it is this author's conviction that economic equality for women would mean less rural-to-urban migration, some alleviation of urban poverty, and a hope of defusing the population bomb. She makes a plea for a halt to the worldwide hierarchization of men's and women's work roles as a way to rectify the unjust and inefficient loss of women's productive (not reproductive!) functions.

Hammond, B.L., and L.G. Polhamus. 1965. **RESEARCH ON GUAYULE, 1942-1959**. U.S. Department of Agriculture, Technical Bulletin 1327. 157 pp.

Research began in 1922 for a source of rubber to protect against possible loss of availability from foreign markets. After the outbreak of World War II, the U.S. Government initiated the Emergency Rubber Act and efforts were begun to analyze the possibilities of cultivating this plant for high yield production. This study includes the research on botanical aspects, various levels of success with seeding, weed control, harvesting, seed production and storage. Plant physiology was studied to determine distribution and ways of storing rubber, factors affecting rubber formation and other physiological aspects that cause plant injury such as disease. Shrub processing for extraction of rubber is reported with analytical techniques to determine rubber content. The authors summarize optimum conditions for planting, harvesting and processing.

Kenya, Ministry of Finance and Planning, Central Bureau of Statistics, Nairobi. 1975. **STATISTICAL ABSTRACT, 1974**. Publisher same as author. 297 pp.

A statistical compendium, as its title implies, of information about Kenya, including sections on land and climate, population and vital statistics, migration and tourism, external and East African trade, agriculture, forestry and fishing, industrial production, fuel and power, transport and communications, education, public health, labor and manpower, and justice. Periods of coverage vary, but many tables bring current information down to 1974, even though some are estimates. Figures under Land and Climate are extraordinarily detailed, including rainfall, temperatures, and relative humidity. The section on agriculture deals with small farms and settlement schemes as well as large holdings, plus information on resettlement, crops, and livestock. The Bureau, which is responsible for the preparation of these statistics, also issues a quarterly Kenya Statistical Digest. Write to them at P.O. Box 30266, Nairobi.

Niknam, F., and B. Ahranjani. 1975. **DUNES AND DEVELOPMENT IN IRAN**. Iran Ministry of Agriculture and Natural Resources, Tehran, Forestry and Range Organization. 21 pp.

This publication recognizes the cycle of settlement, development, over-utilization, dune formation, and abandonment that characterized ancient civilization, and seeks to focus on ways of alleviating such conditions prevailing in the Khuzestan and southern coastal plains province, and the central plateau province of Iran. Two recent factors causing deterioration of land resources are population increases demanding more land for cultivation and grazing, and soil losses to water and wind erosion as a result of tillage as an easy way to establish land ownership. The official sand dune stabilization project, initiated in 1966, is described, showing significant increases in governmental support to the present time as indicative of a national commitment to seek new ways of reversing the deterioration of wildland resources and restoring the productivity of the country's land base.

Schumacher, E.F. 1975. **SMALL IS BEAUTIFUL**. Abacus ed. Sphere Books, Ltd., London. 255 pp.

This book looks at the economic structure of the western world in a revolutionary way, as its author maintains that man's current pursuit of profit and progress has in fact resulted in gross economic inefficiency, environmental pollution, and inhumane working conditions. He challenges the doctrine of economic, technological, and

scientific specialization, and proposes a system of intermediate technology, based on smaller working units, communal ownership, and regional workplaces utilizing local labor and resources, with the emphasis on the person, not the product. There is a special section on the Third World.

Stoner, C.H., ed. 1974. **PRODUCING YOUR OWN POWER: HOW TO MAKE NATURE'S ENERGY SOURCES WORK FOR YOU.** Rodale Press, Emmaus, Pennsylvania. 322 pp.

A discussion of designs and experiments with small-scale power production of alternative sources of energy: wind and water, organic matter such as wood and farm wastes, and solar. A practical handbook with straightforward directions, illustrations, and conversion tables for the do-it-yourself pioneer. Especially helpful is the listing of suppliers of various types of equipment. Solar water heaters, wind generators, hydraulic rams, methane gas digesters, and other devices are explained in detail, with drawings and detailed instructions. While it is geared to a constituency that has access to the means and the will to achieve the ends, perhaps there is helpful information for others less fortunate, as well as for those who seek to instruct and demonstrate.

Tottori University, Tottori, Japan, Faculty of Agriculture, Sand Dune Research Institute. 1975. **BULLETIN** No. 14, March.

Includes several articles (in Japanese, with English abstracts) on trickle irrigation, various equipment investigations, such as nozzle hydraulics, and reports of crop response through the use of this irrigation system. There is also a section on annual meteorological data (for 1973) at the Dune Station, including statistics on air and soil temperatures, relative humidity, solar radiation, wind velocity, and cloud cover.

Williams, M.J. 1974. **DEVELOPMENT CO-OPERATION: EFFORTS AND POLICIES OF THE MEMBERS OF THE DEVELOPMENT ASSISTANCE COMMITTEE. 1974 REVIEW.** Organisation for Economic Co-operation and Development, Paris. 325 pp.

The latest in a continuing series of such reviews, reflecting profound changes in the situation and outlook for developing countries, the most important of which relate to the effects of soil price changes and food shortage on development. The major themes: Major populations in the developing world live so close to subsistence that sudden

changes in their economic or physical environment can create a desperate situation, which the economic events of 1973 in oil and commodity price changes, as well as food shortage, not only greatly exacerbated, but for which economic assistance and other financial flows have not been adequately responsive. New policies and forms of international cooperation are needed to make development efforts more relevant to development problems. There is a special section on "The Tragedy in the Sahel."

Wisniak, Jaime. April 1975. **INVESTIGATION OF CHEMICAL PROPERTIES AND POSSIBLE USES OF JOJOBA OIL.** Ben Gurion University of the Negev, Beer-Sheva, Israel. 112 pp.

This report covers work done during the first year of a U.S.-Israel Binational Science Foundation Grant, including measurement of the physical properties of jojoba oil as a factor of the temperature. In addition, numerous isomerization and hydrogenation runs were made. Results reveal that the oil can be hardened to a solid with a melting point about human body temperature, thus amplifying its medical uses. The solubility of hydrogen in jojoba oil has been determined at temperatures ranging between 50 and 250 degrees C, and pressures between 100 and 800 psig. Jojoba oil was hydrogenated with several nickel and copper-chromite catalysts under a wide range of temperature, pressure, catalyst concentration and agitation rates. Isomerization during hydrogenation was unaffected by changes in catalyst concentrations and operating temperature. It increased with decreased pressures and agitation rates. Hydrogenated wax has been compared to carnauba and beeswax, and the experiments at Beer-Sheva show it to have an excellent replacement potential.

**WATER HARVESTING SYMPOSIUM, PHOENIX, ARIZONA, MARCH 26-28, 1974.** U.S.D.A., Agricultural Research Service, Western Region, Berkeley, California. 329 pp.

Water harvesting, like many techniques in use today, is now new, being practiced as early as 4500 B.C. by the people of Ur and later by the Nabateans. Twentieth century technology has extended the range of materials from the early use of soil crusts and rock surfaces, to artificial means including impermeable covers such as metal, rubber, plastic, concrete, as well as chemical soil treatments and land-forming techniques. Used to develop local water supplies in remote areas for livestock, wildlife, runoff farming, and domestic use, the techniques for water harvesting were explored at this symposium in the context of the definition as "the process of collecting natural precipitation from prepared watersheds for beneficial use."

## NORTHEAST GHANA SAVANNAH PROJECT

The Council for Scientific and Industrial Research, Accra, Ghana, is undertaking a scientific study of the possible threats of drought in the upper region of Ghana which shares boundaries with Upper Volta, with a view to advising the Government on appropriate action to take. The Tamne Basin has been selected for the study which U.S.AID and the Ghana Government are funding cooperatively.

The dramatic effect of drought in the Sahel has focused attention on the need for Ghana to formulate long-term policies to study the ecological and cultural conditions in the area under study, particularly as it is widely held among scientists that increasing low and erratic rainfall in the Sahel regions of West Africa is tending to drift southward into the Savannah Zone. Should such changes take place, livestock and crop development, already suffering from poor distribution of rainfall, would be adversely affected in Ghana's northern savannah region. The project will involve interdisciplinary studies. Burning, water availability, overgrazing and deforestation, cultivation practices, and socioeconomic studies will constitute the main areas of research. It is expected that interested Ghanaian scientists from the country's universities, research institutes, and ministries will want to participate, as well as representatives of private agencies.

Contact: The Secretary, Northeast Ghana Savannah Project, CSIR, Box M32, Accra.



### SPECIAL SUMMER SEMINAR

#### Arid/Semi-Arid Natural Resources Program

On July 9, 1975, Mr. Warren M. Forsythe of the Tropical Agricultural Research and Training Center, InterAmerican Institute of Agricultural Sciences, OAS, Turrialba, Costa Rica, spoke on "The Semi-Arid Areas of Central America," at a special summer seminar, sponsored jointly by the 211(d) NRP, the School of Renewable Natural Resources, and the Department of Soils, Water, and Engineering.

Forsythe pointed out that the Pacific side of Central America has an ecological classification of dry and very dry tropical forest according to the Holdridge system. The semi-arid Pacific area forms a strong contrast to the Atlantic zone with its humid tropical forests, the most striking evidence being the difference in rainfall: 1200-1800 mm/157-199 mm, the latter occurring between May and October, leaving the six remaining months intensely dry. Annual crops are grown in the wet months, and hay is used to feed livestock in the dry season. The rainfall is highly erosive, with attendant flooding problems. Forsythe reminded his listeners that ecological problems of this zone are more related to our arid lands problems than many are acknowledging.