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# **A.I.D. RESEARCH AND DEVELOPMENT ABSTRACTS**



**U.S. Agency for International  
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4. International Health Planning Methodology series: 059-067
5. International Health Planning Reference series: 069-074
6. **Oral Rehydration Therapy; An Annotated Bibliography: 068**
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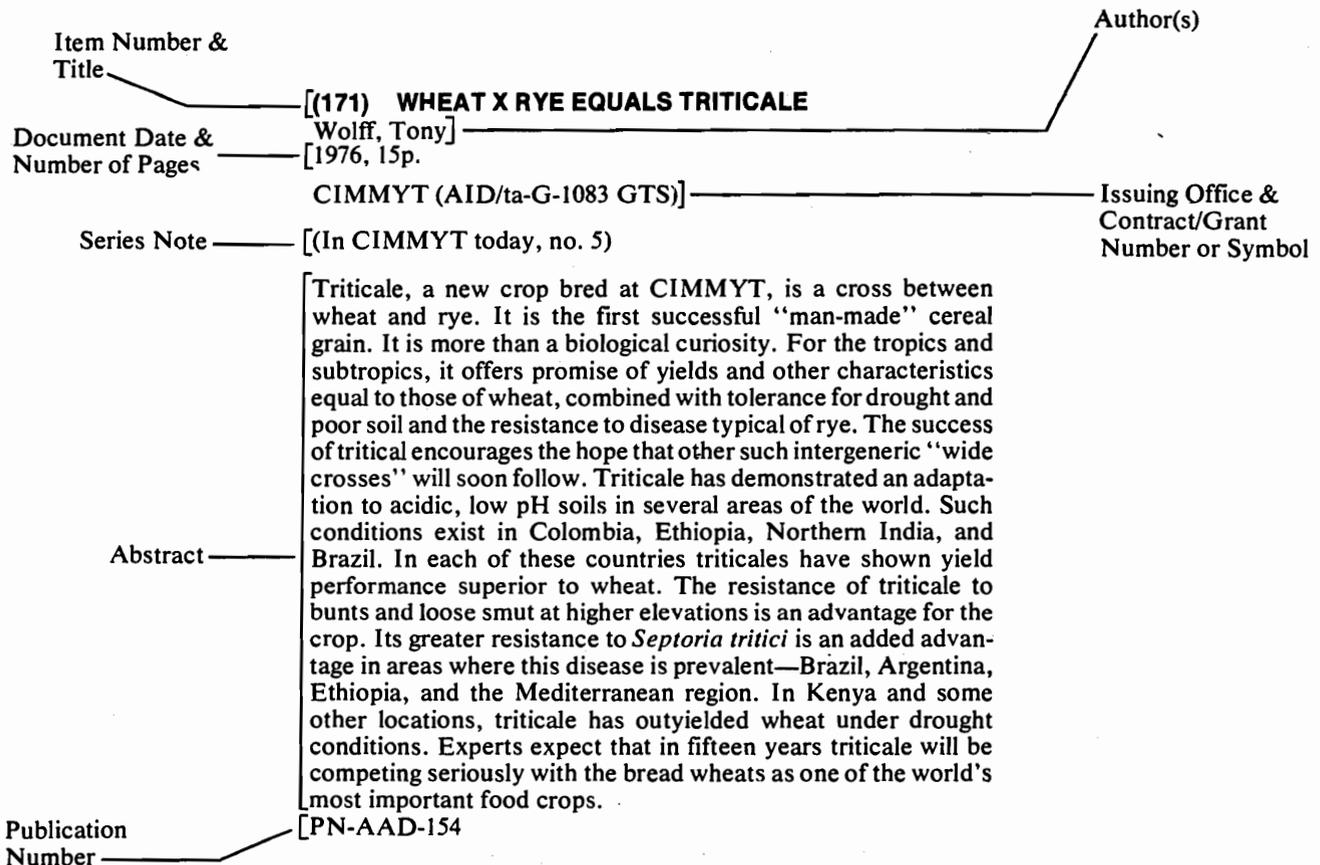
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(Related titles in a series are frequently listed below the citation.)

When completing order forms at the rear of this issue, be certain to use the Publication Number.

## PLANT PRODUCTION

### (001) METHODS OF WEED CONTROL IN CASSAVA

Doll, J.D.; Piedrahita, C.W.  
1976, 12p.

CIAT (AID/ta-G-1090 GTS)

Presents results of research efforts directed toward increasing cassava yields, highlighting the importance of timely weed control, and adoption of an adequate control program. Contains discussions of effects of weed competition; plant populations and weed control systems; herbicide selectivity; and a set of chemical control recommendations based on effectiveness, selectivity, availability and cost. Includes data tables and figures from previously published sources.

PN-AAE-773

### (002) A CONTINUOUS RICE PRODUCTION SYSTEM

Johnson, Loyd; Diaz-D.; Alfonso  
1974, 11p.

CIAT (AID/ta-G-1090 GTS)

(In CIAT information bul. no. 2-E)

Discusses a system of continuous rice production, a modified Asian wetland culture, for the American lowland tropics. This system is favored for its steady utilization of labor, land, equipment, low production costs, and capital investment. Contains information on selection of farm including water control, soils, land clearing, size; selection of equipment; operation and care of equipment; layout and development of the farm; cultural practices such as planting, weed and insect control, fertilizer, irrigation, harvesting; and future operations. Photographs illustrating equipment, field preparation, planting, and harvesting are provided.

PN-AAG-739

### (003) A GUIDE FOR CASSAVA FIELD TRIALS

Thompson, R.L.; Wholey, D.W.  
1972, 42p.

CIAT (AID/ta-G-1090 GTS)

Provides guidelines for cassava researchers regarding experimental procedures and recording experimental conditions. Discussion includes research objectives and experimental techniques such as site location and plot size, laying plots, managing experimental material, planting system, fertilizer and chemicals, plant diseases, weed and insect control, harvesting and yield evaluation recording data, presenting results. The appendix contains examples of forms for recording experimental data including planning, procedures, economic evaluation, harvest, climatic; instructions for preparing disease samples; and conversion factor tables.

PN-AAG-735

### (004) INTERNATIONAL RICE TESTING PROGRAM FOR LATIN AMERICA: REPORT OF THE SECOND CONFERENCE, 1977

CIAT; IRRI  
1977, 39p.

The International Rice Testing Program (IRTP) for Latin America was convened to maintain international cooperation, correct deficiencies in IRTP methods of operation, determine the need for nurseries, exchange ideas on current rice problems, and develop a chronology of activities to disseminate testing results to farmers in the region. Under this program, rice nurseries from the Asian region are sent by IRRI (International Rice Research

Institute, Philippines) to CIAT (Centro Internacional de Agricultura Tropical) for evaluation. Following evaluation, appropriate materials are distributed to Latin American countries. In 11/76, 28 sets of Viral-76 were sent to 17 Latin American countries. The results were sent to CIAT and presented at the conference. Average yield in the majority of countries was relatively high and the performance of some varieties was excellent. Other topics of discussion included current research on the presence of bacterial leaf blight in Latin America, development of resistant varieties to blast, drought problems, and weed control in upland rice. Tables accompany the text depicting types of nurseries sent, yields, growth rates, and climatic conditions.

PN-AAG-740

### (005) SULFUR IN THE TROPICS

Blair, Graeme; Int. Fertilizer Development Ctr., Muscle Shoals, Ala.; Sulphur Inst., Washington, D.C.  
1979, 69p.

IFDC (AID/ta-G-1218 GTS)

This research paper discusses sulphur as a nutrient in tropical regions. Sulphur deficiencies are common in tropical areas, and research showing crop responses to sulphur, and hypotheses for tropical soil deficiencies in sulphur are presented.

Although sulphur is essential to plant growth, it has received little research attention. This is due to: (1) the difficulty of sulphur analysis; and (2) the masking of sulphur deficiencies through use of other fertilizers containing low levels of sulphur.

Tropical soils have low total sulphur contents because of low sulphur-content parent materials, extreme weathering and leaching losses, the rapid turnover of sulphur-containing soil organic matter, and agricultural practices. Crop removal and burning contribute heavily to sulphur losses. The use of nonsulphur-containing phosphatic fertilizers aggravates sulphur deficiencies either by replacement of sulphur by phosphate ions on uncharged surfaces in the soil, or by unfavorable changes in soil pH.

Soil and tissue testing are discussed as indicators for sulphur deficiencies. Plant analysis appears more promising than soil testing, but problems with analytical procedures must be overcome before useful data can be obtained.

A variety of charts, tables, and other data are presented showing results of numerous sulphur experiments in the tropics. An extensive bibliography is provided.

PN-AAG-794

### (006) TROPICAL LEGUMES: RESEARCH FOR THE FUTURE

National Research Council. Board on Science and Technology for Int. Development  
1979, 342p.

NAS (AID/csd-2584 GTS)

Of the thousands of known legume species, less than 20 are cultivated extensively today. This report identifies and discusses approximately 200 additional, "neglected" species which could be exploited to great benefit by developing countries as a food source, cash crop, or soil fertility agent. The family of legumes is divided into three sub-families, Caesalpinioideae, Mimosodeae, and Papilionoideae, which can further be classified as root crops, pulses, fruits, forages, fast-growing trees and luxury timbers, and "miscellaneous" (ornamentals, sunnhemp, gums, green manure, soil reclamation, and erosion control). Pulses and root crops (eg., Bambara Groundnut, Marama Bean, Lablab Bean, and yams) are

# AGRICULTURE

an excellent source of protein. Pulses contain more protein than almost any other plant product—20 to 40% on the average and as high as 60%. While root crops, in general, are good sources of vitamins and minerals, some tropical root crops, such as the Marama Bean, also have a very high protein content and could therefore serve as a meat substitute in low-income areas. Potential cash crops include the fast-growing trees (sources of wood pulp and lumber), luxury timbers (eg., rosewoods and afromosia), ornamental plants, sunnhemp (source of fiber and green manure), and gums (sources of food additives and ingredients in medicines and cosmetics). Other legumes provide good forage for livestock and, as nearly all legumes have nitrogen-producing root nodules, greatly add to soil fertility. A list of selected readings and research contacts accompany each section of the report. An appendix lists 43 legume species and their comparative nutritional values.

**PN-AAG-844**

## **(007) CASSAVA BACTERIAL BLIGHT; ABSTRACTS OF LITERATURE**

Ibekwe, G.O.

1978, 111p.

IITA (AID/ta-G-1491)

Contains abstracts of the world literature on cassava bacterial blight, CBB. The items are written to highlight the information on CBB disease, which has caused considerable yield losses, and its categories: general literature; etiology and symptomatology; epidemiology; yield losses, cultural control; chemical control; breeding for resistance; and a list of forthcoming papers, as of June 1978. Includes author, subject, bacteria species and geographical indexes. In English, French, Portuguese and Spanish.

**PN-AAG-868**

## **(008) BIBLIOGRAPHY OF DRYLAND AGRICULTURE: A SELECTIVE LIST OF MATERIALS FOR AGRICULTURE OF SEMI-ARID TEMPERATE REGIONS; FIRST SUPPLEMENT TO THE SECOND EDITION**

Wolff, A.E.; Oregon State Univ. Office of Int. Agr.

1978, 258p.

Or. State (AID/ta-G-1221 211(d))

(1976 edition, 169p.: PN-AAC-775)

This first supplement to the Bibliography of Dryland Agriculture consists of 1008 entries of material concerning the agriculture of semi-arid regions such as Australia, Africa, the Mid-East, and parts of Africa. The entries are arranged by title, author, and subject, each in a separate index. In the title index, entries contain author, title, publication date, pagination, and the U.S. Library of Congress call number. An overview of the subject index finds the following major headings: agricultural development; arid regions; cereals, wheat, and grain production; range management; seeds; mineral nutrients including phosphorous and nitrogen; irrigation; grazing; livestock production; agricultural economics; water management; soils; and plant diseases.

**PN-AAG-965**

## **(009) CASSAVA DRYING**

Best, Rupert; CIAT

1979, 26p.

CIAT (AID/DSAN-G-0076)

(In series 5EC-4)

Examines methods for drying and storing cassava roots which improve the marketing and utilization of this valuable crop in LDCs. Includes material on standards for dry chips; the drying

process; and chipping and drying costs. Photographs of equipment, tables, and diagrams are provided. The appendix contains information on the construction and operation of the cassava chipper and the manufacture of the cutter blades.

**PN-AAH-311**

## **(010) PRODUCTION OF CASSAVA PLANTING MATERIAL**

Lozano, J.C.; Toro, J.C.; Castro, Abelardo; Bellotti, A.C.; CIAT 1977, 25p.

CIAT(AID/ta-G-1386)

(In Series GE-17)

Discusses methods for producing good quality material for propagation of the cassava plant in order to insure high yields, reduce root rot, and prevent the introduction of pests. Includes material on the quality of cassava seed; sanitary condition of the seed; and storage of cuttings. Color photographs illustrating propagation methods are provided.

**PN-AAH-312**

## **(011) AN ANNOTATED BIBLIOGRAPHY OF CHICKPEA DISEASES 1915-1976**

Nene, Y.L.; Mengistu, A.; Sinclair, J.B.; Royse, D.J.; Int. Crops Research Institute for the Semi-Arid Tropics

1978, 49p.

ICRISAT (AID/ta-G-1499)

(In Information bulletin no. 1)

The chickpea is a native Asian plant species grown as a pulse crop throughout tropical and subtropical Asia, northern Africa, southern Europe, Central America, and the southern United States. It is used as both a "direct food" and an ingredient in other foods and can be considered a major source of protein for millions of people. This publication is a bibliography of reference materials relating to chickpea diseases. It is primarily intended to help agricultural workers locate publications that will assist them in identifying fungal and bacterial microorganisms associated with chickpea seeds. Three-hundred-thirty-one reference entries, dated from 1915 through 1976, are included, arranged alphabetically according to the author's last name. A brief abstract accompanies each citation. An index cross-referencing specific chickpea diseases, control methods, and miscellaneous problems to individual reference entries is also provided. This index is divided into seven sections: five sections delineated according to the causal agent of the disease (fungi, bacteria, viruses, nematodes, and phanerogamic parasites), one section dealing with chemical control, and the remaining section containing miscellaneous subject headings.

**PN-AAH-585**

## **(012) THE ELEUSINES; A REVIEW OF THE WORLD LITERATURE**

Rachie, K.O.; Peters, L.V.; Int. Crops Research Institute for the Semi-Arid Tropics

the Semi-Arid Tropics

1978, 49p.

ICRISAT (AID/ta-G-1421)

This book reviews world literature on the Eleusines. Common names for this genus of millet grain include: Ragi, Finger millet, Birdsfoot, Nagli, Dagussa, and Mil Rouge. Ragi plays an important part in the nutrition of millions of people in the semiarid tropics, particularly in India and East. It is estimated to comprise 11% of all millet production in the world.

Ragi is one of the hardiest crops grown under the dry cultivation conditions of India and East Africa (500-1,000 mm annual rainfall). It is often associated with rice on lands where irrigation is not feasible, and typically grows on steep or sloping lands. This crop has a wide range of seasonal adaptations, and can be grown year-round with sufficient moisture and temperature. It is also adaptable to many soil types, although most commonly found on lateritic soils.

Ragi grain is most frequently used as a flour in porridge, bread, and cakes. The green grain can be roasted and eaten as a kind of vegetable. It makes an excellent malt, and is sometimes used as fodder for ruminants.

Ragi has a very high reproducibility (200-500 fold), and is often grown for that reason. Additionally, the grain is highly resistant to storage insect pests, and keeps as long as 50 years.

The book contains extensive information on the Eleusines, including their taxonomy, biology, morphology, genetics, cytology, and breeding techniques. Major sections of this book are devoted to crop growth and management, disease susceptibilities, insect and animal pests, nutrition investigations, and detailed information on the storage, processing, utilization, chemical composition, and trade and marketing of the product. Appendices list vernacular names, distinguishing characteristics, geographical distribution, ranges of variability for botanical characters, improved strains, and the chemical composition of the ragi grain. An extensive bibliography is provided.

PN-AAH-492

## IRRIGATION

### (013) ASSESSMENT OF AQUATIC WEED PROBLEMS AND THEIR ECONOMIC SIGNIFICANCE IN GHANA

Allen, G.E.; Gaudet, John  
1978, 36p.

Or. State (AID/CM/ta-C-73-23 Res.)

This report assesses specific aquatic weed problems in Ghana and discusses possible control measures. Weed infiltrations by Pistia, Azolla, Salvinia, and other floating weed types threaten the water quality and physical structure of the Barakese and Weija reservoirs, which provide the main source of drinking water to Accra.

Chemical and mechanical methods are recommended in an outlined action program to control weed growth in the reservoirs. 2, 4-D Amine and Dalapon are suggested for use on broadleaved weeds and grasses/sedges, respectively. The use of draglines is also an effective, though expensive, means of removing weed build-ups.

Reservoir Officer Maintenance training, preparation, and mobilization are recommended, along with proper weed assessment and management activities. Long-term recommendations include: (1) finding a permanent solution to the high nutrient influx at both Weija and Barakese; (2) conducting studies on specific weed problems at the universities in Legon and Kumasi, and the Institute of Aquatic Biology; (3) initiating a biological weed control program through the Commonwealth Institute of Biological Control Laboratory in Kumasi. A timetable for seasonal weed control is proposed. References and relevant data are included.

PN-AAG-635

### (014) CLIMATE AND IRRIGATION REQUIREMENTS FOR BRAZIL

Hargreaves, G.H.  
1976, 47p.

Utah State (AID/ta-C-1103 Res.)

(In CID 76-A-164)

Estimates irrigation requirements for Brazil through analysis of climatic interrelations for various locations throughout the nation. Data published by the Ministry of Agriculture were used to tabulate mean monthly values of temperature, relative humidity, and precipitation for 155 locations. These data were, in turn, used to present a comparison of climatic conditions and to estimate potential evapotranspiration and irrigation requirements for each of the locations. Data for each location are presented in table format. The methods and equations presented in this report require an absolute minimum of data and enables agriculturalists and engineers to estimate water requirements and water use for other locations. Theoretical discussion, derivation, and other details relative to irrigation application are omitted.

PN-AAG-639

### (015) THE SOUTHERN FULANI FARMING SYSTEM IN UPPER VOLTA: A NEW OLD MODEL FOR THE INTEGRATION OF CROPS AND LIVESTOCK PRODUCTION IN THE WEST AFRICAN SAVANNAH

Delgado, C.L.  
1978, 176p.

Mich. (AID/REDSO/WA-77-107)

(In English and French; French, 200p.: PN-AAG-896)

This paper provides research results on a study of the Southern Fulani farming system in south-central Upper Volta. Following the Sahelian drought of 1974, donor agency and governmental policy in this area has stressed shifting livestock production from northern to southern and central regions of the country in order to lessen dependence on erratic rainfall patterns. Hypotheses about Fulani society and economic relations which address this strategy are researched and tested by the author. Areas examined include: (1) characteristics of the research site; (2) availability and allocation of labor within an average household; (3) monthly flow of crop and livestock outputs from the average household; and (4) a summary profile of the typical Fulani production unit. The primary conclusion resulting from this research is that the real potential for economic growth through integration of crop and livestock enterprises lies in closer relations between the Fulani and Mossi tribes. The objective of rural development policy should be to promote specialization in crops and small stock by the Mossi, and cattle and small stock by the Fulanis. Recommended policy actions cover 4 major types of interventions: (1) government actions to bolster the cattle-trusting system; (2) creating a rise in relative returns to herdsmen for maintaining entrusted cattle; (3) actions to move surplus Fulani cattle manure to uses in Mossi market gardening; and (4) improving herder access to purchased food grains. A bibliography of references is provided, along with tables of labor flow data, and samples of questionnaires used in the study.

PN-AAG-895

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# AGRICULTURE

## (016) FARM WATER MANAGEMENT IN UPLAND AREAS OF BALUCHISTAN

Kemper, W.D.; Mazher-ul-Haq; Saeed, Ahmad; Colo. State Univ. Engineering Research Ctr. 1979, 88p.

Colo. State (AID/ta-C-1411 Res.)

This study describes and evaluates water management practices of farmers in Baluchistan, Pakistan. The study identifies specific farm water management activities which may be good investments for farmers and government. Water losses during delivery from source to field averages 24 percent in Baluchistan, which is about half as much loss as in the Punjab. Reduced delivery loss was caused by watercourses being shorter (averaging about 3,000 feet from source to field) and having operating water surface levels that are commonly lower than the surface of adjacent lands. The higher cost of water (ranging from Rs. 75 to Rs. 1,200 per acre foot, depending on the area and crops grown) also causes most farmers to take better care of their water. The value of water also varies with the season, ranging from zero during January and February, when some farmers allow karez water to run to the rivers, to over Rs. 1,000 per acre foot in the months of May through August, when some of these same farmers are buying water from well owners at a cost of over Rs. 1,000 per acre foot. Surface and underground storage facilities are needed to save this water from seasons when its value is low to seasons when its value is high. Surface storage such as was built for Zandra Karez behind Sharon bund is considered highly beneficial by the farmers. Underground storage and valved concrete pipe, perforated and gravel-packed in the intake portions of the karez, appear to be promising possibilities that should be investigated with farmers who see the need. Overirrigation occurs in the average fields by almost 100 percent. In karez areas this is caused by lack of farmer control of the rate of delivery water. Farmers waste the water by overirrigation rather than letting it go to more obvious waste. Well owners waste water because: (1) they do not know how much is enough and (2) electric powered wells are on fixed rates per month and the well owners see the extra water as having no cost. Substantial farmers' inputs should be obtained on all improvements to assure their feeling of responsibility and to build their pride of ownership. Assisting karez shareholders to buy pumpsets for wells to complement their karez water during prolonged drought periods or as the water table is lowered by surrounding wells should be considered. Another consideration should be the immediate implementation of May 1978 groundwater ordinance to protect the rights of groundwater users and prevent economic losses and social disruption that result from resource dislocation and groundwater depletion. The volume of runoff water is estimated at ten times the volume of water retrievable from the ground per year. Farmers attempt to use this runoff water with sailaba type cultivation which involves holding flood waters with bunds until they have entered the soil. Over 90 percent of the bunds observed were breached due to lack of engineering and provision for overflow. Water trapped in the remaining bunds is not used effectively because land is not levelled. Bunds are much higher than needed, but are not properly packed. Guidelines for construction of such systems are needed to help these sailaba bunds return more benefits than their costs. Practical research with farmers is needed to gain information on frequency and intensity of runoff events, effective low cost designs for bunds and overflow structures, amounts of water that should be retained, and types of crops and cultural practices which will use that water most effectively. Appended to this study are: (1) a table of approximate costs of pumping water from dug wells; (2) estimates of evapotranspiration from watercourses and nonbeneficial evapotranspiration from the hydrologic system; and (3) an essay on use of water on sailaba and barani lands.

PN-AAG-920

## (017) FACTORS AFFECTING LOSSES FROM INDUS BASIN IRRIGATION CHANNELS

Trout, T.J.; Colo. State Univ. Engineering Research Ctr. July 1979, 222p.

Colo. State (AID/ta-C-1411 Res.)

(In Water management technical report no. 50)

The purpose of this study is to develop more efficient low cost techniques to convey irrigation water from the canal to the field in earthen channels. The study was conducted in Pakistan's Indus Basin and the findings apply primarily to the 78,000 small conveyance systems which irrigate 12 million hectares of land in that basin. Although measured watercourse conveyance losses have varied widely, 30 to 50 percent of the water which enters most watercourses at the head does not reach the fields. This inefficiency exacerbates water logging and salinity problems caused by excessive groundwater recharge and the resulting rise in water table levels. Watercourse systems were studied in depth by ponding and inflow-outflow methods to determine functional relationships between several measurable parameters and the loss rates. Statistical analysis of the collected data indicated that: (1) watercourse loss rates (liters per second/100 meters) increase with, but are slightly less than proportional to, the usual flow rate in the channel; (2) loss rates are lower in more often used channels; (3) loss rates are higher in elevated channels; (4) loss rates are very sensitive to changes in flow depths, and thus increase with upward fluctuations in flow rates or roughness coefficients; and (5) intake rates into upper bank soils are very high and are apparently caused by extensive rodent and insect burrows inside the banks. A watercourse loss model was constructed based on the percent conveyance losses, or volume of water lost from the watercourse system in the process of delivering it to the fields, divided by the volume which entered the watercourse at the head, times 100. The model was applied to several practical watercourse design alternatives: (1) reorganization of field shapes to decrease the number of farmers' branches; (2) subdivision of watercourse command areas and flows to decrease conveyance distances and/or increase channel usage times; (3) reduction of transient losses by reducing the length of wetted channels; (4) elevation of the watercourse channels to reduce roughness coefficients; and (6) decreasing seepage rates into watercourse wetted perimeters.

PN-AAG-921

## (018) AQUATIC WEED MANAGEMENT: INTEGRATED CONTROL TECHNIQUES FOR THE GEZIRA IRRIGATION, SCHEME. REPORT OF A WORKSHOP

MADANI, SUDAN, 1978

National Research Council. Board on Science and Technology for Int. Development 1979, 98p.

NAS (AID/ta-C-1433 GTS)

This paper summarizes a workshop on the management of aquatic weeds in the irrigation canals of the Gezira Scheme, Wad Mehani, Sudan. The workshop, held December 3-6, 1978, was sponsored by the U.S. National Academy of Sciences - National Research Council (NAS/NRC) and the University of Gezira. The broad objective of the workshop was to formulate recommendations for an integrated weed management program using short- and longterm control techniques.

Minor irrigation canals, which channel water off of the main canals to irrigated fields, are easily invaded by aquatic weeds that impede water flow and promote malaria and bilharzia vector growth. Aquatic weeds can be floating, emersed, or submersed. Submersed weeds cause the most serious problems, and are the most difficult to control.

Aquatic weeds are presently controlled using either biological, herbicidal, mechanical, or manual methods. Draw-down control methods are no longer used because of the advent of intensive, year-round cropping. Mechanical control is an expensive technique. Herbicidal control requires special equipment, trained personnel, and further knowledge of weed species' life cycles, physiology, and reproductive characteristics. Biological control methods remain largely untested. Whichever method is chosen must be compatible with the multiple uses of canal waters, which include drinking, cooking, and bathing.

The workshop agenda, working group reports, recommendations observations, and conclusions are included. Papers presented at the workshop, which cover topics of aquatic weed management, malaria and schistosomiasis control in irrigated canals, gravity-flow irrigation, and use of the Chinese grass carp as a biological control agent, are reproduced in the second part of the report. A list of references is included.

**PN-AAG-923**

## **(019) OPERATIONAL IRRIGATION EVALUATION OF PAKISTAN WATERCOURSE CONVEYANCE SYSTEMS**

Trout, Thomas; Bowers, S.A.; Colo. State Univ. Engineering Research Center  
1979, 120p.

Colo. State (AID/ta-C-1411)

(Water management technical report, no. 52)

This report describes operational water loss studies on five Pakistan watercourse systems. Although the measurements were designed primarily to better understand the water conveyance systems, evaluations of field applications and of farmer understanding of his irrigation systems were also made. Other objectives were to: (1) determine the extent of transient condition watercourse conveyance loss so that past steady-state measurements can be adjusted to reflect total operational losses and (2) to better understand the watercourse system and the reason for water losses so that techniques to reduce losses can be proposed. Discussion of findings is based on numerous tables, graphs, physical layouts of the watercourses, and flow diagrams. The watercourse systems, selected from various geographical areas of the Indus Basin, were evaluated during complete irrigation turn rotations while operating normally. This allowed a quantification of the various types of water loss, including transient condition losses such as dead storage, bank washouts, outlet leadage, and high initial seepage into dry channel banks. Flow measurement was made with Cutthroat flumes and water volumes were determined through integration of the flow hydrographs. Total conveyance losses ranged from 38% to 56% and averaged 45%. Six to eight percent of the inflow was consistently lost to transient conditions of which about half was dead storage. Transient losses depended primarily on the length of channel filled and drained. Steady-state conveyance loss rates were significantly higher in the farmers' branches than in the main channels, and increased rapidly as the flow rates increased. Seepage rates into watercourse banks were much higher than intake rates into the surrounding fields on three watercourses, indicating a potential for conveyance loss reduction utilizing only improved earthen channels. Application efficiencies, monitored on three of the studied watercourses, varied widely and average 63%. Farmer water application did not correlate with measured antecedent soil moisture deficiencies.

**PN-AAG-985**

## **(020) EVALUATION AND IMPROVEMENT OF IRRIGATION SYSTEMS**

Peri, Gideon; Skogerboe, G.V.; Colo. State Univ. Engineering Research Ctr.  
1979, 99p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 49A)

A comprehensive procedure for the evaluation and improvement of irrigation systems is suggested. The irrigation system is quantified by four parameters: distribution uniformity and deliver, deep percolation and storage efficiencies. The irrigation management and irrigation regime are quantified by ratios of recommended and determined intervals and depths for the individual application.

Evaluation of performance of an individual application is based on the water distribution profile after irrigation. Efficiencies and coefficients that describe the irrigation performance are derived directly from the water distribution profile. Based on these efficiencies, the irrigation performance is determined and classified into the appropriate performance categories and subsequently, the need for improvement and types of improvements are determined.

The overall irrigation season is quantified by four parameters: marginal water costs, yield-water economic relations, crop water use efficiency and yield per unit of area. Besides the yield categories, the overall and seasonal levels of performance are quantified by the four water parameters and environmental and economic inputs. Evaluation leads to recommendations toward improvements of the irrigation system in regards to management and regime.

**PN-AAH-588**

## **(021) EVALUATION AND IMPROVEMENT OF BASIN IRRIGATION**

Peri, Gideon; Skogerboe, G.V.; Norum, D.I.; Colo. State Univ. Engineering Research Ctr.  
1979, 199p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 49B)

A procedure is outlined for the design and evaluation of basin irrigation systems, showing the interactions between the various basin characteristics, the operational parameters, the management parameters, and the performance parameters. A general model is discussed by considering the various functions upon which it must be based (infiltration, advance, recession).

A simple model for the determination of the infiltrated water distribution under basin irrigation is also presented. The model can be applied to both level and sloped basins. Comparison with other more complicated models shows satisfactory agreement in the distributions.

A complete infiltrated water distribution under basin irrigation can be approximated from limited field observations, which are described. However, as only two of a possible four parameters are sufficient to define each distribution, the selection of these parameters should be made on the basis of circumstances under which the field observations were made. General guidelines are given for the selection of the most reliable parameters. The main advantage of the method is its simplicity in both the field measurements required and in the data analysis. The procedure suggested is suitable for most practical cases, especially as a preliminary evaluation procedure when detailed studies are not warranted.

**PN-AAH-589**

# AGRICULTURE

## **(022) EVALUATION AND IMPROVEMENT OF BORDER IRRIGATION**

Peri, Gideon; Norum, D.I.; Skogerboe, G.V.; Colo. State Univ. Engineering Research Ctr. 1979, 121p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 49C)

The evaluation of border irrigation requires the use of a model that relates the operating conditions to the irrigation results, such as: (a) total water quantity delivered to the border; (b) water losses outside the border by runoff; (c) average depth of application; and (d) water distribution within the border. Evaluation for improving border irrigation can be carried out in two major ways: (a) field tests; and (b) theoretical models.

The improvement of border irrigation based on field tests requires the estimation of the infiltration equation and the advance and recession for a specific inlet stream and border parameters (slope, length, surface). The performance parameters can then be calculated to determine the irrigation performance and the need for improvements. Then, the operating conditions that are to be changed can be determined.

Theoretical models for the evaluation and improvement of border irrigation performance enable one to predict the water distribution and losses for a given set of conditions, without direct field measurements. Only limited amounts of preliminary field work are required to predict the irrigation performance for a wide range of parameters and variables. Available models are described, as well as the process for applying these models.

**PN-AAH-590**

## **(023) IRRIGATION AND HONOR: CULTURAL IMPEDIMENTS TO THE IMPROVEMENT OF LOCAL LEVEL WATER MANAGEMENT IN PUNJAB, PAKISTAN**

Merrey, D.J.; Colo. State Univ. Engineering Research Ctr. 1979, 61p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 53)

Inadequate organization of irrigation water users is now recognized as the major constraint to improving on-farm water management in Pakistan. Previous studies carried out by Colorado State University and Pakistani sociologists have identified characteristics of local social organization that either inhibit or facilitate the introduction or programs for watercourse reconstruction and maintenance. This report, based on a detailed study of one village, including observations of a watercourse reconstruction project, supplements previous studies by describing a major theme in Punjabi culture, the concept of izzat ("honor", "reputation"). Much of Punjabi behavior, and especially the difficulty of organizing local level cooperative projects, can be understood in terms of the concept of izzat. The concern for preserving or increasing one's izzat, or reducing others' izzat, generates conflict and competition among people and discourages cooperation. The implications of the concept of izzat for organizing farmers to construct their watercourses and manage their irrigation water is discussed, and some general recommendations are presented.

**PN-AAH-591**

## **(024) ORGANIZATIONAL PROBLEMS AND THEIR CONSEQUENCES ON IMPROVED WATERCOURSES IN PUNJAB**

Mirza, A.H.; Merrey, D.J.; Colo. State Univ. Engineering Research Ctr. 1979, 207p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 55)

Based on an intensive survey of ten improved watercourses in Punjab, this study shows the inadequacy of present forms of social organization of watercourses for insuring their adequate maintenance. Using as the major criterion the quality of maintenance of improved watercourses, the study suggests the following sociological characteristics as conducive to good maintenance under present conditions: a large percentage of landholdings in the 6.5 to 25 acre range; relatively equal distribution of power and influence among farmers on the watercourse; a large percentage of farmers being perceived as having some power and influence; relative "progressiveness" as measured by institutional services available in the community, educational level of the farmers, and percentage of farmers who listen to the radio regularly; previous history of cooperation and lack of recent conflict; single-biraderi social structure; and a small number of watercourse shareholders. Based on this research, the study makes concrete recommendations for improving the present On-Farm Water Management Pilot Project (including selection of watercourses), and presents a detailed proposal for setting up experimental Water Users Associations and monitoring their progress.

**PN-AAH-592**

## **(025) OPTIMIZATION OF LENGTHS OF ALTERNATIVE WATERCOURSE IMPROVEMENT PROGRAMS**

Reuss, J.O.; Colo. State Univ. Engineering Research Ctr. 1980, 61p.

Colo. State (AID/ta-C-1411)

(In Water management technical report no. 57)

A sound theoretical basis is established and computational methods developed for choosing between alternative methods of construction or improvement of watercourse systems that operate on a rotational or turn basis. These methods were developed for use in Pakistan. The factors controlling the selection of lining methods include: annual cost per unit length; the expected water loss associated with each method and the value of water.

In water distribution systems operating on a rotation basis, various reaches often have vastly different use times, with utilization generally declining from head to tail. These differences in utilization markedly affect the benefits derived from lining on any particular section, but have little or no effect on cost of construction. Major conclusions include: first, that net benefits are generally maximized when different methods, such as lining and earthen improvements, are applied to various sections depending on use time; and secondly, the major beneficiaries to improvement of high use sections are the downstream users that may be located on reaches where high cost improvements may not economically be feasible. Computational methods are developed for: (a) determining the optimum points for changing lining methods; and (b) quantifying benefits to improvements accruing to users throughout the system.

**PN-AAH-593**

## RURAL DEVELOPMENT

### (026) RURAL DEVELOPMENT IN THE YEMEN REPUBLIC: STRATEGY ISSUES IN A CAPITAL SURPLUS LABOR SHORT ECONOMY

Cohen, J.M.; Lewis, D.B.  
1979, 98p.

Harvard (AID/ta-BMA-8)

(Discussion Paper no. 52)

This Discussion Paper concerns the proper rural development strategy for Yemen's capital-surplus, labor-short economy. The paper was prepared for AID by the Harvard Institute for International Development. Until the early 1970's, Yemen's annual gross national income was less than US \$100 per capita. At that time, the country had a shortage of capital with a surplus of labor—a characteristic typical of developing countries. Within the last 5 years, however, employment opportunities in Saudi Arabia have attracted 40% of Yemen's male labor force. Remittances from these earnings have increased Yemen's gross national income per capita by a factor of 6. Because of this new capital-surplus, laborshortage situation, there is growing concern that the usual models of agriculture and rural development will not effectively meet Yemen's needs. The paper details theoretical issues underlying this problem of development economics. Basic information on rural development in Yemen is also presented. Appendices include maps of the country, basic socio-economic data, and a working bibliography containing 169 entries (1939-1979)

PN-AAG-816

### (027) AGRICULTURAL SECTOR ASSESSMENT SRI LANKA

Newberg, Richard; Fletcher, L.B.; Simmons, Emmy; Kemper, Doral, Aucther, Ed  
1979, 107p.

AID/ASIA/USAID/Sri Lanka

Report identifies major rural development needs in Sri Lanka and makes recommendations for AID priority support. Two initial sections detail the economic geography and recent history of food, agriculture, and rural development in Sri Lanka. The country's natural resource base for production of food, fiber, forestry products, and fish is impressive, generally well-preserved, and only partially exploited. GSL institutions serving the agricultural sector, though many, are inadequately funded and staffed and responsibility is fragmented. Rural people, especially small farmers, are not given adequate technical guidance, and the levels and instability of prices and market outlets for many commodities are serious constraints to increased production. The GSL's 1978-82 development plan emphasizes economic reform, increased employment, and investment in a few large projects (chief among which is the Mhawali Ganga Project), as well as revision of price policy and subsidy restraints. Several resource development opportunities receive little attention. These are detailed in the report's middle section. A final section recommends priorities for AID support. After noting six areas as candidates for major loans, and five others as candidates for technical assistance projects, the report recommends that AID avoid involvement in small, scattered projects and limit itself to four or five major activities, preferably under a single umbrella project. Recommended especially are support of the Mahawali project, rainfed agriculture in the Dry Zone, a comprehensive fertilizer strategy, and sector planning and policy analysis (not credit, however). Preliminary scopes of work are provided for three of these activities. Twentyfive tables and two charts accompany the text of the report.

PN-AAG-851

### (028) PRELIMINARY AND INFORMAL OBSERVATIONS OF SOCIO-ECONOMIC IMPLICATIONS OF FEEDER ROAD IMPROVEMENT IN HAITI

Conway, F.J.; Darisme, J.W.  
1979, 26p.

Group Seven (AID/otr-C-1387)

This document reports on the findings of a preliminary and informal study of the socio-economic effects of feeder road construction and improvement in several small communities in rural Haiti. The subject communities include La Vallee in the south of Haiti, and Barriere, Battant, Carrefour, Menard, Dondon, St. Raphael, and Pignon in the North. Generally, residents welcomed the road improvements, which in some places reduced travel time to the nearest city from 3 days to several hours. The flow of goods to the marketplace was expedited as well as the transport of children to schools and the sick to hospitals. Most inhabitants viewed the roads as a prerequisite to their communities economic development and overall well-being. However, discontent was expressed by many regarding the hiring of an outside construction contractor, which had ignored them and failed to provide employment for locals.

PN-AAG-887

### (029) POOR RURAL HOUSEHOLDS. TECHNICAL CHANGE, AND INCOME DISTRIBUTION IN DEVELOPING COUNTRIES: TWO CASE STUDIES FROM WEST AFRICA

Matlon, Peter; Eponou, Thomas; Franzel, Steven; Byerlee, Derek; Baker, Doyle  
1979, 204p.

Mich. State (AID/ta-C-1328)

(In African Rural Economy Program working paper no. 29)

This study focuses on detailed analysis of rural incomes in the West African countries of Sierra Leone and Nigeria. The study arises out of a growing concern over the widening income gaps characterizing most developing countries in the past few decades, and the effects of development programs on the interpersonal distribution of income. The study area is characterized by 4 factors that lend importance to research results: (1) the high land/human ratio, and generally egalitarian system of land tenure; (2) limited technical change in agriculture; (3) low levels of mean incomes and infrastructural/institutional development; and (4) the extreme paucity of information at the household level.

Research findings show that incomes display a fairly equitable distribution in Sierra Leone and Nigeria. Rural inequality at the village level appears to be directly affected by population pressure and improved road access, which functions to provide non-farm and cash cropping opportunities to higher income with greater investment capacities. A serious degree of absolute poverty exists among the poorest 30% of households in both areas, particularly in the less humid, high population density portions of Sierra Leone.

The trend toward income inequality is increasing, due to structural changes in the employment market (such as increased urbanization and the high cost, relative to poor household income, of investment in non-farm enterprises).

Policy options for equitable rural development include: (1) development of improved crop production packages for lowincome producers which economize on production limiting factors- capital, peak period calories, and management; (2) raising interest rates charged by formal lending institutions; (3) reorienting lending operations to perform a savings function for rural, small-scale producers; and (4) removing export taxes on labor-intensive agricultural export crops. References are included, along with appendices on mathematical definitions used in the study, and data on urban incomes.

PN-AAG-889

# AGRICULTURE

## **(030) RURAL DEVELOPMENT, EDUCATION AND FERTILITY: A STATE-OF-THE ARTS PAPER**

Cheng, Benjamin; Lawson, W.D.; Levine, W.T.; South-East Consortium for International Development; Research Triangle Inst.  
1979, 95p.

RTI (AID/ta-CA-1)

PN-AAG-907

## **(031) RURAL DEVELOPMENT, WOMEN'S ROLES AND FERTILITY IN DEVELOPING COUNTRIES: REVIEW OF THE LITERATURE**

Javillonar, G.V.; Zivetz, Laurie; Thomason, S.G.; Griffith, Janet; South-East Consortium for International Development; Research Triangle Inst.  
1979, 298p.

RTI (AID/ta-CA-1)

PN-AAG-908

## **(032) RURAL DEVELOPMENT, MIGRATION AND FERTILITY: WHAT DO WE KNOW?**

Findley, S.E.; Gundlach, J.H.; Kent, D.P.; Rhoda, Richard  
Research Triangle Inst.; South-East Consortium for International Development  
1979, 254p.

RTI (AID/ta-CA-1)

This report is part of a series of state-of-the art papers, financed under AID project 9311170, which are intended to provide AID officials with a better understanding of the impact of development activities and improved standards of living on population growth. This particular paper examines what is known regarding the interaction of rural development efforts, rural-urban migration, and fertility, especially rural fertility. The paper is divided into three sections. The first section examines current theories and evidence regarding the nature of rural outmigration, specific variables inducing migration, and the types of persons responding to the migration variables. The second section summarizes research findings with respect to migration and fertility. Factors which operate to reduce the fertility of both native urban and migrant women are discussed. These include lengthy separation from spouse while migrating, increased educational attainment, commitment to work outside the home, working at a position where children cannot be cared for, little reliance on children as workers at home or in the market, access to and use of improved health care and family planning services, and increases in the level of family income. In the third section, the authors focus on migration and related fertility impacts of the "new priority" rural development activities. Authors conclude that very few of these development programs slow or stop rural-urban migration. Rather, they only limit rural-rural migration. Only after many years can a reduction in rural-urban migration be expected, and then only if the long-term economic outlook for rural areas has improved significantly. Migration's indirect effect on rural fertility is fairly limited. But in the long term, the indirect effects may be substantial. In particular, if migrants adopt small family norms, then they may introduce these concepts to rural areas when they return to live or visit. An annotated bibliography includes publications dating from 1969 to 1979.

PN-AAG-930

## **(033) HUMAN RESOURCES IN RURAL DEVELOPMENT: SOME THEORETICAL ISSUES**

Byerlee, Derck  
1973, 12p.

MSU

PN-AAA-987

## **(034) RURAL DEVELOPMENT ACTIVITIES, FERTILITY, AND COST AND VALUE OF CHILDREN**

Turchi, B.A.; Bryant, E.S.  
Research Triangle Inst., South-East Consortium for International Development  
1979, 229p.

RTI (AID/ta-CA-1)

This report is part of a series of state-of-the art papers, financed under AID project 9311170, which are intended to provide AID officials with a better understanding of the impact of development activities and improved standards of living on population growth. This particular paper examines how rural development affects the cost and value of children and, thus, fertility. Section I develops a conceptual model of factors influencing reproductive behavior. The model relates a wide range of external socioeconomic factors with the social, psychological, and economic value and cost of children as perceived by the parent. The remaining sections of the paper survey the literature elaborating these relationships. Section II lists the factors affecting the value of children in several countries in Africa, Asia, Latin America, and the Middle East. Universal factors are identified which may affect the value of children during the process of modernization. Sections III and IV focus on the time and financial opportunity costs of childbearing and the relation of these costs to fertility. The role of rural development policy is analyzed in Section V. The only politically acceptable policy interventions are those which introduce attractive new options to child-centered activities. These include employment and educational opportunities for women, increased consumption of market goods and services, introduction of urban amenities, construction of housing suited primarily to small families, and introduction of new technologies to reduce the value of child labor. A lengthy annotated bibliography covers literature published from 1960 through 1979.

PN-AAG-931

## **(035) THE RELATIONSHIP OF FERTILITY TO INCOME AND WEALTH IN RURAL DEVELOPMENT**

Meeks, T.J.; Lee, Bun Song  
Research Triangle Inst.; South-East Consortium for International Development  
1979, 205p.

RTI (AID/ta-CA-1)

This report is part of a series of state-of-the art papers financed under AID project 9311170, which are intended to provide AID officials with a better understanding of the impact of development activities and improved standards of living on population growth. This particular paper examines the relationship of fertility to income and wealth. Part I reviews the principal approaches in use today for analyzing the effect of income and wealth on fertility. Part II discusses the relationship of rural development activities to fertility, income, and wealth. Paradoxes abound in the relation of fertility to income and wealth. The relation, sometimes positive and sometimes negative, depends largely on whether one is considering the long or short run, the direct or indirect effect, the pure income effect or the substitution effect from economic development. Empirical findings are broadly consistent with a threshold relation of fertility first increases, then decreases as the

# DEVELOPMENT ADMINISTRATION

level of income and development rises. Even at the higher levels of development, however, the inverse relation is small relative to the total variation in fertility. Factors other than income can explain much of this variation in fertility. The direct effects of rural development strategies on fertility are not well established. The limited evidence available suggests that, by itself, a more equal distribution of land would raise fertility. It is plausible that agricultural modernization would lower fertility, more certainly in the long-run, by raising the return on alternative assets. By this view, nontraditional farm inputs and children would be substitutes, unlike land and children. Given the low absolute return on children estimated in a number of studies, the development of adequate substitutes might be possible in the not too distant future, if properly pursued. A comprehensive annotated bibliography lists references from 1960 through 1979.

PN-AAG-932

## DEVELOPMENT ADMINISTRATION

### **(036) PROCEEDINGS OF THE WEST AFRICA CONFERENCE, TUCSON, ARIZONA, 1976**

Paylore, Patricia; Haney, R.A.  
1976, 349p.

Ariz. (AID/ta-G-1111 211(d))

Presents the Proceedings of the West Africa Conference held in Tucson in April, 1976. The Conference grew out of a linkage established between its co-sponsors, the University of Arizona and the Ghana Council for Scientific and Industrial Research. It was designed to discuss, primarily for the benefit of American university research scientists, natural resources development and management in the arid and semi-arid countries of West Africa, and the related social, economic, and political constraints to that development. The basic message provided in the Proceedings is the necessity of involving other experts (especially social scientists), women, health personnel, and, above all, local people, in natural resource issues. Proceedings are presented according to the Conference's 7 Sessions. These were: (1) Overview of West Africa; (2) The Sahel: Pastoral Nomads and a Fragile Ecology Traditional Practices and Some Proposals for Change; (3) West Africa: The Migration of Human Populations - Urbanization and Rural Development; (4) The Volta River Basin: A Case Study of the Impact of Development; (5) Integrated Rural Development; (6) Concerns in Providing Effective Technical Assistance in Developing Countries; (7) The Role of U.S. Universities in West African Development and the Problems Related to the University's Capability to Fulfill that Role. An appendix provides further documentation on regional aspects of national development in West Africa; West Africa's future; trade in West Africa; the United Nations 1977 Conference on desertification; and the ecology of the Sahel-Sudan Region of Sub-Saharan West Africa.

PN-AAG-796

### **(037) PLANNING, BUDGETING, AND MANAGEMENT ISSUES IN ZAMBIA, MALAWI, AND SWAZILAND**

Bryant, Coralie; Blue, Richard; DeGregori, Tom  
1979, 75p.

AID/PM/TD

(In Development Studies Program. Case studies in development assistance no. 4)

This case study, prepared for AID's Southern African Analysis Program, describes the state-of-the art of planning, budgeting, and

management in Zambia, Malawi, and Swaziland. Management manpower shortages are cited as one of the leading constraints to development in these countries. Authors note that at least in Malawi, the few skilled people available are placed in key positions. Swaziland's institutional and planning problems have resulted from an extensive traditional political system (headed by the King) operating in parallel with the civil administrative system. Another problem common to these countries, is the lack of data analysis skills. Malawi has proved most effective in mobilizing their own resources, and judicious in both accepting and using donor assistance. Authors recommend less emphasis upon longterm participant training, and question whether LDCs require the same level of sophistication as that used by donor agencies to assist LDC development. Instead, AID and other donor assistance should be directed to development of short-term, in-country management training programs, transportation maintenance and management institutes, self-help construction institutes, and rural appropriate technology institutes.

PN-AAG-901

### **(038) WORKSHOP ON ADVANCED TRAINING IN COMMUNICATION FOR SOCIAL DEVELOPMENT IN THE GAMBIA**

Chicago Univ. Community and Family Study Center  
1979, 67p.

Chicago (AID/pha-G-1177)

This report evaluates the Workshop in Advanced Training in Communication for Social Development in The Gambia. The workshop was planned, organized, and implemented by the Ministry of Information of The Gambia. The Gambia Family Planning Association, and the Community and Family Study Center of the University of Chicago. Fifty persons from Gambian private and governmental organizations received training at the workshop. The program consisted of eight courses: (1) Principles and Theories of Communication; (2) Social, Demographic, Ecological, and Psychological Aspects of the Development Process; (3) The Content of Social Development Programs in The Gambia; (4) Person-to-Person Communications for Social Development; (5) Mass Media for Social Development; (6) Communication Research and Evaluation; (7) The Tabulation and Analysis of Social Research Data; (8) The Planning and Management of Communications Programs. There were assigned readings, laboratory exercises, studio exercises at Radio Gambia, and individual projects. Instruction was planned and guided by the University of Chicago teaching team working in close collaboration with The Gambian sponsors. Because the University of Chicago awarded a certificate to each participant who successfully completed the course, the Community and Family Study Center was given overall responsibility for selecting and scheduling teachers for the courses. The response of the participants was enthusiastic and favorable. Not only did the workshop bring training in communications techniques and theories which participants would not otherwise have gained, but it also provided them with an opportunity to interact with their government leaders and program directors in reviewing all of the major development programs for the nation.

PN-AAG-956

### **(039) WOMEN AND DEVELOPMENT; FINAL REPORT OF WORKSHOP, BROOKINGS INSTITUTION, WASHINGTON, D.C., 1979**

Tinker, Irene; Am. Assn. for the Advancement of Science  
1979, 183p.

AAAS

This report is a compilation of background information, supporting statements, recommendations, and eleven background papers that address the need for participation of women in income

producing activities in developing countries. The report represents the results of the first of four workshops on women and development. The dominant theme throughout the workshop was the critical need to consider the issue of "women in development" as an integral part of all recommendations and projects flowing from the U.N. Conference on Science and Technology for Development. Workshop discussions focused first on technology to assist women in providing for their families' basic energy, food, and water needs, and secondly on technologies to provide new income. These discussions were directed toward national action to improve the planning and use of science and technology, and they emphasized the importance of ensuring that technological transfer benefit the workers as well as the owners of production. To enhance endogenous participation of women in development planning, workshop participants recommended science and technical education for female professionals and skill training for poor, illiterate women. The twenty-one recommendations made by the workshop are therefore grouped into two categories: integrated planning and inclusion of women in technology policymaking. The appendices contain suggested technology impact evaluation methodologies, a study of energy consumption trends in LDCs, and a list of workshop participants. The eleven background papers occupy three-fourths of the report and cover such topics as the role of women in rice processing in Indonesia, effects of technology on Iranian women, socio-economic evaluation of solar installation in Upper Volta, petty trade options for urban West African women, women in multinational corporations in LDCs, and women in banking, finance, and entrepreneurship.

**PN-AAH-076**

**(040) EXPATRIATE PROFESSIONALS AS INTERNATIONAL CONSULTANTS**

Stepanek, J.E.; Ivory, Ming  
1979, 72p.

AID/DS/ST

Outlines EPIC (Expatriate Professionals as International Consultants), an action program to address the problem of LDC brain drain through the transfer of technology to the needs of LDCs. The problem of brain drain arises when the professionally educated in an LDC take up permanent residence in a developed country, with substantial loss of money and personnel to the mother country. At Istanbul in June 1978, representatives from 20 LDCs discussed their approaches to this problem and endorsed a UN-backed experiment in Turkey to attract expatriate professional back home as short-term technical assistance volunteers. Based on the Turkish experiment, which has led the UN to finance similar programs in up to 12 LDCs, the present report recommends an action program to assist and encourage the high expatriate population in the US in a transfer of technology appropriate to the needs of LDCs. In addition to providing a practical solution to the brain drain problem, the EPIC program would provide support for employment-creating projects for the poor and a cost-effective substitute for traditional technical assistance. Essential to the success of EPIC are: (1) the establishment in each LDC of an effective administrative system to link volunteers with host organizations; and (2) private US sector organizations willing to enter into agreement with LDC organizations. In addition to detailing the implementation and evaluation components of EPIC, the report contains a review of current literature on the brain drain problem, including substantial summaries of the Istanbul Report; analyses of related problems; data on the whereabouts of the expatriate professional population and, of particular importance to EPIC, of the professional associations through which expatriate professionals can be identified and contacted.

no PN

**(041) THE ECONOMIC IMPACT OF DROUGHT AND INFLATION IN THE SAHEL**

Berg, Elliot  
1976, 39p.

Mich. (CSD-2547 211 (d))

(In Discussion paper no. 51)

Summarizes economic developments in the Sahel since the great drought of 1968-74. The first section reviews the most evident effects of the drought, covering human mortality, physiological damage, and ecological changes. Livestock and agricultural losses are also discussed, as are adverse effects on export rate, national income, public sector finance, and the balance of payments. It is pointed out that the disaster gave rise to a few social benefits; it significantly expanded intra-Sahelian cooperation and focused worldwide attention on the ongoing needs of the Sahel. The second section describes income distribution changes caused by drought, inflation, and government policies. The report's conclusion details policy implications which arose from the drought and inflation. Agricultural expansion, appropriate use of food subsidies, and limits on livestock populations are recommended.

**PN-AAC-740**

**(042) LAND REFORM IN SUB-SAHARAN AFRICA: AN ANNOTATED BIBLIOGRAPHY**

Baron, Donald  
1978, 50p.

USDA (RS/USDA-04-77)

Annotated bibliography summarizes views presented in recent books and articles concerning the relationship between land tenure and economic development in Sub-Saharan Africa. Under the customary tenure, title is vested in a tribal or familial group rather than the individual farmer. Principal among the problems presented by this system of tenure are the lack of security (tribal leaders often have the power to confiscate land from individual farmers) and the inability of individual farmers to alienate their rights in land. Group control thus prevents the use of land as security for loans for land improvements. This document is divided into five annotated sections, each of which reviews a specific land reform issue or set of issues. A corresponding bibliography follows each section. The following topics and related references are included: (1) Tenure-related Constraints (43 references, 1956-1977), (2) Individualization of Ownership (31 references, 1961-1976) (3) Tenure Problems in Ghana and Nigeria (32 references, 1956-1975), (4) Land Registration and Consolidation (32 references 1954-1975), (5) Land Reform in Kenya (31 references, 1955-1977)

**PN-AAG-726**

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## **(043) A MULTI-PURPOSE HOUSEHOLD QUESTIONNAIRE: BASIC ECONOMIC AND DEMOGRAPHIC MODULES**

Freedman, Deborah; Mueller, Eva  
1977, 106p.

AID/DS/POP

This document, prepared for the World Bank and AID, outlines a multi-purpose household questionnaire for use in lesser developed countries. The questionnaire consists of a number of small question sub-modules, designed to provide a limited but central core of data, profiling each household on a demographic, sociological, and economic basis. The specific sub-modules identify household members and provide information on employment, fertility and child mortality, migration, and household characteristics, assets, and income. Sample forms and instructions for their use are included in the text.

PN-AAG-826

## **(044) SHELTER SECTOR ASSESSMENT, PERU**

Priftis, Ted; Conger, Lucy; Stout, Donald; Trudelle, Randall  
1979, 111p.

FCH (AID/otr-G-1583)

This document outlines the currently severe economic and housing situation for the very poor in both rural and urban areas of Peru. The report was prepared by AID's Office of Housing. Symptomatic of Peru's overall economic troubles have been a rapidly growing rate of inflation, balance of payments deficit since 1974, an overwhelming external debt-servicing problem, and falling real wages. Conditions having serious implications for the housing sector include: (1) Peru's unavoidable economic recession which will further squeeze effective demand for housing; (2) the particular vulnerability of the housing sector's finance institutions the GOP may pull the subsidy plug from the entire S&L system and bring the Banco de la Vivienda del Peru (BVP) to a halt; and (3) the localization of approximately 75% of Lima's population in squatter settlements and inter-city slums. By 1977, the BVP calculated that the monthly family income necessary to qualify for a loan to finance a minimal-level house exceeded the income of 97% of the families of Metropolitan Lima. The elements of a housing program for the poor should include infrastructure, education, community services, food, and medical care. Report provides further, in-depth discussion of the country situation (governmental further, in-depth discussion of the country situation (government structure, geographic, and climatic conditions), the overall economic setting, and a socio-cultural profile of the very poor.

PN-AAG-854

## **(045) THE ECONOMIC IMPLICATIONS OF A MIDDLE EAST PEACE SETTLEMENT: AN ECONOMIC DEVELOPMENT MODEL FOR THE WEST BANK AND GAZA STRIP**

Spector, B.I.; Kayvan, Sayeed; Keynon, Fary; Harvey, William  
1978, 311p.

CACI (AID/ne-C-1553)

(Final report, contract AID/ne-C-1553, part I) (Part 2, 186p.: PNAAG-873)

PN-AAG-873)

This paper is the second of a 2-part series on the economic implications of a Middle East peace settlement. This volume presents the 5 year growth prospects for the West Bank and Gaza Strip, based on analyses of an economic development model.

In order to achieve real growth in the economics of the West Bank and Gaza regions, increased domestic and foreign investments are

needed over the next 5 years. If projected immigration rates of Palestinians are accurate, expanded investment and assistance are particularly needed in infrastructure development, housing, relief services, and jobs.

Two alternative growth scenarios are hypothesized for the 1979-83 period, based on: (1) continued 8% annual real growth, and (2) an hypothesized 4.6-5.6% annual growth rate. The latter projection is considered more realistic. Projections of investment requirements by sector indicate that construction of housing and public facilities will require the most investment over the next 5 years. Both construction and public services can be easily expanded to meet needs if investment capital is made available. Immediate expansion in agriculture will be more difficult, due to scarce land and water resources. Government development plans should be encouraged to improve the absorptive capacity of the industrial sector.

Initially, high investments of foreign capital in the West Bank and Gaza will be required for development of infrastructure and to provide relief services for incoming Palestinians. Gaza will likely require more assistance and investment due to its less developed economy.

Rapid economic growth in these areas can be stimulated by: (1) establishing a stable and secure political environment for investment; (2) implementing an economic development plan to structure and guide growth; (3) providing government incentives to channel domestic savings into investment and encourage private foreign investment; and (4) developing adequate public infrastructure to facilitate the successful absorption of private capital investment.

An extensive bibliography of references use by the authors of this report is included.

PN-AAG-874

## **(046) GROWTH AND EQUITY IN MEXICO**

Texas Univ. Lyndon B. Johnson School for Public Affairs  
1979, 149p.

Tex. LBJ (AID/otr-C-1606)

(In Development Studies Program. Case studies in development assistance no. 5)

This paper presents information resulting from an AID-sponsored study between 1977-78 on growth and equity in Mexico. Covering Mexican economic history since 1930, the study examines the relationship between overall economic growth and the distribution of that growth in Mexico. Patterns of growth were compared with other actual or conceptual models, bearing in mind recent literature on meeting basic human needs. Four types of information were collected and analyzed: (1) time series statistical data; (2) intermittent statistical data; (3) data and information generated by studies of economic growth and equity in Mexico; and (4) information generated by interviews with scholars and officials in the U.S. and Mexico.

Mexico's economic growth policy has been extremely successful, while its equity policy has been very deficient. Assessments of improvements in status and incomes for poorer Mexicans yield mixed results. The poorest 40% of Mexican families are presently as disadvantaged as they were 20 years ago; the remaining 60%, however, are comparatively better off than 2 decades ago. Benefits from agricultural investments have accrued primarily to large commercial farmers in recent decades. Government health services and educational assistance also appear to be deficient in poor and rural areas, as opposed to wealthier districts. Simultaneously, however, death rates have fallen and percentages of children entering primary schools have increased, indicating equitable government action.

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The following observations and recommendations are made regarding further national growth and development: (1) National expenditures should be re-directed to assist poor and rural regions in agriculture, health, housing, and education; (2) Surplus revenues should be re-directed to urban and rural poor through increased public sector projects; (3) Greater incentives should be provided to industry to encourage labor-intensive investment choices.

Extensive footnotes and references are provided. Three annexes provide tabular data on agricultural production, health, and educational status of population, et al; a Mexican quality of life index by state for 1970; and an analysis giving equity aspects of the Mexican growth experience.

**PN-AAG-900**

## **(047) DEFINITION AND MEASUREMENTS OF POVERTY**

Kazen, F.M.; Acad. for Educational Development  
1978, 142p.

AED (AID/afr-C-1131 GTS)

This report covers efforts to define the concept of poverty and to arrive at a methodology for estimating poverty levels utilizable by four international development assistance agencies: the World Bank (IBRD); the Inter-American Development Bank (IDB); the Economic Commission for Latin America (ECLA); and the InterAmerican Foundation (IAF). Of all the agencies, only one, IAF, has resisted adopting a quantitative measure of poverty. IAF assumes that the poor are readily visible to its field representatives and relies on direct contacts with the poor and groups that serve them to help them identify other needy poor (a process referred to as "the grapevine effect"). IAF has developed qualitative indicators -- known as "social gains" -- and the current attempts at their field validation are reviewed in this report. The three other institutions are exploring quantitative measures. These fall into two categories: absolute and relative poverty measures. Absolute poverty measures involve some measure of minimum levels of consumption or income that allow a separation of the poor from the rest of the population. Relative poverty measures are defined as some percentage of per capita income distributions of the country. Cut-off lines are variously set at 20 percent, 33.3 percent, 40 percent, or 50 percent. The number of persons falling below this line are classified as the poor. However, even attempts to measure the poor by the most rigorous of quantitative methods yield, at best, approximation. Apart from limitations of the available income distribution and lack of pertinent information for some countries, various assumptions, subjective considerations, and use of proxies affect the reliability of final results. It is recommended that a methodological workshop be organized to bring together concerned Latin American/Caribbean. Bureau officials to discuss discrepancies in poverty estimates pointed out in this report. In addition to a number of tables, the report includes two appendices: (1) Issues in Measuring Development Performance, and (2) Validation of the Inter-American Foundation's Social Indicators.

**PN-AAG-928**

## **(048) LDC WHEAT IMPORTS IN 1985 AND THE IMPACT OF DEVELOPMENT ASSISTANCE ON LDC WHEAT IMPORTS**

Gormely, P.J.; Kennedy, T.E.; Chhatwal, G.S.; Kan. State Univ.  
Food and Feed Grain Inst.  
1977, 48p.

Kan. State (AID/ta-C-1162 GTS)

(In Special report no. 5)

This report projects 1985 LDC wheat imports and analyzes the impact of development assistance on these imports. Projections are made for 97 LDC's, comprising 99% of LDC populations. The methodology used for these projections is as follows. First,

projected 1985 wheat consumption is computed by: (1) determining the ratio of 1985 to 1974 (the projection base year) population; (2) establishing the ratio of 1985 to 1974 per capita wheat consumption through comparison of the average annual growth rates of per capita consumption (reckoned as the product of the growth ratio of personal consumption expenditure (PCE) and personal income elasticity); (3) determining the ratio of 1985 to 1974 total wheat consumption by multiplying (1) by (2); (4) deriving total 1985 wheat consumption by multiplying (3) by 1974 estimated total wheat consumption. For LDC's as a whole, consumption will rise in 1985 by 40% or 48% (depending on whether **Trend** or **High** PCE growth rates are assumed). LDC 1985 wheat **production** is found by projecting to 1985 the production growth rates obtained between 1962-1974. The authors, assuming a less rapid growth but not a decline, project that production will have increased by 54% by 1985. It is then projected that 1985 LDC wheat **imports** will remain approximately the same as in 1974 for LDC's as a whole (or at most increase by 25%), though increasing in most LDC's, while decreasing sharply in China and India as these countries move to near self-sufficiency. These projections are well below IBRD's projections of greatly increased LDC wheat imports, projections based, according to the authors, on untenable PCE estimates. Finally, development assistance will have the general effect of reducing imports by increasing production. Imports will nevertheless increase unless there is a decrease in the most critical factor of all: LDC population growth. Twenty statistical tables and a list of 8 references are appended.

**PN-AAG-988**

# EDUCATION

## **(049) REGIONAL COOPERATION IN EDUCATION IN THE NEAR EAST**

Peretz, Don; Katz, J.L.; Compton, L.F.; Ballard, R.J.; Toth, James; Hofferbert, R.I.; Ballard, R.J.; Mize, D.W.  
1978, 73p.

AMIDEAST (AID/ne-G-1526)

Past Egyptian and Israeli experience in technical assistance activities indicates possibilities of mutual cooperation in education development; however, at the time of this report, the political setting, the psychological atmosphere, and the commitment to cooperation indicate that the only Middle East candidates are Egypt and Israel. America-Mideast Educational and Training Services, Inc. (AMIDEAST) proposes a three phase plan for cooperation through a triateral commission including the U.S. In the initial phase, contacts would be exploratory, undertaken with U.S. assistance. Projects would be small-scale, with low visibility, small numbers of participants, for relatively short periods of time. Funding would be modest. Phase two would be initiated by the trilateral commission after a trial period of three to five years for the projects in phase one. Success of phase one projects would assure continuity of contracts between participants into phase two. With an atmosphere conducive to further cooperation developed, the three countries participating in the trilateral commission would be prepared for longer term commitments to larger, more concrete projects, with more participants and greater funds. Some of these projects will include cultural exchanges, joint textbook surveys, language training institutes, institutes for study of pre-modern culture, teacher education, joint scientific research, and exchanges of mass media techniques, educational television programs, and audiovisual materials. Projects undertaken in phases one and two

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form the basis of phase three. By the time participants would be ready for phase three, a decade of close ties between Egypt and Israel would have passed. Cultural and educational cooperation and exchanges will have become common. Derivative from the original trilateral commission will be numerous sub-commissions, some operating bilaterally, others continuing to function with representatives of the three countries. Two major expectations of phase three include the establishment of a Sinai University and of regional research institutes associated with the university.

PN-AAG-888

### (050) INTERNATIONAL LINKAGES IN HIGHER EDUCATION: A FEASIBILITY STUDY

Int. Linkages in Higher Education Study Group  
1978, 189p.

NASULGC (AID/ta-G-1320)

This document investigates possibilities for international cooperation in postsecondary education, centering on the role of the U.S. The growth and diversity of American higher education is reviewed, with special emphasis on its innovative tradition, linkage of pure and applied research, community service, and problemsolving orientation. The study reveals positive signs of the spread and recognition of international education through program development and consortia formation. However, international education is declining in nearly all countries and subject areas.

A.I.D. faces problems of trained manpower shortages in countries where educational development efforts are being made. Institutional linkages are suggested as a means of developing institutional capabilities in LDCs that is flexible and relatively lowcost.

Following extensive review of the national and international academic perspective plus review of relevant U.S government agency functions, the following conclusions are drawn for further participation in international education initiatives: (1) national need for international education transcends specific agency purposes and programs but has yet to be expressed through national leadership or adequate funding and coordination; (2) new initiative is required to meet the expressed need of foreign and American institutions and American government agencies for access, information referral, liaison, and other services; (3) there exists no program for planned and sustained institutional cooperation through linkages. Therefore, a new educational linkage program is desirable.

Recommendations for such a new linkage program include: (1) creation of a Council for International Cooperation in Higher Education; (2) development of specific purposes and plans for purpose achievement, utilizing participation faculties; (3) provision of support at key administrative levels to assure conformance with institutional priorities; and (4) provision of adequate funding.

PN-AAG-913

## SOCIAL SCIENCES

### (051) A STUDY OF REGIONAL COOPERATION IN THE SOCIAL SCIENCES IN THE NEAR EAST

Elim, R.S.; Cantori, L.J.  
1978, 74p.

(AID/ne-C-1421)

This study analyzes the possibility of Egyptian-Israeli cooperation in the social sciences as a means for solving regional development problems. The document provides three separate reports. The

report on Egypt treats population problems and government efforts in family planning. Also examined are the social ramifications of technology in rural development. Social science research capabilities, including a description of major research institutions, are described. The report on Israel focuses on the activities of the Division of International Cooperation and the Foreign Ministry, and on the development social science capabilities within the universities of Tel Aviv, Hebrew, Haifa, Bar Ilan, and Ben Gurion. A report on the West Bank considers regional cooperation, conflict with Israel, and the developmental social science capabilities of the universities of Al-Najah, Bethlehem, and Birzeit. The study concludes that research capabilities in Egypt and Israel proper are substantial, but that West Bank capabilities are diminished by weak staffing. Additional funding and greater mobility are needed in Egypt because most research facilities are centered in independent institutions outside the university structure. Israel has failed to approach development comprehensively and has failed to pay attention to public administration. Also discussed are the political impossibility of Palestinian cooperation with Israel and the unfeasibility of cooperation with Jordan. The study recommends creation of a West Bank Development Institute, increasing salaries of Jordanian faculty who teach on the West Bank, starting West Bank university programs in agriculture and public administration, encouraging social cooperation among West Bank universities, and strengthening the university policy role of the Council for Higher Education of Gaza.

PN-AAG-886

### (052) THE FULANI IN A DEVELOPMENT CONTEXT: THE RELEVANCE OF CULTURAL TRADITIONS FOR COPING WITH CHANGE AND CRISIS

Riesman, Paul  
1979, 92p.

Riesman (AID/REDSO/WA-78-138)

This paper discusses the Fulani peoples of the West African Sahel in light of prospects for providing various forms of economic assistance. The author has lived with the Fulanis for 4 years, and presents an integrated view of their physical and social environment from an ecological perspective.

Fulanis live in nomadic, semi-sedentary, or sedentary conditions. A small segment of Fulanis function as religious elites (marabouts), and live individually or in small family units throughout the sedentary or semi-sedentary communities. Fulanis are primarily a cattle-herding people, although some have taken to raising millet for human consumption.

The Fulanis have evolved many cultural and religious traditions anarchic social organization, opposition to education, lack of social cooperation, adherence to "outmoded" religious codes- the, while appearing irrational to the Western mind, function to maintain the necessary discipline for a physically grueling, nomadic existence... The author stresses the need to understand Fulani values and beliefs before undertaking any development efforts. Past development efforts by USAID and the French government are described and evaluated for success or failure in providing the Fulanis with culturally acceptable forms of assistance.

Recommendations for future assistance include: (1) Utilize project beneficiaries in early planning and implementation phases; (2) Create channels of communication within the Fulani community whereby information on available services can be provided in a non-threatening manner; (3) Project planners should assume that a valid reason exists for any seemingly irrational practice, when envisioning a change in that practice. Included in the paper is an annotated bibliography.

PN-AAG-856

# NUTRITION

## **(053) FOOD COMPOSITION TABLE FOR USE IN EAST ASIA, A RESEARCH PROJECT**

U.S. Dept. of Health, Education, and Welfare; Public Health Service

1972, 343p.

AID/TA/N

This reference volume presents tabular data on the proximate composition, mineral contents, and vitamin contents of East Asian foods. Countries included in the study are Burma, Thailand, Cambodia, Laos, Vietnam, Mainland China, Malaysia, Singapore, Indonesia, Philippines, Hong Kong, Taiwan, Korea, and Japan. This publication provides more food data than other regional food tables, including data for proximate composition, calcium phosphorus, iron, sodium, potassium, retinol, betacarotene equivalent, thiamine, riboflavin, niacin, ascorbic acid, and percentage of inedible portion of the foods. Available data on amino acids, fatty acids, other B-vitamins, and trace elements, contributed by FAO, are presented in the second part of the document.

PN-AAD-796

## **(054) AN INVENTORY OF INFORMATION ON THE UTILIZATION OF UNPROCESSED AND SIMPLY PROCESSED SOYBEANS AS HUMAN FOOD**

Wang, H.L.; Mustakas, G.C.; Wolf, J.; Wang, L.C.; Hesseltine, C.W.; Bagley, E.B.

1977, 282p.

USDA/NRRC (PA/AG/TAB-225-12-76)

The lack of low-cost nutritious foods is a basic problem encountered by the poor in numerous lesser developed countries. Increased use of soybean foods by the poor could effectively ease this problem, but, while soybeans have been a basic part of oriental diets for centuries, their acceptance by western cultures has been minimal. A project has been initiated by AID to promote soybeans as a food staple among the rural poor in a select (test) LDC and to develop methods for introducing unprocessed or simply-processed soybeans as a "direct food" for low-income peoples of other LDC's. This document was prepared as a result of that project. It is a survey of the current knowledge on the food uses of soybeans and patterns of soybean consumption throughout the world. Traditional soybean foods and soybean processing methods according to country or region are discussed, as well as recently developed, non-traditional processing methods. Other sections of this document deal with ways of cooking and serving soybeans in the American diet, industrial processes for producing edible soy protein, the marketing of soybean products, barriers to acceptability and utilization of soybeans in food, and needed research or development work to overcome such barriers in developing countries.

PN-AAG-849

## **(055) NUTRITION PLANNING: THE STATE OF THE ART: PROCEEDINGS OF MEETINGS HELD AT THE UNIV. OF CALIFORNIA, BERKELEY, 1976, 1977**

Joy, Leonard; Wood, Christina; Calif. Univ., Berkeley

1978, 154p.

Calif.--Ber (AID/ta-C-1353)

This report documents the proceedings of two conferences. The first was a Food and Nutrition Policy Analysis Workshop held in preparation for a second, larger Symposium on Policy Making and Planning to Reduce Malnutrition. The volume includes the papers

and summary discussions of the Workshop and Plenary Papers and discussions of the Symposium, together with the review of participants' post-Symposium reflections. The Workshop papers include the following: The Determinants of Nutrition Status; Recent Developments: Poverty-Focused Planning; Sectoral Approaches to Food and Nutrition; Community Approaches to Food and Nutrition Policy Analysis; Strategies for the Reduction of Malnutrition; Systems Approach to Nutrition Planning; Intersectoral Food and Nutrition Planning; and Data Requirements for Food and Nutrition Planning and Policy Analysis. Papers presented at the Symposium include the following: The Nature of the Nutrition Problem; The Concept of Nutrition Planning; The Philosophy of Nutrition Planning; and The Politics of Food and Nutrition Planning: A Preliminary Working Paper on its Socioeconomic Context. Appended to the report are lists of Workshop and Symposium participants.

PN-AAG-983

## **(056) USE OF THE CHILD'S GROWTH CHART AS AN EDUCATIONAL TOOL**

Pielemeier, N.R.; Jones, E.M.; Munger, S.J.; Synectics Corp.

1978, 125p.

Synectics (AID/ta-C-1231)

This document reports on a study assessing the effectiveness of child growth charts as an educational tool in LDC mother/child health clinics. Ghana and Lesotho were chosen as sites for the study which took place during 6/76 to 6/78. Three rounds of field interviews were conducted, with a six-months time lapse between interviews. The interviews were used to obtain background information on the participating clinics, communities, and families; to determine the mothers' knowledge of nutrition and attitudes about food; and to record growth rates of the children. Also, during the interviews mothers were taught (using charts) to recognize the following conditions: normal growth with no illness, severe malnutrition, weight loss, and diarrhea. In addition, the growth chart of the mother's own child was related to feeding and other child-care practices. The study revealed extensive and effective use of growth charts among the surveyed clinics in both Lesotho and Ghana. In Lesotho, the vast majority of the mothers were able to understand and use the growth charts during the first interview. In Ghana, initial comprehension was not so high, but the mothers' performances improved over the study period. One of the most serious implications of the study is that the comparative value of growth charts over other educational methods could be better explored in a series of smaller-scale and better controlled investigations. The report includes tables of data resulting from the interviews and a two-page bibliography (1961-78) of other reports and studies on nutrition and the use of growth charts.

PN-AAH-387

# HEALTH AND MEDICINE

## **(057) HEALTH MANPOWER PLANNING IN TURKEY, AN INTERNATIONAL RESEARCH CASE STUDY**

Taylor, C.D.; Dirican, Rahmi; Deuschle, K. Taylor, C.C.; Dirican, Rahmi; Deuschle, K.W.

1968, 312p.

Johns Hopkins (AID/C-1883-1 Res.)

The Turkish Health Manpower Study begun in 1963, has two sets of objectives. Turkish planners and educators were interested in how the health needs of Turkey could best be met. There was discussion

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of the need for radically altering medical and nursing education. This study attempted to: define the numbers and classifications of health personnel; identify imbalances in geographical, rural/urban, or social distributions of personnel; study utilization patterns of health services and determine present demand. It also analyzes economic factors controlling the potential expansion of health services; studies educational trends; explores various possibilities of improving the quality and efficiency of health services; and evaluates the pilot projects of the national health services and made suggestions for improving the national plan. The second set of objectives was to achieve technical sophistication and imagination in methodological innovation to measure and project both effective demand and supply of health manpower. Specific studies were conducted to gather data in the following areas: tracing and identifying the supply of professionals, defining major difficulties of medical practice and doctor utilization, and identifying the major professional problems of nurses. Data was also gathered on estimating cost of medical services and doctors' income, determining problems of rural health services, evaluating medical education, and estimating unmet demand for health services. Two generalizations come from this analysis. Manpower availability can be increased more efficiently and rapidly by improving utilization of personnel already available. The most important qualitative considerations in educational planning relate to the development of the service values and attitudes which determine the ultimate productivity, effectiveness, and quality of all personnel.

PN-AAD-335

## **(058) HEALTH CARE TRAINING MANUAL FOR THE VILLAGE HEALTH PROMOTER; TRAINEE'S MANUAL**

Project Concern International  
1978, 342p.

PC (AID/pha-G-1101)

(Instructor's manual, 238p.: PN-AAG-986)

This trainee's manual for village health promoters is designed for use in a low-cost, health care training environment utilizing both formal and non-formal training techniques. The manual offers a self-help approach to health care by training promoters to provide limited curative care and public health and nutrition education. Each of the 37 illustrated units provides instructional and attitudinal techniques for the prevention and treatment of common health problems. Special emphasis is placed on diseases related to poor maternal child health, nutritional deficiencies, sanitation-related diseases, hygiene, and health education. Included in the manual are units to prepare promoters (1) to make and effectively use teaching aids, (2) to treat children under five years old, (3) to set fractures, (4) to provide injections and immunizations, and (5) to advise on dental problems. The appendix is a 41-item list of equipment and supplies needed in the course.

PN-AAG-987

## **(059) GUIDELINES FOR ANALYSIS OF COMMUNICABLE DISEASE CONTROL PLANNING IN DEVELOPING COUNTRIES**

Chin, James; Morrison, F.R.; White (E.H.) Co.  
1979, 234p.

HEW/PHS/OIH

HEW/PHS/OIH (RS/HEW/OIH-01-74)

This volume for the planning and evaluation of communicable disease control programs is the first in a series of volumes known collectively as the International Health Planning Methods Series. The series provides AID officers, advisors, and health officials in LDCs with critically needed guidelines for incorporating health

planning into national plans for economic development. The communicable diseases selected for discussion in this manual constitute major public health problems in LDCs. The manual contains 15 state-of-the-art papers on the planning and evaluation of specific disease control programs. Each paper includes a reference list. Contributors include specialists and experts from various universities and national health research centers, who discuss specific aspects of disease control programs, such as program organization, surveillance systems, and immunization projects. Articles on specific diseases and disease types include coverage of malaria, tuberculosis, leprosy, venereal disease, filariasis, schistosomiasis, onchocerciasis, trachoma, bacterial enteric diseases, parasitic enteric diseases, and rabies. The papers outline the complexities of epidemiologic interactions between disease causing organisms, their reservoirs, and hosts in different geographic, climatologic, and cultural settings. With an understanding of a disease and its epidemiologic correlates in a given setting, effective control methods can be planned and evaluated.

PN-AAH-127

## **(060) GUIDELINES FOR ANALYSIS OF ENVIRONMENTAL HEALTH PLANNING IN DEVELOPING COUNTRIES**

Fraser, R.W.; Shani, Hadasa; White (E.H.) Co.; Plog Research, Inc.  
1979, 122p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

This manual for planning in the field of environmental health is the second volume in a series known collectively as the International Health Planning Methods Series. The series provides AID advisors and national health officials in LDCs with critically needed guidelines for incorporating environmental health planning into national plans for economic development. This manual has three objectives: (1) to describe the inter-related environmental hazards to health affecting people in LDCs; (2) to identify competing elements, priorities, and institutional relationships affecting available solutions; and (3) to offer components needed to make planning decisions, including recommendations for data collection methods, surveillance methods, standards, and alternative technologies. The manual covers material ranging from contemporary issues in environmental health, through principles of environmental health assessments, planning, and evaluation, to consideration of specific types of projects having environmental health impact. In addition to the need for fundamental improvements in such areas as drinking water supply, waste water and excreta disposal, and pest control, the authors have noted the occasionally adverse effect of economic development projects. Examples are drawn from the fields of agriculture, industry, transport, and land use patterns. Each chapter has its own bibliography.

PN-AAH-128

## **(061) GUIDELINES FOR ANALYSIS OF HEALTH MANPOWER PLANNING**

Staff, R.J.; Porter, D.R.; White (E.H.) Co.  
1979, 82p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

PN-AAH-129

## **(062) GUIDELINES FOR ANALYSIS OF SOCIO-CULTURAL FACTORS IN HEALTH**

Fraser, R.W.; White (E.H.) Co.; Plog Research, Inc.  
1979, 75p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

PN-AAH-130

# HEALTH AND MEDICINE

## **(063) GUIDELINES FOR ANALYSIS OF HEALTH FACILITIES PLANNING IN DEVELOPING COUNTRIES**

Porter, D.R.; Staff, R.J.; Whitfield, Melvin; White (E.H.) Co. 1979, 88p.

HEW/PHS/OIH

This manual treats the subject of health facilities planning in LDCs. It is the fifth volume in a series known collectively as the International Health Planning Methods Series. The series provides AID advisors and national health officials in LDCs with critically needed guidelines for incorporating health planning into national plans for economic development. Four factors should be considered in planning for the development of health facilities: (1) how are health facilities resources being distributed within the subject country? (2) how well is health facility planning integrated with other planning? (3) what role does the local community play in defining public health intervention strategies, fundamental health care needs, and the development of manpower and primary facilities resources to meet these requirements? (4) what are the trade-offs between allocating capital to tertiary and secondary facilities and allocating it to primary facilities? This manual provides a framework for the planner who is concerned with the development and distribution of various types of health facilities. The authors emphasize the use of this framework as a model planning tool that can be adapted to meet local needs and resources. They assert, for example, that (1) geographic and climatic factors should have great impact on the architectural design and site selection of the health facility, (2) specific adaption must be made by the planner himself, and (3) health facilities architecture should be compatible with existing socio-cultural factors in the planning region. Appended to this manual are: (1) a list of publications with most up-to-date data; (2) the Declaration of the International Conference on Primary Health Care held in Alma-Ata; (3) a checklist of contacts; (4) assessment forms for health facilities, potential users, environmental factors, architectural factors, utilization, facility site characteristics, resources, and population characteristics; (5) an analysis of social insurance; (6) an analysis of medical records, facilities, and programs; (7) a list of journals, publications, and organizations of pertinent interest to health services facilities; and (8) an eight page international bibliography.

PN-AAH-131

## **(064) GUIDELINES FOR ANALYSIS OF PHARMACEUTICAL SUPPLY SYSTEM PLANNING IN DEVELOPING**

Schaumann, Leif; White (E.H.) Co.; Stanford Research Institute 1979, 89p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Methods series, v.7)

This manual presents guidelines for analysis of pharmaceutical supply systems planning in LDCs. It is the seventh volume in a series known collectively as the International Health Planning Methods Series. The series provides AID advisors and national health officials in LDCs with critically needed guidelines for incorporating health planning into national plans for economic development. The emphasis in this manual has been placed on developing guidelines useful as an overall analytical model of an ideal pharmaceutical supply system within the framework of national developing planning. The discussion of the supply system revolves around functional, evaluative, and motivational consideration. Adaptation from the ideal can be made to accommodate local needs and resources. The authors emphasize the importance of making pharmaceutical products available to the rural poor segment of the LDC population. In many LDCs, essentially western concepts occasionally conflict with traditional or indigenous health care systems. Provision of pharmaceutical

supplies, therefore, must take place within an existing culture and must accommodate traditional expectations if the system is to be used effectively by the resident population. Product coverage of this manual is limited to pharmaceuticals for preventive and therapeutic use on humans. Also, while some discussion has been included on the subject of indigenous medicine and traditional remedies, the predominant orientation is toward provision of western pharmaceuticals. Appended to this manual are: (1) a therapeutic classification system; (2) a list of selected issues and approaches related to local production of medicinal chemicals; (3) selected tables to aid in planning and assessment; and (4) a list of selected international data sources.

PN-AAH-132

## **(065) GUIDELINES FOR ANALYSIS OF HEALTH SECTOR FINANCING IN DEVELOPING COUNTRIES**

Robertson, R.L.; Zschock, D.K.; Daly, D.A.

1979, 65p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Methods series, V.8)

PN-AAH-133

## **(066) A COMPENDIUM OF PAPERS ON COMMUNITY HEALTH PLANNING ISSUES**

White, (E.H.) Co.; Plog Research, Inc.

1979, 99p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Methods series, v.9)

This manual treats the subject of community health planning and consists of a collection of papers dealing with the integration of community health concerns into development planning. It is the ninth volume in a series known collectively as the International Health Planning Methods Series. The papers in this volume comprise the proceedings of the three-day conference on Planning for Health Care in the Context of Economic Development held in San Diego, California during May 1978. The first paper in this manual, "Bridging the Health Gap," by Paul Ahmed and Aliza Kolker, is concerned with the use of indigenous resources in LDCs. "Family Composition and Structure in Relation to Nutrition and Health Problems: Impact and Measurement," by Susan Scrimshaw and Gretel Pelto, is concerned with predicting outcome variables for studies of the impact of nutrition and nutrition-related health programs on family composition and structure. Richard Hart's paper, "Rural Health Reorganization in Tanzania: The Implications of Change Implementation," deals specifically with the cultural impact of plans for health care improvements in Tanzania. "The Community Health Worker: Guidelines for Training the Community to Power the Program," by Aaron Ifekwunigwe, describes the functions of basic health, nutrition, family planning, and environmental services in community implementation of health programs. "Critical Environmental and Economic Interdependencies: The Search for Societal Values," by Climis Davos, distinguishes three areas for further research which will facilitate health sector development in the context of local culture: (1) interdependency of environmental goals; (2) the health impact of these interdependencies; and (3) boundaries beyond which health concerns and impacts should not be traded in the name of economic advance. "Health Sector Assessment," by Paul Ahmed and Aliza Kolker, provides background for development of health sector assessments as a tool for coordinated and integrated health services planning. John Hanlon's paper, "Socio-Cultural Factors in Health Planning Throughout the World," warns of the negative effect of ignoring socio-cultural factors in health planning. Finally, "Psycho Social and Cultural Aspects of International Health Planning: The Challenge of Providing Health Care Assistance in Developing

# HEALTH AND MEDICINE

Countries," by Paul Ahmed and Renee Fraser, points out numerous criticisms and deficiencies in early attempts to provide health care assistance.

**PN-AAH-134**

## **(067) A COMPENDIUM OF PAPERS ON HEALTH AND ECONOMIC DEVELOPMENT**

Roemer, M.I.; Wooley, P.O.; Woolsey, T.D.; CPI Associates, Inc. 1979, 93p.

HEW/OHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Methods series, v.10)

This compendium of papers deals with the delicate relationship between health and economic development, expressed here dramatically as a choice between health or wealth. It is the tenth volume in a series known collectively as the International Health Planning Methods Series. The volume consists of three authoritative articles and an introductory essay which pose the following questions: is economic development essential for improved health; or is improved health required for economic development? According to the authors, neither alternative is very promising unless supported by reliable assessments of local health needs and resources. A suggested middle path requires identification of specific health sector targets, upon which public spending can be concentrated to make a maximum impact on overall health improvement. "Health, Income Distribution, and Source of Health Expenditures in Developing Countries," by Milton I. Roemer, addresses the relation of health to the economic level of families in nations, advancing the thesis that increased public sector spending for public health will improve the overall health of the population in LDCs. He recommends that LDCs adopt a goal of equity in their health policies to develop proportional expenditure among economic groups "A Systems Perspective on Health and Development," by Paul O. Wooley, also addresses the relationship between health and socioeconomic development, setting out principles designed to clarify meaning and importance of the word "health." He concludes that our information is too uncertain and too ambiguous to assess fully the relationships between development and health. Theodore D. Woolsey's "Needed Development Research for Measuring the Health of Populations in LDCs" concentrates on the many problems of measurement associated with health issues in LDCs. He summarizes the issues associated with the definition of the health of a nation's population and assesses the way that various approaches to measurement might be adapted for use by LDCs. Each paper is followed by a reference list.

**PN-AAH-135**

## **(068) ORAL REHYDRATION THERAPY: AN ANNOTATED BIBLIOGRAPHY**

Baumslag, Naomi; Davis, Robert; Mason, L.G.; McQuestion, Michael; Sabin, Edward; Synder, John; Wiesenthal, Andrew U.S. Office of Int. Health 1980, 125p.

HEW/PHS/OIH (RS/HEW/OIH-01-77)

As a leading cause of death in small children and an important contributing factor to malnutrition, diarrheal diseases have easily acquired the rank of a major public health problem in the developing world. This document consists of a collection of annotated abstracts on oral rehydration therapy in the treatment of diarrhea. Morbidity and mortality in diarrheal diseases usually result from the loss of fluid and electrolytes in the stool. The use of oral rehydration solutions (salt and glucose) has long been advocated. In 1968, comprehensive metabolic balance studies clearly demonstrated that such oral infusions could maintain fluid and electrolyte balance in persons with cholera. The 133 entries

contained in this document are arranged under five categories (history, clinical trials, composition, impact, and implementation), and cover the period 1949-1979. However, most of the abstracts are of recent publications, and all are in English.

**PN-AAH-149**

## **(069) SELECTED BIBLIOGRAPHY AND STATE-OF-THE-ART REVIEW FOR COMMUNICABLE DISEASES CONTROL**

Chin., James; Morrison, F.R.; White (E.H.) Co. 1979, 76p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Reference series, v. 1)

**PN-AAH-121**

## **(070) SELECTED BIBLIOGRAPHIES AND STATE-OF-THE-ART REVIEW FOR ENVIRONMENTAL HEALTH**

Fraser, R.W.; Shani, Hadasa; White (E.H.) Co.; Plog Research, Inc. 1979, 188p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Reference series, v. 2)

**PN-AAH-122**

## **(071) SELECTED BIBLIOGRAPHIES AND STATE-OF-THE-ART REVIEW FOR HEALTH MANPOWER PLANNING**

Staff, R.J.; White (E.H.) Co.; Plog Research, Inc. 1979, 79p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Reference series, v. 3)

**PN-AAH-123**

## **(072) SELECTED BIBLIOGRAPHIES AND STATE-OF-THE-ART REVIEW FOR SOCIO-CULTURAL FACTORS IN HEALTH**

Fraser, R.W.; White (E.H.) Co.; Plog Research, Inc. 1979, 85p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Reference series, v. 4)

**PN-AAH-124**

## **(073) SELECTED BIBLIOGRAPHIES FOR PHARMACEUTICAL SUPPLY SYSTEMS**

Schaumann, Leif; White (E.H.) Co.; Stanford Research Institute 1979, 26p.

HEW/PHS/OIH (RS/HES/OIH-01-74)

(In International Health Planning Reference Series, v.5)

**PN-AAH-125**

## **(074) SELECTED BIBLIOGRAPHIES AND STATE-OF-THE-ART REVIEW FOR HEALTH FACILITIES PLANNING**

Whitfield, M.L.; Miller, Sheldon; White (E.H.) Co. 1979, 48p.

HEW/PHS/OIH (RS/HEW/OIH-01-74)

(In International Health Planning Reference series, v. 6)

**PN-AAH-126**

# SCIENCE AND TECHNOLOGY

## **(075) BREAST IS BEST; A BIBLIOGRAPHY ON BREAST FEEDING AND INFANT HEALTH**

Baumslag, Naomi; Mason, L.G.; Roesel, Chris; Sabin, Edward; U.S. Office of Int. Health  
1979, 153p.

HEW/PHS/OIH (RS/HEW/OIH-01-77)

Although its beneficial effects have long been known, and despite its universal recommendation by scientific and health organizations, breast-feeding has largely been replaced today by bottle-feeding. The reasons for this are not entirely clear. Explanations range from the aggressive advertising tactics of infant formula manufacturers to lack of understanding and support from health professionals. In any case, research shows a higher incidence of diarrhea, respiratory disease, malnutrition, and mortality in bottle-fed than in exclusively breast-fed infants. Breast milk contains a species-specific combination of protein, amino acids, and fats that is particularly nutritious for infants and effective in combating infection. Various factors, such as worry, the use of high estrogen contraceptives, and malnutrition, can affect the quality and even quantity of breast-milk, but research in this area is far from conclusive. In the bibliography with abstracts of world research on breast-feeding and infant health. The material is divided into the following 8 sections: (1) breast-feeding in general; (2) quality and quantity of breast milk; (3) infant morbidity and mortality; (4) the infant food industry; (5) maternal nutrition; (6) supplementary food and weaning; (7) breast-feeding and reproduction; (8) promotion of breast-feeding. Appended to the bibliography are author and country indices. The reinstatement of breast-feeding in developing countries, where 80% of the world's 1.5 billion children live, mostly under unhealthy conditions, and where infant mortality and morbidity are consequently high, could have profound beneficial effects on infant health. One expert estimates that 10 million children could be saved from diarrheal disease and severe malnutrition each year through breast-feeding. Breast-feeding has other beneficial effects. It delays the return of the menses an average of 4 months and, together with the taboo against sexual intercourse with nursing mothers, constitutes a very effective form of birth control. Breastfeeding is also advantageous economically: it is cheaper for developing countries to import extra food so that mothers can produce more milk than to import breast milk substitutes. The promotion of breast-feeding may be the single most important action which governments and health organizations can take to improve infant health.

PN-AAH-148

# SCIENCE AND TECHNOLOGY

## GENERAL

### **(076) REPORT OF THE SEMINAR ON REMOTE SENSING APPLICATIONS AND TECHNOLOGY TRANSFER FOR INTERNATIONAL DEVELOPMENT, UNIV. OF MICHIGAN, 1979**

Environmental Research Inst. of Michigan;  
1979, 93p.

ERIM (AID/DS/ST)

This report presents complete texts or summaries of 21 presentations given at a seminar on the use of remote sensing technology in LDC's. Its purpose was to provide an overview of remote sensing uses to LDC administrators and decision-makers, while also treating in detail some key remote sensing techniques. The seminar was sponsored by AID's Office of Science and Technology and was organized and conducted by the

Environmental Research Institute of Michigan. A total of 53 speakers, delegates, and observers (a list is provided), representing 17 nations and 4 international organizations, participated. The papers presented deal with the seminar's main themes. Papers 106 treat the causes and effects of desertification and the uses of remote sensing technology to solve desertification problems, including a discussion of technology transfer and resource monitoring. Papers 7-10 deal with agricultural production, including the use of area sampling frames to estimate agricultural production, multipurpose agriculture surveys, the use of satellite data in agricultural information systems, and agriculture monitoring and assessment. Paper 11, on the interrelationships between agriculture, forestry, and human land use, leads to papers 12-13 on the use of remote sensing in forestry and range inventory and monitoring. Papers 14-17 treat the uses of satellite data in exploring ground water sources, particularly in Egypt, Nigeria, and West Africa. Papers 18-19 review the relationship between remote sensing technology and Latin America's development needs. The final two papers discuss, respectively, the role of the United Nations in remote sensing and whether remote sensing can be considered an appropriate technology.

PN-AAG-963

### **(077) PROCEEDINGS OF THE WINROCK INTERNATIONAL WORKSHOP ON APPROPRIATE TECHNOLOGY, MORRILTON, ARK. 1978**

Winrock Int. Livestock Research and Training Ctr.  
1979, 45p.

Winrock

(Sponsored by Office of U.S. Coordinator, UN Conference on Science and Technology for Development)

Reports on a workshop held at the Winrock International Conference Center near Little Rock, Arkansas from December 15, 1978 concerning the use of appropriate technology. Two dozen leading practitioners of appropriate technology from the US and abroad attended the conference. Appropriate technology is defined by the following characteristics: (1) that it can be simple, intermediate, or high technology; (2) that it is based on dialogue and mutual respect between those who plan, produce, consume, and are affected by the technologies chosen; (3) that it relates to existing skills or those acquirable by training; (4) that it distributes political and economic power more equitably; (5) that it uses all resources efficiently and keeps total-life costs low; and (6) that it is understandable by, and accessible to end-users. Appropriate technology projects implemented in the US and in developing countries are described in a series of case studies. These include a small-farm energy project in Nebraska; a tree-planting operation in Botswana; development of integrated architectural, ecological, and agricultural units (which contain plant and fish growing "microfarms") at the New Alchemy Institute at Cape Cod and Prince Edward Island, Canada; development of a solar aquasystem for the community of Hercules, California; a Detroit ambulatory health center utilizing an array of specialists in addition to physicians; small business assistance in South America; and food processing operations in the US and Honduras. While most were small-scale operations, one had a total project cost of \$50 million. The report recommends that funding of appropriate technology projects be multi-source, tapping private, governmental, and international sources. Financing should be made as directly as possible to project participants. To further advance the use of appropriate technology, USAID and other international agencies should make efforts to review and assess the impact of past and on-going appropriate technology programs. Cooperative mechanisms should be developed among these agencies to provide on-site visits and training to other national or international groups interested in appropriate technology. Among such mechanisms might be UN travelling fellowships in appropriate technology.

PN-AAH-075

# SCIENCE AND TECHNOLOGY

## **(078) SOME UNITED STATES ACTIVITIES USING SCIENCE AND TECHNOLOGY FOR DEVELOPMENT**

U.S. Dept. of State  
1979, 29p.

(Dept. of State Publ. 8990)

Provides an overview of US development assistance activities conducted during the past three decades. The discussion of US assistance is divided according to the following sectors: agriculture and related fields; energy and natural resources; health, population, and nutrition; industry and employment; education; and information sharing. Illustrative examples of US activities are provided in the areas of agricultural research pondculture and other fisheries development, renewable energy, natural resource surveys, health care delivery, and radio mathematics. Also highlighted are the contributions of the National Technical Information Service (NTIS, US Department of Commerce), the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation (NSF) to international development. This pamphlet was prepared for the UN Conference on Science and Technology for Development (UNCSTD) in Vienna, Austria in August, 1979. PN-AAH-077

## **ENERGY**

### **(079) ALTERNATIVE ENERGY SYSTEMS; FINAL REPORT AND PRELIMINARY REPORT (ON THE SOLAR DATA COLLECTION SYSTEM--SOLAR DATA ACQUISITION**

Solar America, Inc., Albuquerque, N.M.  
1979, 105p.

SAI (AID/LAC-C-1339)

(In cooperation with ICAITI and CATIE)

This final report summarizes the background research of Solar America, Inc. (SAI) on potential applications of alternative energy technologies in Central America (CA). This work was done to assist the AID Regional Mission for Central America (ROCAP) in preparing an alternative "appropriate technology" energy project to counteract the high consumption of fuelwood in that region. SAI, working with counterpart institutions, identified and recommended specific technologies for project field-testing, developed selection criteria for such testing, determined potential field sites, conducted preliminary appraisals, and investigated possible commercial applications and development of a Central American manufacturing capability. Results of that work are included in this paper.

Of the 5 energy resources evaluated, 3 are recommended for further testing in CA: biomass, solar, and hydro energy. Direct combustion, anaerobic digestion, and charcoal production and pyrolysis are recommended biomass technologies. Direct combustion of biomass should be a highly acceptable technology because of its similarity to present fuelwood combusting processes. Solar dryers, a particularly versatile technology, are well-suited to local testing and adaptation. A single demonstration is recommended for solar furnaces used in pottery production due to uncertainties in their economic feasibility.

Hydroppower is one of the greatest resources of the CA isthmus. Many "mini-hydro" sites already exist in CA where the technology has been proven effective. Due to the negative environmental effects associated with dams, mini-hydro systems which do not utilize dams are suggested. Geothermal and wind energy are not presently recommended for testing in CA due to their high development costs.

The report provides detailed technical information on technologies discussed, and table summarizing recommendations. Information is included on budgetary requirements for technology field tests and is included on budgetary requirements for technology field tests and demonstrations.

PN-AAG-750

### **(080) MAURITIUS ALTERNATIVE ENERGY PROJECT; FEASIBILITY STUDY REPORT**

Raiford, M.T.  
1979, 29p.

AID/AFR (AID/afr-C-1572)

This paper discusses the prospects for alternative energy development in Mauritius, providing general and USAID-specific recommendations for assistance.

The potential for alternative energy development in Mauritius appears to be quite good, in terms of the climatic, economic, social, and political environment found there. Being a 100% importer of oil makes Mauritius ripe for alternative energy development. The government, university, industrial/commercial, and private sectors are eager to implement renewable energy resource forms. Some forms are already being utilized. Sugar factories on the island are entirely self-sufficient in energy, generating all their steam and electricity from sugar cane waste (bagasse). Solar hot water heaters have been successfully installed in homes and hotels on the island.

Obstacles to alternative energy development primarily involve organizational and financial constraints. An alternative energy development proposal formulated in 1977, which would establish a technology development and consultancy center at the University of Mauritius has not been implemented because of its complicated organizational set-up and high cost. An alternative proposal is therefore set forth by the author.

The author's proposal includes: (1) creation of a National Energy Board (NEB), and an Alternative Energy Research Institute (AERI); (2) creation of an energy extension service to disseminate results and technologies developed at AERI; (3) promotion of currently available technologies; and (4) creation of a solar loan bank and solar data handbook.

Recommendations to AID include: (1) provision of immediate funding to Mauritius for a 3-year alternative energy development effort; (2) provision of consultants and faculty exchange in support of project activities; and (3) compilation of solar data by the author. Attachments include an annual project budget outline, the author's itinerary, and simple solar data figures.

PN-AAG-850

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# SCIENCE AND TECHNOLOGY

## **(081) BIOLOGICAL AND SOCIOLOGICAL BASIS FOR A RATIONAL USE OF FOREST RESOURCES FOR ENERGY AND ORGANICS; AN INTERNATIONAL WORKSHOP**

Boyce S.G.; Int. Workshop for the Man and the Biosphere Program, Mich. State Univ., 1979  
1979, 205p.

USDA/FS

This paper describes the results of an international workshop on rational forest use held at Michigan State University between May 6 and 11, 1979. The workshop was organized by the Man and the Biosphere Program (MAB) committees of Mexico, Canada, and the US to examine worldwide use of forest biomass for energy applications. The use of wood for energy purposes has many socioeconomic and environmental implications, and raises important technical questions concerning the growth, management, harvest, and regulation of trees for fuel use. Three main issues addressed in the workshop were socio-economic relationships, the energy input/output relations of forests, and the environmental consequence of using forests and trees for fuel. Following workshop discussions, paper presentations from a variety of countries, and inter-group discussions, specific recommendations were adopted by the 3 issue groups (included in this report). Out of these recommendations, the following 5 actions were suggested: (1) each country, under its particular social and economic conditions, should assess its biological potential for using woody materials for energy; (2) each country should develop an effective way to monitor changes in the biological productivity of forests, trees, and shrublands in relations to their use for energy and organics; (3) institutional arrangements should be made for international exchanges of information and technology, and for the use of forest, tree, and shrubland resources for energy in relation to social, cultural, political, and economic relationships; (4) MAB should encourage and coordinate studies of social, economic, and biological opportunities in small communities to use woody materials more effectively for fuel; (5) increasing human demands on the forests and shrublands should be given priority in assessments of wood for energy; in monitoring changes in the productivity of lands; and in programs to expand, modify, and transform forest and shrublands to other uses. Papers presented at the workshop are reprinted in this document, and include additional literature citations.

PN-AAG-859

## **(082) ENERGY AND DEVELOPMENT: A PRELIMINARY ANALYSIS FOR LESS DEVELOPED COUNTRIES**

Trehan, R.K.; Leigh, J.G.; Park, W.R.  
1979, 114p.

MITRE (AID/SOD/PCD-C-0146)

This report describes the results of quantitative linear regression analyses of the relationships between commercial energy production and consumption and economic and social development in 112 LDCs. The work is a continuing part of a broader effort to provide analytical support for policy development in USAID energy assistance programs. The results indicate that energy contributes heavily to socioeconomic development in LDCs: (1) GNP per capita is strongly related to commercial energy consumption; (2) growth rates in GDP per capita are strongly related to growth rates in investment, employment, and energy; (3) the Physical Quality of Life Index (PQLI, based on infant mortality, life expectancy and literacy) is strongly related to commercial energy consumption, and to GDP per capita. The relationship of energy to GNP changes with countries' level of development. A unit change in commercial energy consumption relates to approximately three times the change in GNP for advanced non-agricultural LDCs as for low

income agricultural countries. The significance of energy is emphasized by the deleterious effects which have resulted from oil price rises since 1973: (1) real GNP per capita growth rate dropped by more than half (from 3.1% to 1.5%) after 1973; (2) inflation rates more than tripled (from 7.7% to 24.5%) after 1973; (3) real balance of payments deficits nearly tripled after 1973. LDCs which depend on imported oil suffered severe repercussions, but these effects were reversed or much reduced for oil-exporting LDCs. The relationship between PQLI and energy consumption is relatively independent of the economic structure or geographic location of a country, but appears to be affected by the culture of the country as expressed in its dominant religion. Generally, for a given PQLI, Islamic countries have higher energy consumption and GDPs than Christian countries, and Christian countries are higher than Buddhist or Hindu countries. Thus, the way in which resources are used may be as important in affecting the PQLI as the absolute level of the resources.

PN-AAG-912

## ENVIRONMENT

### **(083) COOPERATIVE RESEARCH POTENTIAL IN THE MIDDLE EAST**

Johnson, J.D.; Norvelle, Michael  
1979, 194p.

Ariz. (AID/ta-G-1111 211(d))

The purpose of this study is to determine the potential for cooperation in the environmental and natural resources sciences between the various countries of the Middle East, with particular emphasis on Israel, Syria, and Jordan, and to identify and evaluate potential regional projects and activities in these fields. The study consists of the author's conclusions and recommendations and such supporting documents as the trip report, a list of literature cited, institutions relevant to social sciences, and subject bibliographies for biology, the Dead Sea, desertification, forestry, geology, mineral development, pollution, range management, sand dune stabilization, soils, water harvesting, weather, and environmental considerations in development management. Also appended is a list of references concerning Halophytic plants. Analysis of available information regarding the existing conditions within each country with respect to environmental issues suggests a wide variation in research capability and current expertise. It is thus necessary to carefully examine proposals with respect to each country's ability. Unless government attitudes toward the role environmental policies play in development are oriented toward environmental protection, it appears that environmentally oriented projects hold little promise. The general consensus of Egyptian scientists, however, was that cooperative research with Israelis will not be undertaken until the Palestinian issue is resolved. Discussions with Jordanian researchers indicated clearly that joint Jordanian-Israeli research projects are not feasible in the near future. Cooperative research projects between Arab institutions offer considerable promise. Politically-oriented workshops on how to approach regional cooperation which only incidentally address such topics as health, water management, or economic botany may have some chance of success.

PN-AAG-885

### **(084) A STUDY OF FOREST FIRE PROTECTION IN SYRIA**

Lowden, M.S.  
1979, 27p.

Lowden (AID/ne-C-1636)

This study, prepared by a forest fire consultant for AID, recommends improvements in Syrian forest fire protection to

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reduce soil erosion, loss of recreation areas and wildlife, and to promote domestic wood production. The author discusses current governmental forest policies, fire prevention, fire protection, fire fighting and afforestation practices. General government policy is to save the present forests and conduct afforestation programs. Farmers cannot use forest to graze animals and camping is permitted only in designated areas. Approximately 30 million trees will be planted in the 1979-1980 planting year, and 24 nurseries are currently operating to produce trees for this program. Fire prevention methods are the use of road signs and public contact by forest guards. Fire fighting is discussed in terms of methods, use of fire roads, transportation to the fire, and fire fighting personnel. Because forestry could become important in Syria as a domestic industry, improved fire protection efforts are recommended. Acquisition and utilization of inputs will increase the efficiency of the fire protection system. Radios should be obtained to allow for dependable communications between field fire crews and district headquarters. Vehicles for hauling water and transporting fire crews, aircraft to carry water or chemicals, and heavy fire fighting equipment and tools should be obtained. Information on fire prevention should be disseminated through the media and leaflets, and older, faded road signs should be replaced with symbolic signs. Local and out-of-country training, conducted in part by a fire technicians hired from a foreign country, should be established for forest protection managers and guards. Preparation of fire protection handbooks and national level fire protection programs, establishment of a department of fire protection in the national office, and changes in safety and precautions should be introduced as new management practices. Recommendations for afforestation practices include a more scientific approach to the seeding, testing, and storing of tree varieties. Appendices are included at the end of the report which list forest fires in Syria between 1966 and 1978, the causes of fires in the Lattakia district during those years, and rainfall levels in the Lattakia district from 1975 through 1979.

PN-AAG-925

## (085) DRAFT ENVIRONMENTAL REPORT ON THAILAND

Library of Congress. Science and Technology Div.  
1979. 94p.

LC (SA/TOA-01-77)

(Sponsored by AID and the U.S. National Committee for Man and the Biosphere)

This report describes Thailand's environmental characteristics, including legislation and programs concerned with environment. With the passage of the Enhancement and Conservation of National Environmental Quality Act in 1975 and the subsequent establishment of the National Environmental Board, Thailand has taken significant steps toward addressing its environmental problems. However, this effort is hampered by lack of coordination among government agencies responsible for resource management. Thailand also suffers from the absence of systematic regulation for pollution control. There is a need for applied research and ecological data on specific ecosystems and how to modify them. Thailand's surface water resources are becoming increasingly polluted from municipal and industrial wastes, particularly in the Bangkok area. Major soil problems include leeching, and the loss of topsoil and erosion due to the practice of shifting cultivation and both open-pit and strip mining. Wastes from mining industries disturb water, soil, and the coastal zone. The effects of shifting cultivation and depletion of forests is most severe in the Northern highlands and the Northeast region. Coastal mangrove forests suffer from indiscriminate logging for charcoal production; encroachment by strip farming, mining, and other industrial development; and from water pollution and increased

sedimentation due to upland forest clearing. Major threats to wildlife are illegal hunting and trapping, and habitat destruction through forest clearing. Freshwater fisheries also suffer from overexploitation and deterioration of their habitat. In addition to the above-mentioned Act, Thailand has a substantial body of environmental legislation. This includes legislation for water, minerals, forests, wildlife, and fisheries. Although gaps remain and improvement is needed in the legislation, the development of an effective enforcement effort is of primary importance in reversing Thailand's worsening environmental problems. In addition to numerous maps, tables, and charts, the report contains a two-page list of references and six appendices: (1) a list (keyed to map) of national parks and wildlife sanctuaries; (2) the corresponding map; (3) a list of priority areas of a conservation assessment of ecosystems within the Protected Area System; (4) a list of recommended surveys and monitoring projects in ecosystems outside the Protected Area System; (5) a list of members of the national committee for the Man and the Biosphere program; and (6) a list of expenditures on environment in the Fourth Plan (1977-81).

PN-AAG-972

## (086) DRAFT ENVIRONMENTAL REPORT ON SRI LANKA

Library of Congress. Science and Technology Div.  
1979. 83p.

LC (SA/TOA-10-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report describes Sri Lanka's environmental characteristics, including legislation and programs concerned with environment. Located within the tropics and subject to monsoonal winds, the Republic of Sri Lanka has two sharply different climatic zones: the wet zone of the island's southwest and the dry zone covering the remainder of its territory. In spite of such improvements as free education and health service since its independence from the British in 1948, Sri Lanka's economy has suffered from several weaknesses: (1) the inability to meet food demands and the rising cost of food it must therefore import; (2) dependence on foreign exchange for crops which in recent years have suffered price declines on the world market; (3) a decline in foreign investments; (4) a high level of unemployment; (5) inflation; and (6) sharply rising prices for petroleum and other products essential for development. Drought through most of the first half of the 1970's aggravated Sri Lanka's weakened economic condition considerably, bringing about record low yields for rubber and other export crops. Sri Lanka's water, soil, and forest resources offer opportunities for development, but such development must proceed rationally if environmental deterioration, already very much in evidence, is to be avoided. Although the government has established no central authority with responsibility for protection, a wide range of government agencies have functions involving the environment and natural resources, and legislation providing for protection of the environment is on the books. There are also indications that government agencies, despite some ill-advised development efforts, are willing to consider factors such as the protection of wildlife and forests in laying down development plans. The major environmental problems of Sri Lanka, as touched on in this report, are, in descending order of importance, deforestation, problems involving water resources, soil erosion, dangers to coasts and coastal resources - especially coral reefs, wildlife protection, and industrial pollution. There are also problems involving administration and enforcement of environmental legislation. The document includes a number of maps (population density, administrative provinces and districts, rainfall and vegetation zones, major rivers, soils, national parks, areas of most important crops, distribution of Chena agriculture), tables (population growth by district, major ethnic groups,

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population of major urban concentration, domestic water supply, bathing facilities, latrine facilities, major environmental and resources legislation and major agencies responsible for its implementation, roundwood removals, mineral wealth, plantation crops, livestock, industrial operations and pollution, and fuels for domestic use), and graphs (population by age and sex, rural-plantation-urban population, gross national product by sector, and employment). Also appended are a 17 item bibliography, a list of animals protected under the Fauna and Flora Protection Ordinance, and a list of members of national committees for the Man and the Biosphere program.

**PN-AAG-973**

## **(087) DRAFT ENVIRONMENTAL REPORT ON PERU**

Library of Congress. Science and Technology Div.  
1979, 137p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report describes in detail Peru's environmental features, including legislation and programs concerned with environment. Peru is committed to the national development of its natural resources and has made a major effort to ensure that the country's wealth is equitably distributed and that the lot of the poor is improved. Numerous laws and regulations cover natural resources and their development. Major laws cover water resources, forests and wildlife, fisheries, and development of minerals. Enforcement of these laws is often inadequate. Various offices of the Ministry of Agriculture and Nutrition bear responsibility for water, forests, soils, and forest resources, while the National Office for Evaluation of Natural Resources (ONERN) is charged with studying the resource base and setting policy for resources development. Pollution control problems are the responsibility of an agency within the Ministry of Health. The implementation of government programs in these as in other areas has been hampered by Peru's economic woes in the seventies. Water pollution from the dumping of unprocessed municipal wastes and mine tailings into rivers is one of the major environmental problems. Wastage of municipal and irrigation water due to faulty or inadequate supply systems is another. Problems with soils include erosion in all regions but especially on the overworked slopes of the Costa and Sierra regions, salinity in the heavily irrigated Costa, and drainage problems in the wet lowlands of the Selva. Both the Costa and the Sierra have been heavily deforested as a result of land clearing, timber operations, and the collection of wood for firewood and charcoal production. Wildlife numbers throughout Peru have declined as a result of hunting often in conjunction with the loss of habitat as lands are converted for grazing, cultivation, or other economic activities. Coastal waters are increasingly polluted with municipal, industrial, and mining wastes. Fish and other aquatic life have been adversely affected by water polluted by mine tailings as well as by industrial and municipal wastes. The document includes numerous maps, charts, and tables upon which the narrative report is based. Appended to the document are a seven-page references list, a chart and map of Peruvian soils, and a list of national committees for the Man and the Biosphere program.

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## **(088) DRAFT ENVIRONMENTAL REPORT ON NEPAL**

Chakroff, M.S.

Library of Congress. Science and Technology Div.  
1979, 61p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report describes in detail Nepal's environmental characteristics, including legislation and programs concerned with environment. There is no one ministry in Nepal with power over all development activities, but the Ministry of Forests and the Ministry of Water and Power do cover most of Nepal's natural resources and environmental problems. There are many laws and regulations affecting natural resources and the environment, particularly wildlife and forests, although little is known about the degree of enforcement in inaccessible areas. There is little industrial production in Nepal, and no legislation dealing with air or water pollution from industry. Nepal's environment is dependent on three factors: the altitude, the amount of rainfall, and the topography or position of the mountains. The major environmental problems are deforestations, erosion, declining agricultural productivity, impure water, and the rate of population growth. Nepal has few resources except for a vast, as yet underutilized hydroelectric potential in its three major river systems. In the past, Nepal was virtually covered with forests; today, experts estimate that, if deforestation continues at the present rate, all of Nepal's forests will be gone by the year 2000. Agricultural production has declined during the past two years, and, as the population grows, Nepal will soon require all of its rice production to feed its own population, leaving little to be exported. Erosion, a result of deforestation, grazing, and cultivation in the hills and on steep mountainsides carries away 240 million cubic meters of topsoil annually, limiting Nepal's agricultural productivity and causing loss of life and damage to lands both in the Tarai and in northern Indian states as well. The document includes numerous maps, tables and charts. Appended to the document are a 30-item bibliography and a list of members of the national committee for Man and the Biosphere program.

**PN-AAG-979**

## **(089) DRAFT ENVIRONMENTAL REPORT ON MAURITANIA**

Library of Congress. Science and Technology Div.  
1979, 43p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report describes in detail Mauritania's environmental features including legislation and development programs concerned with environment. The problem of rapid desertification of much of its territory and the consequent loss of land devoted to both grazing and subsistence agriculture is the major environmental problem facing Mauritania today. This process, although severely aggravated by the drought affecting the entire Sahelian area of Africa has been made all the worse by certain practices which have upset the balance of the area's ecology. These practices, which may to a large extent be attributed to population pressures, include the extension of agriculture to marginal lands formerly reserved for grazing; the growth of livestock herds, in many cases as a direct consequence of the establishment of new watering facilities, and resulting overgrazing; and deforestation resulting from foraging for firewood or clearing of land for agricultural purposes. With

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the failure of the rains in the 1970's, marginal lands were no longer able to produce food, and, because they had been cleared of their natural growth, better adapted vegetation were frequently lost to the desert. Livestock, deprived of both water and food, died in large numbers, and herdsman, seeking to feed their animals, resorted to stripping trees for fodder, accelerating the process of deforestation and desertification. In Mauritania, where, until recently, the overwhelming majority of the population consisted of nomadic herdsman dependent on animals for food and income, the drastic depletion of their herds also meant a loss of livelihood; this has resulted in the movement of nomadic herdsman to urban areas where they live in crowded tent suburbs where decent water and sanitary facilities are in short supply and where disease is consequently rife. In addition to numerous maps, charts, and tables upon which the narrative is based, the document includes a 12-item bibliography of works useful in preparation of the report. **PN-AAG-977**

## **(090) DRAFT ENVIRONMENTAL REPORT ON JORDAN**

Bauman, Fred

Library of Congress. Science and Technology Div.  
1979, 103p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report provides an overview of environmental characteristics of Jordan, including infrastructure and legislation relevant to environment. Jordan is poor in natural resources: the greatest part of its territory is desert. Only about nine percent of its land is cultivable, and forests cover less than one percent of the country. Water resources are few, and frequent droughts make agricultural production uncertain. Wildlife, once plentiful in the area, has been decimated by overhunting. Mineral resources appear scanty, although phosphates now play an increasingly important role in the economy, and the exploration and development of mineral resources have become the chief government development priority. Jordan's environmental and resource problems are numerous: lack of water resources, deterioration of agricultural land, and deforestation. Health quality is low, with malnutrition and illness affecting particularly children and women in child-bearing stages. Jordan's major problem is insufficient water resources to meet domestic needs of its growing population and demands of farmers for irrigation water. Large segments of the population receive inadequate daily water supplies, and much domestically used water is contaminated by human waste. In crowded, urban AmmanZarqa, pollution of water resources resulting from heavy concentration of industry is also a problem. Degradation of soil resources through erosion is also a problem, particularly in upland areas where wheat, the nation's single most important crop, is grown. Erosion resulting from overgrazing of goats and sheep and from use of modern machinery on land unsuited for deep ploughing is of deep concern. Although extensive areas of upland Jordan were once covered by forest, most of this forest cover has been lost as trees have been cut for firewood or lumber or to clear areas for cultivation. Overgrazing has also been an important contributor to deforestation, and the grazing habits of Jordan's numerous and ubiquitous goats have prevented the regeneration of forest land. The report also includes a variety of maps (population by governorate, rainfall distribution, major rivers and wadis, position of major forest areas, regional geology, nature reserves, industrial development in the Eilat-Aqaba region, mineral resources), tables (age specific causes of human death, monthly rainfall and temperatures, annual average river and wadi flows, reservoirs, annual discharge of East Jordan Springs by district., forests, wood production and utilization, reforestation, expenditures projected under 1976-80 development plan, major crop production from 1973 to 1977, production of fruit and

vegetables from 1973 to 1977, animal production, inorganic fertilizers sold to farmers during 1972-76, agricultural chemicals sold during 1976), and graphs (Gross Domestic Product by sector, employment by sector, land use, and use of cultivated land), as well as a five-page reference list and a list of members.

**PN-AAG-979**

## **(091) DRAFT ENVIRONMENTAL REPORT ON HAITI**

Library of Congress. Science and Technology Div.  
1979, 70p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee on Man and the Biosphere)

This report describes in detail Haiti's environmental features, including legislation and development programs concerned with environment. Haiti suffers from a degree of environmental degradation almost without equal in the world. The chief environmental problem is erosion, the result of deforestation, farming marginal lands on slopes, and overgrazing. Farmers desperate for land to grow their market and subsistence crops have pushed onto some of the steepest slopes, denuding them of forest cover, and laying the soil open to erosion. Population pressure on limited arable land accounts for the farming of marginal, easily erodible land, the clearing of forests on high slopes, and the felling of trees for firewood and charcoal. As land becomes less productive, farmers attempting to meet their food needs are often forced into farming larger areas, leading to further forest clearing and erosion. Faced with this gap between food supply and demand, many Haitians are suffering from malnutrition. Haiti is attempting to halt deforestation through the establishment of communal forests, reforestation of important hydrological basins, and the development of new energy sources to help relieve pressure on the ever decreasing forest cover; to construct terraces to limit soil erosion on the higher slopes; and to extend health services now centered in Port-au-Prince to the interior. Because of its lack of mineral wealth, Haiti is forced to look to outside help, principally the U.S., to help halt the environmental degradation that may soon lead to complete environmental- and human-disaster. The document includes numerous maps, graphs, and charts that provide the basis for most of the narrative. Appended are a 29-item reference list, a list of birds protected under the Haitian Hunting Law of 1971, and a chart of normal monthly rainfall levels in representative locations of Haiti.

**PN-AAG-980**

## **(092) DRAFT ENVIRONMENTAL REPORT ON GUATEMALA**

Library of Congress. Science and Technology Div.  
1979, 99p.

LC (SA/TOA-01-77)

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Provides a detailed analysis of the state of development of Guatemala's natural resources. An initial section outlines the characteristics of Guatemala's population in terms of growth rate, ethnic composition, education, and environmentally-related health problems, such as water supply and sanitation. Governmental, international, educational and research agencies concerned with environmental and natural resource issues are then catalogued, as well as the GOG's monitoring and resource capabilities in the environmental area. A comprehensive survey is then provided, describing Guatemala's legislation on: renewable resources (water, forests, wildlife and hunting, fisheries, air and the atmosphere, pollution control); non-renewable resources (minerals, soil, coasts and beaches); land use and agricultural; and

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pesticide control. This is followed by an equally comprehensive survey of the resources themselves. A final section considers the environmental aspects of Guatemala's agricultural and industrial economy. A brief introduction reproduces Guatemala's major environmental problems as listed in a recent Mission telegram; deforestation and consequent soil erosion; water pollution; and pesticide abuse. The problem of rapid population growth rate is also noted. Expanded discussion of these problems is promised in a not yet produced introduction and summary. Appended are a four page bibliography, together with a listing of the wildlife protected under current Guatemalan law, and a classification of Guatemala's soils as prepared by FAO/UNESCO.

**PN-AAG-981**

## **(093) DRAFT ENVIRONMENTAL REPORT ON BOLIVIA**

Library of Congress. Science and Technology Div.  
1979, 76p.

LC (SA/TOA-01-77)

(Sponsored by AID through the U.S. National Committee for Man and the Biosphere)

This report describes Bolivia's environmental characteristics, including legislation and programs concerned with environment. The Bolivian government has made an effort to face its environmental problems through laws that recognize the importance of forest, soil, and wildlife conservation. The government's five year agricultural plan for 1976-80 stresses these matters. The country's willingness to face environmental problems and accept a rational approach to resource development has been limited by the mistaken assumption that manpower and financial resources are inexhaustible. The recent establishment of a Division of Natural Resources and Environmental Protection in the Ministry of Planning and Coordination as well as new attempts to employ remote sensing are important steps toward including environmental considerations in developing planning. Bolivia's environmental problems vary by region. A principal problem is caused by large population concentrations in the harsh, unproductive Altiplano. Poor cultivation methods and overgrazing of domestic animals, especially sheep, has led to erosion and loss of productivity. The same problem extends to the highly populated valley areas, where farmers cultivate steep slopes, usually without more than the most basic methods. Erosion and loss of plant cover in the highland and valleys has resulted in poor water retention, leading to increased runoff and flooding and to further loss of soil. Heavy runoff from highland regions results in serious flooding of lowlands and consequent limitations of development potential. Accumulation of silt in lowland rivers has in the Oriente, but in the agricultural area of Santa Cruz, slash and burn agriculture practiced by small farmers is leading to increasing soil erosion and abandonment of land. A substantial percentage of disease problems are caused by poor water quality. Deforestation is becoming increasingly problematic as more timber resources are exploited. Much of the native wildlife is considered endangered, while some animals hunted for their skins are on the verge of extinction. The document includes several maps, charts, and graphs upon which the discussion of issues is based. Appended to this document are a four-page reference list and a list of Bolivian soil types.

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