

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



**UNITED STATES AGENCY  
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## FROM THE EDITOR

### Hunger, Applied Research, and Institutional Outreach

"The challenge . . . of feeding a hungry world . . . is not to devise new ways by which the United States can feed the world but how to enable others to feed themselves."

—Dr. N. C. Brady  
Senior Assistant Administrator  
Bureau for Science and Technology  
Agency for International Development

Hunger—chronic malnutrition—affects between 450 million and 1 billion people each year. In 1980, the Presidential Commission on World Hunger concluded that the most basic human right is the right to food and recommended "the United States make elimination of hunger the primary focus of its relationships with the developing countries beginning with the decade of the 1980's".

In a January 1981 response to the Commission, A.I.D.'s Technical Program Committee for Agriculture (TPCA) proposes that hunger be eliminated by "increasing food production and expanding purchasing power" of the hungry. Reasoning that most developing countries depend heavily on agriculture, the TPCA argues that agriculture must become the means to "create employment and raise income as well as produce food." As summarized in item 113 of this issue of *ARDA*, the TPCA recommends that A.I.D. make its antihunger efforts optimally effective by stressing the development of self-sustaining, indigenous research institutions capable of promoting viable small-farm production and marketing systems.

In further defining A.I.D.'s antihunger strategy, Dr. N. C. Brady, in a speech at the University of Maryland on World Food Day, October 17, 1981, stated that A.I.D. assists "... developing nations to strengthen their own institutional, scientific, and human capabilities to overcome their own food and hunger problems through solutions of their own choosing." In operational terms, A.I.D. "... provides technical assistance to developing countries in many fields . . ."; strengthens "... agricultural institutions and trains agricultural personnel, educators, and health workers."; and makes "... substantial investments in research by providing 25 percent of the annual support for the international agricultural research centers, and through collaborative research with U.S. agricultural universities."

Considering that more than one-third of the world's people depend on rice for roughly one-half of their protein and caloric intake, the International Rice Research Institute (IRRI) in the Philippines is an excellent example of the type of institution A.I.D. has in mind to help solve the world hunger problem.

Historically, investments in basic and applied research and in institutional outreach have generated high rates of return. Recall, for example, that during the Green Revolution, predictions of food self-sufficiency for developing countries accompanied introduction of the "miracle rices." And yet today, in spite of technological breakthroughs, rice production is not keeping pace with population growth. Why? In part, because farmers do

not always accept the new varieties and because, even when they do, yields are one-third less than experimental results due to such production constraints as lack of access to seeds, fertilizers, pesticides, soil amendments, water control methodologies, storage facilities, and agricultural credit that viable development institutions could provide.

Perseverance in research and institutional support is evidenced in Study Number 44 of IRRI's Research Paper Series. This study, described in item 040 in this issue of *ARDA*, reports findings on a new rice variety—IR42—bred to outyield the miracle rices by reducing dependence on constraints beyond farmer control. In unfavorable environments in South and Southeast Asia, IR42 gave higher yields than earlier improved varieties in rainfed areas and in areas with soil nutrient deficiencies or toxicities. IR42 also demonstrated good resistance to a wide range of diseases and insects and exhibited better drought and submergence tolerance than its precursors.

Other papers in the IRRI research series announced in this issue describe progress in nitrogen fertilizers for rice (item 024), quality of milled rice (042), insect control methodologies (034), yield stability in problem soils (035), insect resistance (036), plant genetics in the host-parasite relationship (041) and a deepwater rice variety of Bangladesh (044).

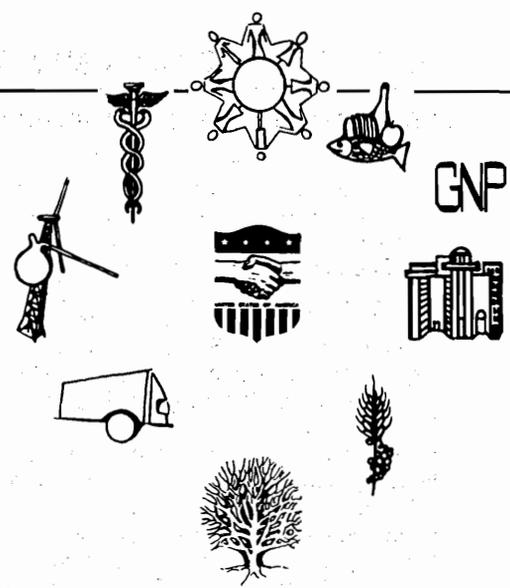
But IRRI's institutional responsibilities and programs extend beyond research on improved rice varieties. IRRI also conducts research on such topics as the effects of the new rice technology on the use of family labor (015), changes in villagers' income distribution and community institutions (072), and causal connections between more than 20 years of climate and weather data and crop performance (002). IRRI also maintains a computerized germplasma data bank permitting automated retrieval of information on 41,000 cultivars in the world rice collection (001).

In addition, to ensure exchange of research results and related development information with other concerned international institutions, IRRI disseminates proceedings of symposia it co-sponsors on such topics as the agrometeorology of rice production (003) and soil-related constraints to tropical food production (004). IRRI also publishes solely-sponsored texts such as item 043 which synthesizes for rice scientists the current knowledge on the crop physiology of rice and on attainment of high yields.

(continued on inside back cover)

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## SUBJECTS AND DOCUMENTS OF SPECIAL INTEREST

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## QUESTIONS AND ANSWERS ABOUT ARDA

<b>What is ARDA?</b>	<i>ARDA</i> , "A.I.D. Research and Development Abstracts", is a quarterly abstract journal issued by the Division of Documentation and Information, Office of Development Information and Utilization, Bureau for Science and Technology.
<b>What is the goal of ARDA?</b>	The goal of <i>ARDA</i> is to transfer development and technical information to active practitioners in development assistance.
<b>For whom is ARDA published?</b>	<i>ARDA</i> 's target audience is A.I.D. staff worldwide and selected key institutions in developing countries. Such institutions are government agencies, universities, libraries, research organizations, and other public and private sector organizations.
<b>What materials are abstracted in ARDA?</b>	<i>ARDA</i> presents abstracts of AID-funded current and less recent research studies, state-of-the-art reports, sector analyses, special evaluations, and other documents which, taken together, describe a broad spectrum of international development experience.
<b>To whom do I address additional questions regarding ARDA?</b>	Please direct all correspondence and requests for further information to: Editor of <i>ARDA</i> S&T/DIU/DI Agency for International Development Washington, D.C. 20523 U.S.A.

## QUESTIONS ET RESPONSES RELATIVE A ARDA

<b>Qu'est-ce qu' ARDA?</b>	<i>ARDA</i> , "A.I.D. Research and Development Abstracts", (Résumés sur la recherche et la développement de l'Agence pour la Développement International), est une revue trimestrielle composée de résumés publiée par la Division de la Documentation et des Informations, Bureau des Informations sur le Développement et leur Utilisation, Bureau pour Science et Technologie.
<b>Quel est l'objectif d'ARDA?</b>	Le but d' <i>ARDA</i> est de transmettre les informations techniques et axées sur le développement, aux techniciens participant à l'assistance au développement.
<b>A qui s'adresse ARDA?</b>	<i>ARDA</i> s'adresse au personnel d'A.I.D. dans le monde entier et aux institutions clés choisies, situées dans les pays en développement. Des institutions de ce genre sont des agences du gouvernement, des universités, des bibliothèques, des organisations de recherche, et autres organisations des secteurs public et privé.
<b>Que contiennent les résumés d'ARDA?</b>	<i>ARDA</i> présente des résumés d'études actuelles et moins récentes relatives à la recherche et financés par A.I.D., des rapports faisant le point des connaissances actuelles, des analyses sectorielles, des évaluations particulières, et d'autres documents qui, ensemble, décrivent un large éventail de réalisation dans le domaine du développement international.
<b>A qui dois-je adresser des questions supplémentaires au sujet d'ARDA?</b>	Veuillez envoyer toute correspondance et demandes de plus amples renseignements à: Editor of <i>ARDA</i> S&T/DIU/DI Agency for International Development Washington, D.C. 20523 U.S.A.

## PREGUNTAS Y REPUESTAS SOBRE ARDA

<b>¿Qué es ARDA?</b>	<i>ARDA</i> , "A.I.D. Research and Development Abstracts", (Sumarios de Investigación y Desarrollo de A.I.D.) es un jornal que sale cuatro veces al año, publicado por la División de Documentación e Información, Oficina de Información sobre Desarrollo, el Despacho de Ciencia y Tecnología.
<b>¿Cuál es el objetivo de ARDA?</b>	El objetivo de <i>ARDA</i> es el de transmitir información técnica y de desarrollo a trabajadores activos en asistencia de desarrollo.
<b>¿Para quién se publica ARDA?</b>	El público prioritario de <i>ARDA</i> consta de los funcionarios de A.I.D. en el mundo entero y de las instituciones claves seleccionadas en los países en desarrollo. Tales instituciones son agencias de gobierno, universidades, bibliotecas, organizaciones de investigación y otras organizaciones del sector público y privado.
<b>¿Qué contienen los informes de ARDA?</b>	<i>ARDA</i> presenta informes de estudios de investigación actual y menos recientes financiados por A.I.D, informes del estado del arte, análisis del sector, evaluaciones especiales, y otros documentos que, juntos, describan un espectro amplio de experiencia de desarrollo internacional.
<b>¿A quién dirijo preguntas adicionales sobre ARDA?</b>	Sírvase dirigir toda correspondencia y pedidos de más información a: Editor of <i>ARDA</i> S&T/DIU/DI Agency for International Development Washington D.C. 20523 U.S.A.

## USER'S GUIDE TO ARDA CITATIONS

<p><b>Item number</b> Numéro de l'article Número de artículo</p>	133	PN-AAH-900	<p><b>Publication number</b> Numéro de la publication Número de publicación</p>
<p><b>Author(s)</b> Auteur(s) Autor(es)</p>	<p><b>A REFERENCE COMPILATION OF SCIENCE AND TECHNOLOGY OFFICIAL DEVELOPMENT ASSISTANCE FURNISHED BY A.I.D. FOR THE LESS DEVELOPED COUNTRIES (LDC's)</b></p>		<p><b>Title</b> Titre Titulo</p>
<p><b>Issuing Organization(s)</b> Organisme(s) de distribution Organismo(s) distribuidor(es)</p>	<p>Reynolds, A.; Gaithwright, T. Logical Technical Services Corporation. 1980, 88 p.</p>		<p><b>Supplementary note</b> Nota supplémentaire Nota suplementaria</p>
<p><b>Document date and page numbers</b> Date et nombre de pages du document Fecha y número de páginas del documento</p>	<p><i>Prepared for the United Nations Conference on Science and Technology for Development</i></p> <p>This research report, summarizing official development assistance provided by A.I.D. to LDC's, was produced to meet the needs of participants in the United Nations Conference on Science and Technology for Development. It represents a synthesis of A.I.D.'s economic assistance philosophy, which is characterized by a two-fold thrust: (1) a "basic human needs" approach to bilateral development assistance, which combines the furthering of U.S. interests abroad with U.S. humanitarian interest in that quarter of the world's population condemned to live at a substandard level; and (2) a refocussing of A.I.D.'s assistance to LDC's from sophisticated technology to light capital, labor-intensive applications of scientific and technological developments. The report concentrates on development assistance in the fields of health, nutrition, and population; energy and natural resources, employment, trade and industrialization, and access to technology; food, climate, soil, and water; and urbanization, transportation, and communication. In each case, the relevant technologies and means of technology transfer are discussed in conjunction with a statement of the development problem addressed by these technologies and with illustrative examples of A.I.D. programs. The report concludes that comparatively little U.S. technology can be transferred to LDC's without significant adaptation. The LDC's have become aware of the need for technologies tailored to fit their resource endowments and absorptive capacities, and stress is being placed on the development of more appropriate technologies as well as on devising policies and institutions permitting LDC's to make better technological choices. An extensive subject index is included in this report.</p>		<p><b>Abstract</b> Résumé Sumario</p>
<p><b>Contract/grant number or symbol</b> Numéro ou symbole du contract/de la subvention o símbolo de contrato o subvención</p>	<p>AID/DSCAN-C-0021</p> <p>Also available in French: PN-AAG-000, 88 p.</p> <p>Paper Copy \$11.44</p>		<p><b>Project number</b> Numéro du projet Número de proyecto</p>
<p><b>Price: Paper Copy/ Microfiche (U.S.\$)</b> Prix: Copies sur papier/ Microfiche (U.S.\$) Precio: Copia en Papel/ Microfiche (U.S.\$)</p>	<p>931023200</p> <p>Microfiche \$1.08</p>		<p><b>Foreign language availability</b> Disponible en langues étrangères Disponible en idiomas extranjeros</p> <p>105 x 148 mm—98 frame— @ 24x reduction</p>

**To facilitate rapid and accurate processing of your requests for documents announced in this issue of ARDA, please observe closely the ordering instructions found on the page following the final abstract.**



**001 PN-AAJ-080**

**GERMPLASM BANK INFORMATION RETRIEVAL SYSTEM**

Gomez, K.A.; Tuazon, D.; Nano, N.E.  
International Rice Research Institute (IRRI).  
1979, 24 p.

*In IRRI Research Paper Series, No. 45*

Since 1961, IRRI has served as the central depository for the world's rice germplasm, receiving seed samples from all over the world and in turn disseminating seeds and information to the world's rice scientists. Since all seeds in the germplasm bank are planted at least once to gather data on their morphologic and agronomic traits, the volume of data in this world collection is enormous—about 1.4 million records. This report describes the major features of the Germplasm Bank Information Retrieval (GBIRET) program, a part of the computerized data management system developed by IRRI in 1976 to manage this huge volume of data. The germplasm bank currently holds about 48,000 accessions, with thousands more added annually, and contains existing information on each accession for 78 descriptors. The first 42 descriptors detail morphoagronomic traits such as seedling height, blade color, embryo size, endosperm type, etc. The remaining 36 traits are recorded as a result of screening at IRRI and describe genetic traits such as high protein content and resistance to or tolerance for adverse environments and pests. The GBIRET program aims to retrieve and display data from the germplasm data bank based on one or more of the characteristics or traits in the file. For example, when asked to identify all accessions in the data bank that are of the Indica type, have culms longer than 150 cm and grains longer than 6.5 mm, with maturity of more than 160 days, and are resistant to blast and bacterial leaf blight, the GBIRET responded with four rice types that fit the description. GBIRET program output information such as this can be in either a subfile form, listing all accessions that satisfy a given query and all their corresponding descriptors, or on a printout listing all accessions satisfying the query with selected descriptors in a specified format. Technical limitations of the current GBIRET program, e.g., regarding the number of criterion descriptors allowed, are noted, and six figures illustrating the GBIRET system and four references (1970–79) are given. Appendices include an abridged GBIRET program listing and procedures for preparing retrieval control cards, i.e., query, list?, output, and title cards.

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Paper copy \$3.12 Microfiche \$1.08

**002 PN-AAJ-082**

**WEATHER AND CLIMATE DATA FOR PHILIPPINE RICE RESEARCH**

Angus, J.F.; Manalo, E.B.  
International Rice Research Institute (IRRI).  
1979, 14 p.

*In IRRI Research Paper Series, No. 41*

To help Philippine rice researchers interpret crop performance, this report describes weather and climate data collected in the Philippines from 1951 to 1978. Detailed surface weather data have been collected at the University of the Philippines at Los Banos (UPLB), an upland environment, and at IRRI, an irrigated lowland area about 1 km away. Rainfall was found to be higher at the lowland IRRI site, although long-term (1917–58) records at the UPLB site indicate a possible cyclic pattern of annual rainfall in that area that should be kept in mind. When measured by the Colorado open rim and Class A pan, monthly mean evaporation rates were the same for both sites when rates were low, but were higher by as much as 2 mm/day at the upland site when rates were high. Although radiation data from the two sites for the 1970–78 period show major discrepancies due to faulty instruments, duration of bright sunshine records are in good agreement and may be used to estimate global radiation. Temperature data showed that maxima are generally lower and minima slightly higher at the lowland site, a difference probably due to the heat buffer provided by the lowland area's surface water. Comparative data on other weather elements, e.g., humidity, have not been compiled long enough to permit generalization. A complete file of daily weather data for the entire area, using UPLB conditions as a standard, is publicly available at the Agricultural Resources Center (ARC), Los Banos. These data, it is noted, can be used in interpreting crop performance provided causal connections are made between crop and weather data. For example, root development and soil nitrogen transformation should be related to soil and water temperature which may differ from mean screen temperature in some conditions. Climatic data have also been collected at 47 synoptic weather stations operated by the Philippine Atmospheric, Geophysical and Astronomical Services Authority (PA-GASA), and an integrated file of weekly data for periods of up to 24 years (1951–74) has been prepared. The file's general contents are noted and an example of the complete file at one station is provided. Appended is a 7-item list of references (1971–77).

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Paper copy \$1.82 Microfiche \$1.08

**003 PN-AAJ-865**

**PROCEEDINGS OF A SYMPOSIUM ON THE AGROMETEOROLOGY OF THE RICE CROP**

International Rice Research Institute (IRRI).  
1980, 251 p.

*Symposium co-sponsored by the World Meteorological Organization (WMO) and IRRI*

Despite the fact that rice provides 40% of the world's population with roughly half its caloric and protein intake and is grown under more diverse agrometeorological conditions than any other crop, research on rice-weather relationships is severely lacking. This report presents the proceedings of the 1979



# AGRICULTURE

Symposium on the Agrometeorology of the Rice Crop. Symposium papers and working group discussions focused on the climatic aspects of rice production and the collection of weather data in rice-growing areas; the recent application of agrometeorology to rice research and extension; the impact of climatic variability on rice production and the variables to be monitored in rice-weather experiments; and methods of rice-weather data analysis and application, such as mapping and crop modeling. A review of rice-growing countries' national weather records revealed that most data are collected by disparate subnational agencies and are therefore non-uniform in content and quality; that climatic data on regional crop yields are inadequate for monitoring and planning purposes; and that interaction between national meteorological and agricultural agencies is weak. It was recommended therefore that WMO assist national meteorological agencies to put raw weather data on magnetic tape for wider dissemination; that subnational, national, and international agencies cooperate closely in their meteorological services; and that regional climatic stations be installed/upgraded to adequately monitor area rice yields and climatic conditions. Further, WMO should coordinate a series of rice-weather experiments to collect a standardized set of weather, soil, and biological data for both wetland and dryland rainfed rice varieties. As to data analysis and modeling, it is recommended that WMO facilitate the collection of daily and hourly measurements of temperature, precipitation, solar radiation, evaporation, and wind for different-sized rice-growing areas and that the feasibility of using satellite data be studied. Future research should study the impact of meteorological conditions on rice crop diseases and pests and ways to mitigate the effects of catastrophic weather on rice production. A list of symposium participants is included.

Paper copy \$32.63

Microfiche \$3.24

**004**

**PN-AAJ-867**

## **PRIORITIES FOR ALLEVIATING SOIL-RELATED CONSTRAINTS TO FOOD PRODUCTION IN THE TROPICS**

International Rice Research Institute (IRRI); Cornell University, College of Agriculture and Life Sciences.  
1980, 471 p.

*Conference co-sponsored by Cornell University and IRRI in cooperation with the University Consortium of Soils for the Tropics*

Soil-related constraints and lack of sufficient agrotechnology to overcome them are among the most significant factors causing low crop productivity in tropical developing countries. This report presents the proceedings of an international symposium held at IRRI headquarters in the Philippines June 4-8, 1979, to discuss the occurrence and degree of knowledge of major soil constraints, future soil research priorities, and international collaboration in soil research. Two papers in the first section treat, respectively, soil constraints to agricultural development

and the need for an internationally-coordinated soil research program. Next, a terminology for the exchange of scientific information is presented as background to the discussion of the relation between major crop production systems and indigenous soil properties in tropical Africa, Southeast Asia, America, and India. The third section describes knowledge gaps in regard to soil acidity and salinity as well as soil deficiencies in nitrogen, nitrogen fixation, micronutrients, phosphorus, potassium, and sulfur; other soil constraints to crop production (water stress, soil erosion, mechanical impediments to land preparation and root growth); and soil fertility evaluation and extrapolation of research. In all, 21 papers were given with a discussion period following each presentation. Suggestions for future research were divided into three ecological zones: humid tropics (savanna and rain forest), tropical wetlands, and the semiarid tropics. Research topics for all three groups that should be priorities in the near future are: soil acidity and salinity, soil chemical composition, crop micronutrients, drought, soil erosion, and soil fertility evaluation and extrapolation. Symposium participants agreed to create a small international organization to coordinate soil research by compiling and disseminating soil information, inventorying problems and setting research priorities, and strengthening national research capabilities through training programs and conferences. A list of symposium participants is appended; concluding each participant's paper is a bibliography.

Paper copy \$61.23

Microfiche \$5.40

**005**

**PN-AAJ-063**

## **LAND USE IN THE ANDES: ECOLOGY AND AGRICULTURE IN THE MANTARO VALLEY OF PERU WITH SPECIAL REFERENCE TO POTATOES**

Mayer, E.

International Potato Center (CIP).

1979, 112 p.

To tailor agricultural programs to the unique aspects of different areas in Peru's Mantaro Valley, this report identifies and maps the valley's major land-use patterns and ecological characteristics, with special reference to potatoes. The region's natural environment is described as well as its land-use patterns, social structures, and predominant farm units. To prepare the map, the valley was classified according to altitude (high, intermediate, low), type of enterprise (peasant or commercial), condition of land (dry or irrigated), and dominant crops cultivated. Overall, land use in the Mantaro Valley reflects the interaction of two major variables: ecology and types of enterprise. Variation in agriculture follows ecological principles: the higher areas are restricted to a few specially adapted crops, while as one moves down, crop diversification increases; rotation cycles become longer, and fallow cycles diminish and disappear. Land use depends largely on farmer location, needs; and resources. Commercial farms tend to be concentrated in the low altitude zone where land is better suited for large-scale, mechanized production. Peasant farmers dominate the upper



two altitude zones where they often supplement their subsistence base with cash crops. Potatoes are the major crop in the valley and are grown in each of the three zones. One of this report's most significant discoveries is the importance of peasant enterprises to national potato production; it was found that while market-destined potato production is carried out by commercial enterprises in the low zone, in the intermediate zone it is done by peasant farmers. Included among this report's recommendations are that the quantity and quality of fertilizer applied to potatoes should relate to 3- or 4-year cropping cycles, not to single crops of potatoes; that additional research should be conducted on technical and socioeconomic aspects of fallowing before specific recommendations are made for improving the area's existing system; and that to improve potato production, it is necessary to view the potato in relation to the area's other crops and to potato farmers. Appended is a 51-item reference list (1948-77) in English and Spanish.

AID/ta-G-1492

931097300

Paper copy \$14.56

Microfiche \$2.16

**006**

**PN-AAJ-152**

## **"LEUCAENA LEUCOCEPHALA": AN EXCELLENT FEED FOR LIVESTOCK**

Benge, M.D.

A.I.D., Bureau for Development Support, Office of Agriculture. 1980, 28 p.

*Agriculture Technology for Developing Countries, Technical Series Bulletin No. 25*

*Leucaena leucocephala* (LL), a leguminous tree native to Central America, is extremely well-suited to the seasonally dry tropics. It can be fed fresh, or as leaf meal, silage, or browse to cows, goats, chickens, and a variety of fish. This report describes characteristics, uses, and planting procedures for LL. *Leucaena's* many varieties, of which the "Giants" (K-8, K-28, K-67) are the most promising, are fast-growing, rugged, drought resistant, and because *Rhizobia* live in a symbiotic relationship with the plant's roots, are able to fix nitrogen from the air. LL is a superior forage to alfalfa in terms of both nutritive value (vitamin A and protein) and digestibility and can yield up to 20 tons of dry matter per hectare per year. Although LL also contains mimosine, a toxic alkaloid, ruminants can still be fed a continuous ration of 40% LL, and non-ruminants thrive on 5-10% LL without adverse effect. A new, low-mimosine LL is being developed and should be available soon. LL-planted pastures can support up to 2.5 cows per ha, but both overgrazing and overgrowth must be checked. LL is an effective weapon against soil erosion and serves to suppress noxious weeds. For fields and planted pastures it is desirable to interplant LL with Guinea, Bermuda, Dallis, Pangola, or Kenya Sheep grass to reduce weed growth, increase ground water levels, and provide a more balanced forage. For marginal, hilly, or very dry land, it is preferable to plant LL, allow growth, cut the plants back to

stumps, allow regrowth, and underplant with a shade-resistant grass such as Guatemala grass. LL requires adequate phosphate, potash, sulfur, cobalt, and molybdenum; high amounts of magnesium; and low levels of calcium. Large, dense seeds should be chosen, then scarified, and inoculated with *Rhizobium*. Pelletization (coating with fertilizer) is also recommended. Although direct seeding is more efficient, seedling propagation/replanting is also common. With 100% germination, 1 kg of seeds planted 1 m apart will sow a 9 ha field. In either case, seedlings should be pruned to reduce dieback and evapotranspiration. A 19-item bibliography (1942-78) is appended.

Paper copy \$3.64

Microfiche \$1.08

**007**

**PN-AAJ-558**

## **EXPERIMENTAL DESIGNS FOR PREDICTING CROP PRODUCTIVITY WITH ENVIRONMENTAL AND ECONOMIC INPUTS FOR AGROTECHNOLOGY TRANSFER**

Silva, J.A.

University of Hawaii, College of Tropical Agriculture and Human Resources, Department of Agronomy and Social Science.

1981, 184 p.

*Departmental Paper 49*

A.I.D.'s Benchmark Soils Project (BSP) was developed to help developing tropical countries improve basic food crop production through a soil classification system and the transfer of successful agrotechnology. The papers in this compilation were presented at the Workshop on Experimental Designs for Predicting Crop Productivity with Environmental and Economic Inputs, held May 20-24, 1974 at the University of Hawaii and are arranged in three categories. The first section explains BSP's objectives and its use of the U.S. Soil Taxonomy System to classify the soils tested in BSP experiments. This section also details the methodology of BSP experiments describing site and crop selection procedures and the stable and variable factors affecting soil and climate. The main objectives of the experiments were to prove the transferability of crops raised in similar soils and to develop a universal equation describing yield response for any one soil given appropriate variables. Papers in the second section describe approaches to, and results from, BSP field experiments. It was suggested that those proposing BSP fertility experiments should both determine: the country soil situation and the extent of tests appropriate for soil variables (nitrogen, phosphorus, potassium, stand, irrigation, etc.) and specify the variables and statistical and economic models used in applying the test results. Cornell University's nitrogen and phosphorus soil experiments proving the high production potential of well-drained acid soils in the tropics are reviewed. The third section includes descriptions of experimental designs suitable for soil fertility experiments. Prediction equations and other mathematical models for estimating optimal inputs and outputs are discussed and recommendations



# AGRICULTURE

are made for improving their utility. Topics include the successful extension in Japan of a fractional factorial design for a fertilizer experiment to 20 crop characteristics such as culm length, number of panicles per ear, etc., and economic aspects of production functions for soils such as the derivation of yield and profit functions for sugarcane. Bibliographies are appended to each paper and a list of workshop participants is provided.

AID/ta-C-1108

931582000

Paper copy \$23.92

Microfiche \$2.16

**008**

**PN-AAJ-562**

## **ROOTS AND TUBERS: A POST HARVEST BIBLIOGRAPHY**

Idaho University, Postharvest Institute for Perishables.  
1981, 143 p.

Idaho University's Information Center of the Postharvest Institute for Perishables (ICPIP) was created in 1980 to globally disseminate up-to-date information on reducing postharvest losses of roots, tubers, fruits, vegetables, nuts, oilseeds, and spices. This bibliography on roots and tubers is the first in a semiannual series of bibliographies of documents available from ICPIP. Approximately 270, mostly post-1970, predominantly English-language items are listed in the following five subject areas: (1) root and tuber biology—biological, chemical, and physical properties, insects and microorganisms, and chemical and biological control of pests; (2) the economics of roots and tubers—marketing facilities and operation, domestic and international trade, loss assessment, livestock feed, and analyses of various economic models; (3) engineering aspects of root and tuber culture—conditioning, curing, harvesting, processing, storage, packaging, irradiation, drying, utilization, quality control, and appropriate technology; (4) training and education related to roots and tubers—symposia, courses, handbooks, and manuals; and (5) miscellaneous topics relating to roots and tubers—rural development, social change, nutrition, and consumer acceptance. The following information is provided for each item: title, author, source and language of the document, the subjects covered in the document, pagination, and date. Paper or reduced (24x) microfiche copies of documents listed in this bibliography are available from ICPIP free of charge to requestors from developing countries or at cost to those from developed countries. Coding sheets and order forms are included.

AID/DSAN-CA-0265

931132300

Paper copy \$18.59

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**009**

**PN-AAJ-121**

## **SWAZILAND CROPPING SYSTEMS RESEARCH AND EXTENSION TRAINING DESIGN STUDY**

Allred, K.R.; Farnsworth, W.F.; Downes, J.D.  
Consortium for International Development.  
1980, 126 p.

As background for an A.I.D. project to assist the Swaziland Ministry of Agriculture (MOA) to increase the self-sufficiency of Swazi small farmers on Swazi Nation Land (SNL), this three-part report outlines needs and strategies in the areas of cropping system research and training of MOA extensionists. The first two sections are prepared, respectively, by an agronomist and a cropping systems specialist. These sections review, in the context of Swaziland's general agricultural situation, cropping systems currently used by small farmers; and cropping systems' research needs in terms of facilities, equipment, commodities, and staff. Recommendations regarding cropping systems research include identifying production constraints to be considered by the A.I.D. Project Paper team; expanding experimental research by developing and testing several applicable and economically feasible cropping systems (crops and cropping systems are detailed); providing sufficient scholarships at the B.S. and M.S. levels to satisfy the program's requirements for research personnel and restaffing and expanding the MOA's Research Division to allow it to participate in onfarm cropping systems research; preparing simplified versions, directed to needs of small farmers on SNL, of annual reports on cropping systems research; and including local farmers in the decisionmaking and testing process. The report's third section, prepared by an agricultural education and extension training specialist, analyzes the MOA's Certificate Training Program for extensionists and makes recommendations to improve it. Recommendations for USAID assistance include upgrading the Program's curriculum and facilities and expanding the staff, and developing a vigorous in-service training program for extension field officers, middle management, etc. Also recommended are improving MOA extension services by producing bulletins and pamphlets on research findings for use by extensionists and providing additional support, training, and equipment for MOA's Information Division. Each of the three sections specifies technical assistance to be provided by the proposed A.I.D. project and concludes with a list of references. Appendices include lists of Swaziland contacts and a pamphlet on programming in the cooperative extension service.

AID/SOD/PDC-C-0217

645021200

Paper copy \$16.38

Microfiche \$2.16

**010**

**PN-AAG-167**

## **AN ANALYSIS OF GRAIN STORAGE IN THREE INTERIOR SAHEL COUNTRIES**

Pinckney, A.  
University of Michigan, Center for Research on Economic Development.  
1978, 78 p.

*Discussion Paper 75*

Marketing expected increases in foodgrain production will require viable grain storage systems in Mali, Niger, and Upper Volta. This report analyzes current grain storage systems in the three Sahelian countries and raises key policy issues. In Mali,



domestic grain is transported to an arrondissement and then to provincial storage centers whose estimated national capacity is 130,000 metric tons (MT). The State Marketing Board, OPAM, transfers 8% of all millet and 30% of rice to widely used central warehouses. While this system saves money, the lack of decentralized warehousing increases transport burdens on suppliers and leads to an unquantified loss of grain in shipping. Mali has no current (1978) grain reserves. In Niger, responsibility for storing grain lies with the National Grain Agency (OPVN), which stores 90% of all grain collected, the rest being stored by local co-ops. Arrondissement storage capacity is estimated at 9,000 MT and total OPVN capacity is 70,000 MT. Niger has 15,000 MT of millet and sorghum on emergency reserve. Although grain storage in Upper Volta officially rests with the Regional Development Office (ORD), two other national agencies control significant amounts of the nation's total storage capacity and reserves. While precise statistics are lacking, it is estimated that ORD's capacity is 20,800 MT and that of the other agencies 37,000 MT. Upper Volta enjoys a 6-week grain reserve. All three countries need to quantify grain reserve capacity and grain losses, end the fragmentation of authority in the storage sector, and bring uniformity to storage facilities. Other issues facing the three countries are: (1) the level at which new investments in storage infrastructure should be initiated (onfarm, community, or national); (2) tradeoffs in national grain reserve policies between efficiency and welfare and between recipients; (3) the composition of grain reserves (i.e., percentage of each grain variety relative to another) and the implications for different grain producers; and (4) questions concerning price policy coordination, institutional structure, appropriate storage technology, and location of facilities in Sahelian long-term grain reserve programs.

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Paper copy \$10.14 Microfiche \$1.08

## 011 PN-AAJ-036

### FOOD PRODUCTION PROBLEMS OF SMALL FARMERS IN LOW-TECHNOLOGY NATIONS: SOME EVIDENCE FROM NIGERIA

Awa, N.E.  
Cornell University, Department of Communication Arts.  
1980, 17 p.

*Cornell International Agriculture Mimeograph No. 79*

Small farmers' disinclination to adopt government policies to increase agricultural production should not be viewed as demonstrative of inherent conservatism but rather as a rational response to perceived risks and problems. Thus concludes this case study on Nigerian farmers' reaction to the Government of Nigeria's (GON) efforts to promote use of such innovations as fertilizer, pesticide, and new crop varieties. Data gathered from 172 small yam, cassava, rice, and cowpea farmers in Nigeria's East Central and Southeast States showed that credit non-availability and the lack of agricultural infrastructure were major constraints. Borrowing from friends and family is still practiced

for production credit, but there is also a growing class of professional moneylenders who charge high interest rates and enforce rigid contracts. Although State government lending institutions have been established, they are slow, highly selective, graft-ridden (bribes often equal one-third of the loan), and demand detailed information farmers often lack. No money, inadequate knowledge, and high risk were viewed as major constraints to obtaining State credit by 68.6%, 42.4%, and 30.8% of the respondents, respectively—only 4 farmers (2.3% of the sample) had procured State loans. In the case of infrastructure, lack of basic agricultural support services—roads, public transport, clean water, electricity, etc.—reduced farmers' adoptive behavior. This "lack of supply" combined with a "lack of funds" were cited by 55.5% and 51% of the respondents as major disincentives, while risk and non-use by neighbors were deemed critical by only 2.3% and 1%, respectively. This supports previous findings that the GON often raised farmers' expectations but failed to later provide promised inputs (e.g., seeds). Thus, even if farmers were able to obtain credit and grow a larger crop, poor roads and the lack of public transport would result in local sales flooding the market and further depressing already low prices. The author concludes that price supports and ancillary services must be provided to make higher production profitable and permit GON production targets to be met. A 17-item bibliography (1962–77) is appended.

AID/ta-BMA-8 931113700  
Paper copy \$2.21 Microfiche \$1.08

## 012 PN-AAJ-037

### A METHOD OF WATERSHED LAND CLASSIFICATION AND ASSESSMENT FOR THE TROPICS: A CASE STUDY OF RIO GUANARE, VENEZUELA

Hawes, R.A.; Hamilton, L.S.  
Cornell University, College of Agriculture and Life Sciences.  
1980, 33 p.

*Cornell International Agriculture Mimeograph No. 77*

To avoid environmental degradation while developing natural resources in the tropics, an adequate appraisal of existing land resources is prerequisite. Adequate appraisal—which must be simple, flexible, technically sound, and quickly executed—involves assessing an area's major environmental components, delineating relatively homogeneous environmental units which tend to respond uniformly to a given treatment, and describing local prevailing or likely land use practices. This report describes the methodology used in an appraisal, carried out largely by one person over a 20-month period, of the 157,000 ha of Venezuela's Rio Guanare region. To provide a framework for assessing biotic performance capabilities, Rio Guanare's upper and middle watershed area of plains, piedmont, and bedrock-controlled mountains was divided into five tropical forest bioclimate zones: (1) dry, cleared for cultivation or grazing; (2) moist, cleared for permanent agriculture; (3) pre-



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montane moist, cleared for permanent agriculture or burnt for grazing; (4) premontane wet, with a diverse vegetative cover; and (5) lower montane wet, a mixture of forest and grassland. To determine broad land zones, this framework was applied to geological materials taken from maps, aerial photographs, and field studies. The resultant 46 land types were rated for their present suitability for the production of five crop types (coffee, bananas, maize, citrus, and cassava), grazing, watershed protection, and the production of timber, firewood, or commercial forests. The five ratings (from highly suitable to permanently unsuitable) correspond to those of the Food and Agriculture Organization. In contrast to earlier, more pessimistic area studies, about 36% of the land was rated as being high to moderately suitable for some type of agriculture, mainly coffee production. Included in forestry-related findings were that 16% of the watershed is in critical condition and should remain forest and that only 10% of the area is suitable for fuelwood production. Areas and species permanently non-suitable for various activities are specified and the need to account for such non-suitability in planning is stressed. Appendices include a 21-item Spanish and English bibliography (1958–80).

AID/ta-BMA-8 931113700  
Paper copy \$4.29 Microfiche \$1.08

**013 PN-AAJ-230**  
**PRE-PROJECT ASSESSMENT OF THE  
AGRICULTURE AND RURAL DEVELOPMENT  
SECTOR IN THE PEOPLE'S REPUBLIC OF THE  
CONGO; FINAL REPORT**

Hung, G.N.; Downs, R.E.; Alfaro, J.F.; Biddier, W.K.; Barbour, R.  
Development Associates, Inc.  
1980, 255 p.

Although the Congolese government has pursued industrial and urban development at the expense of rural development for nearly 20 years, agriculture will remain the foundation of the Congolese economy when known oil reserves—the spearhead of industrial development—are depleted by the late 1980's. To help restore viability to the Congolese small farm sector, this report, divided into five sections, assesses the sector and proposes a medium- and long-term strategy for A.I.D. assistance. Part I summarizes the historical, sociological, demographic, economic, and financial conditions impacting on agricultural development. Part II reviews the agronomic, engineering, performance, and marketing aspects of the shrinking agricultural sector. Part III looks at the targeted population of small farmers—their backgrounds, income, production, cooperative organizations, and socioeconomic participation—as well as past international assistance provided to the small farm sector. Part IV details constraints to agricultural development, specifically identifying environmental, cultural, financial, marketing, transport, and administrative limitations. Thus, an optimal U.S. strategy of assistance, as outlined in 18 proposed projects in Part V, would be: (1) designed with the medium-term

(1–3 yrs) objective of improving agricultural marketing and preparing for future rural development and the longer-term (3–5 yrs) goal of increasing productivity, diversifying agriculture, and improving rural infrastructure; (2) in the form of P.L. 480, Title I grants and concessional loans; (3) experimental and investigative in nature in order to provide information needed to plan future assistance; (4) divided so that two-thirds of the aid is allocated to the southern regions, one-third to the northern regions; (5) channeled to small farmers either directly or through cooperatives or pre-cooperatives, not through state farms or ranches; and (6) initially favor food, cash crop, fish, and livestock production and marketing at the expense of forestry and agroindustrial production. Appended is a 64-item bibliography (1947–80) of French and English references.

AID/SOD/PDC-C-0158

Paper copy \$33.15

Microfiche \$3.24

**014 PN-AAJ-219**  
**FURTHER MECHANIZATION OF EGYPTIAN  
AGRICULTURE**

ERA 2000, Inc.  
1979, 639 p.

Agricultural mechanization in Egypt stands at a crossroads from which the Government of Egypt (GOE) must decide whether to aggressively intervene or pursue a laissez-faire strategy. This study, aimed to assist the GOE to select the optimal strategy and to highlight possible avenues of A.I.D. assistance (herein proposed at \$78.8 million for 1980–84), concludes there exists in Egypt the foundation for a vigorous expansion of mechanization which could increase farm production 47% by 1990 with only a negligible adverse social impact. After providing a brief outline of the history and current status of agricultural production and mechanization in Egypt; offering information on labor, machinery, and power requirements and costs; and exploring farmers' attitudes toward mechanization, the authors report the costs and benefits of mechanizing production of cotton, maize, wheat, rice, sugarcane, and berseem. Specifically, the most promising opportunities for increased production are seen to be improved seedbed preparation, more timely planting, increased subsoil coverage and precision levelling, replacing animal-drawn sarkias (water wheels) with mechanical pumps, diversifying the use of tractors, and increased use of thresher/winnowers and mechanical grain harvesters. To follow through on these opportunities will require a significant increase in the number and types of equipment, especially tractors, subsoiling/land-levelling equipment, self-powered thresher/winnowers and mower/binders, motor-driven pumpsets, and new types of land preparation, planting, and cultivation equipment. To improve the agricultural support system and thereby glean the maximum gain from mechanization, the authors recommend upgrading machine management, improving repair facilities, modernizing local capacity for farm equipment manufacture, expanding farm mechanization research and development, increasing the sup-



ply of trained mechanics and spare parts, and developing an effective management information system. A proposed budget is included outlining possible A.I.D. assistance in the recommended farm mechanization program.

AID/ne-C-1513

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Paper copy \$83.07

Microfiche \$7.56

**015**

**PN-AAJ-083**

## THE EFFECT OF NEW RICE TECHNOLOGY ON FAMILY LABOR UTILIZATION IN LAGUNA

Smith, J.; Cascon, F.

International Rice Research Institute (IRRI).

1979, 17 p.

*In IRRI Research Paper Series, No. 42*

To fill a research gap on the impact of modern rice varieties (MV) in developing countries, this paper analyzes four surveys (1965, 1970, 1975, and 1978) of 45 farmers with atypical, high-yield farms in Laguna, the Philippines, to estimate the impact of the 1966 introduction of MV's on family labor use. The study showed a general change from labor-intensive to labor-saving practices (i.e., the use of chemicals and machinery) after 1975, as farmers adjusted to changing factor price ratios. Further, family labor declined steadily throughout the entire period of the study. To explain this decline, a Cobb-Douglas production function was used to test a hypothesis that MV's increase the number of operations that require large amounts of hired help to meet set deadlines, e.g., weeding, thus making hired operations more important than family operations in increasing output. Regression analyses showed that a 1.0% increase in hired labor could increase output by 0.2% using MV's, but would hardly affect output using older varieties; and that, conversely, a 1.0% increase in owner operator's labor (the chief component of family labor) could increase output 0.12% using older varieties, but have no marked impact using MV's. The study also revealed that total operator's labor decreased nearly one-third; that a significant portion of this time was spent growing watermelon, a lucrative crop; and that farmers spent much less time in non-farm activities and much more time in a wide range of farm management activities such as touring paddy fields and meeting with extensionists and rural bank personnel, with a significant (5%) increase in farm management production elasticity. The study also showed that the increased availability of nonfarm work, mainly in factories, decreased onfarm family labor. As of 1978, 60% and 53%, respectively, of male and female children over 18 held such jobs. Finally, the study revealed that total farm income increased 53% in real terms, resulting in an increased capacity to hire manual laborers. Taken together, these changes in labor use are similar to those that occurred over a 40-year period in Japan and Taiwan. An appendix on regression tests and 9 references (1961-79) are included.

AID/DSAN-G-0083

Paper copy \$2.21

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**016**

**PN-AAJ-221**

## POTATO PRODUCTION AND UTILIZATION IN KENYA

Durr, G.; Lorenzl, G.

Centro Internacional de la Papa; University of Nairobi, Department of Agricultural Economics; Technical University Berlin, Institute of Socio-Economics of Agricultural Development.

1980, 133 p.

As part of a series of studies being conducted by the International Potato Center on the production, marketing, and use of potatoes in developing countries, this report describes the history of Kenya's potato industry and makes recommendations to improve it. Production and use of potatoes have expanded rapidly since potatoes were first grown in Kenya, over 70 years ago, primarily by European farmers for their own community and for export. Although potatoes are a relatively unimportant crop nationally in terms of both total agricultural production and per capita caloric intake, an uneven distribution of consumption and production makes them an important food crop and/or consumer item in some areas. Production occurs mainly in the central highlands and consumers are located mainly in these and in urban areas. Potatoes are grown by small subsistence farmers primarily for home consumption, by large commercial growers in the Meru district, and by forest cultivators who plant potatoes in slash and burn plots for a year or two prior to growing maize. Yields for small farmers are generally low due to poor seed quality, inadequate disease and pest control, and low soil fertility. Certified seed is not widely used because of its expense, the long maturing time and low marketability of available varieties, and the difficulty of obtaining seed in time for planting. In urban areas, potatoes are widely accepted but relatively costly in comparison to other staples such as maize, rice, and beans. Recommendations to improve commercial production of potatoes include determining consumer preferences in appraising the quality of potatoes; alleviating price fluctuations by providing better storage facilities; and intensifying production through selective mechanization of planting and harvesting, use of improved seed of marketable varieties, and crop rotation. Recommendations for subsistence farmers include improving onfarm storage and intensifying production, especially through technologies not requiring capital investment. An appendix discusses the objectives and methodology of the potato producer and trader surveys. A 65-item list of references (1938-79), containing one item in German and the others in English, is included, along with 54 illustrated tables.

AID/DSAN-G-0079

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Paper copy \$17.29

Microfiche \$2.16



017

PN-AAJ-073

## FOOD POTENTIAL OF AQUATIC MACROPHYTES

Edwards, P.  
International Center for Living Aquatic Resources  
Management (ICLARM).  
1980, 53 p.

*ICLARM Studies and Reviews 5*

The only aquatic plant that is also a major agronomic species is the emergent macrophyte rice, *Oryza sativa*, the world's most important single crop and a staple in the diet of more than 50% of the world's population. To facilitate the use of other aquatic macrophytes (AM) in food production, this paper reviews existing literature for methods to convert AM's, generally thought of as weeds and thus warranting destruction, into human food, livestock fodder, fertilizer, and herbivorous fish food. The potential for integrated AM-herbivorous fish systems and the possible health hazards associated with aquatic macrophyte cultivation are also reviewed. Loosely defined, AM's are aquatic plants which grow in water or in soils covered with water for a large portion of the growing season in tropical and semitropical areas. Since AM's may be cultivated in waterlogged or swampy soils not suitable for either terrestrial crops or aquaculture, their cultivation increases the amount of productive land in a given area. Although more than 40 AM species are edible, only certain ones (taro, Chinese water chestnut, water spinach, and *Neptunia oleracea*) have clear potential for widespread use due to the social unacceptability and cost inefficiency of most varieties. Water spinach and *N. oleracea* are identified as the most promising varieties, and further research on their protein content and yield capacity is recommended. Given their high moisture content, however, AM's are not economically feasible livestock fodder because their low nutritive quality does not justify the harvesting, transporting, and processing costs required to convert fresh plants into dry feed. The most promising fertilizer use of AM's is composting in fish ponds, and further research on the use of AM's and slurry in biogas production is recommended, as is study of the feasibility of stocking herbivorous fish to control AM's in irrigation systems with large macrophyte populations. While the presence of AM's may lead to mosquito breeding, contamination from the use of animal and human wastes as fertilizer and the accumulation of toxic chemicals by AM's in waste recycling systems are more likely AM-related health hazards. Recommended countermeasures, respectively, are rendering wastes innocuous prior to use and separating domestic from industrial wastes. A 202-item list of references (1918-80) is included.

AID/DSAN-G-0174

931112400

Paper copy \$6.89

Microfiche \$1.08

018

PN-AAJ-074

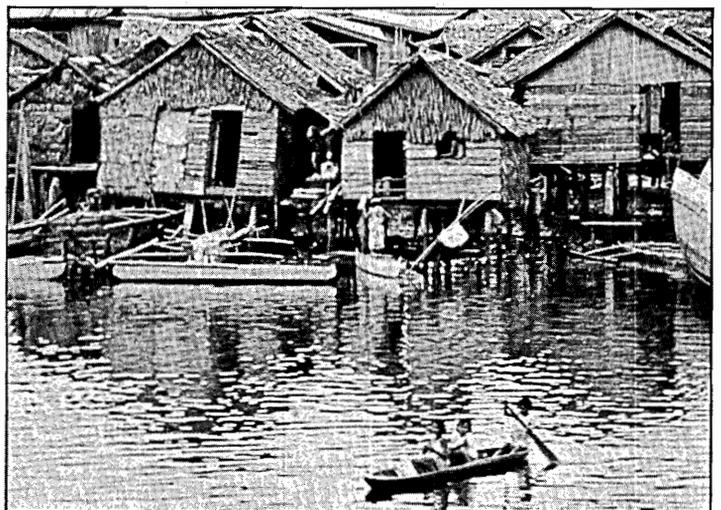
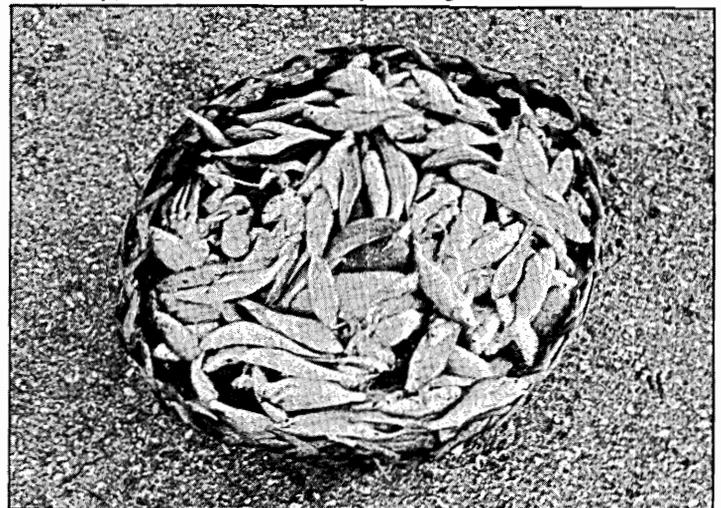
## PHILIPPINE MUNICIPAL FISHERIES: A REVIEW OF RESOURCES, TECHNOLOGY, AND SOCIOECONOMICS

Smith, I.R.; Puzon, M.Y.; Vidal-Libunao, C.N.  
International Center for Living Aquatic Resources  
Management (ICLARM); Republic of the Philippines, Ministry  
of Natural Resources, Fishery Industry Development Council.  
1980, 89 p.

*ICLARM Studies and Reviews 4*

International interest in the socioeconomic development of traditional small-scale fisheries has grown rapidly in the last 10 years. This report, first in a series of country reviews, describes the current status of Philippine municipal fisheries. Six areas are discussed: (1) Sector Overview: Although small-scale municipal fishermen (MF) annually provide 55-60% of the Philippine fish catch, their incomes are dwindling due to declining fish resources and rapid inflation. Recent surveys show MF incomes to be half the established poverty threshold. (2) Resources: Contrary to earlier views, evidence suggests that

**Four aspects of Philippine municipal fisheries: mixed gill net catch; ownership; and a retail market, emphasizing the market rather than the**





traditional fishing waters are being overfished and that maximum sustainable yields have been reached. (3) Technology: Traditional fishing methods are still widely used by MF; less than half possess motorized vessels. Technological research has been limited and aimed mostly at upgrading gear and vessels. (4) Socioeconomics: Statistical correlations show that successful MF are better educated but also more dissatisfied with their living conditions. Nearly half want to shift from fishing to another occupation. Those seeking a change, however, are younger, less educated, and poorer. (5) Development Programs: The two major developmental thrusts are increased production and improved marketing. For example, credit programs have helped MF acquire improved vessels, engines, and gear. Marketing projects have stressed the establishment of a nationwide cold storage network to speed distribution and reduce spoilage. (6) Management and Research: Because of overfishing trends and conflicts between commercial and municipal fishermen, steps are being taken to manage or restrict fishing, e.g., large vessels are prohibited from some coastal or shallow waters. Incentives to reduce fishing are needed to keep MF's from being further impoverished. Further research efforts should emphasize analytical and statistical studies aimed at

**beach landings for bancas; fishing village with little if any land subsistence orientation of municipal fisheries.**



understanding the dynamics of municipal fisheries, especially regarding MF's low standard of living. Appendices include a 99-item bibliography (1950–80) and research recommendations of the Philippine Council for Agricultural and Resources Research.

AID/DSAN-G-0174

931112400

Paper copy \$11.57

Microfiche \$1.08

**019**

**PN-AAJ-075**

## **REVIEW OF BREEDING AND PROPAGATION TECHNIQUES FOR GREY MULLET, "MUGIL CEPHALUS" LINNAEUS**

Nash, C.E.; Shehadeh, Z.H.

International Center for Living Aquatic Resources Management (ICLARM).

1980, 88 p.

*ICLARM Studies and Reviews 3*

Although the size, nutritional quality, fecundity, and adaptability of mullet, especially grey mullet (*Mugil Cephalus* L.), indicate their potential as a major source of animal protein in the world's tropical and subtropical coastal areas, mullet have yet to be successfully bred in captivity. This state-of-the-art report provides a compendium of knowledge on mullet propagation. Given the historical non-intensive cultivation of mullet in the Mediterranean, Southeast Asia, Taiwan, Japan, and Hawaii, as well as more recent experiments in intensive mullet cultivation—the forerunner to any large-scale operation, the authors suggest that pilot mullet hatcheries are now justified. Toward this end, they outline both natural spawning and induced breeding techniques for mullet, including information on broodstock selection, spawning behavior, egg morphology and incubation, induced maturation, larval behavior and nutrition, and postlarval development. Although it appears mullet do not breed in any specific environmental pattern, successful breeding does require a substantial quantity of healthy, sexually mature broodstock; appropriate temperature and photoperiod to influence physiological changes in the pituitary gland and gonads; and artificial conditions to permit the female to develop oocytes beyond tertiary yolk globule stage and to allow the male to complete spermiogenesis. To meet these needs, the authors provide a detailed description of hatchery techniques—broodstock collection, maintenance, and spawning; fertilization, incubation, and hatching; larval rearing; production of food (photoplankton, rotifer, copepod, amphipod, and brine shrimp); and facility staffing. Requirements for hatchery design—size, site, materials, construction, and equipment—are addressed. Although shortages of purified salmon gonadotropin (a hormonal stimulant) and brine shrimp (an important larval food) could constrain future mass production of mullet, the authors remain confident that mullet have the greatest potential of all the marine and brackishwater finfish for becoming humankind's most important supplier of aquatic animal protein. Appended are a 180-item bibliography (1916–78), a list of hatchery equipment, and information on a technical training film.

AID/DSAN-G-0174

931112400

Paper copy \$11.44

Microfiche \$1.08



020

PN-AAJ-280

## INTEGRATED AGRICULTURE-AQUACULTURE FARMING SYSTEMS

Pullin, S.V.; Shehadeh, Z.H.  
International Center for Living Aquatic Resources Management (ICLARM); Southeast Asian Regional Center for Graduate Study and Research in Agriculture.  
1980, 265 p.

*ICLARM Conference Proceedings 4*

Although integrated agriculture-aquaculture (IAA) farming has been practiced in Asia for centuries and offers more efficient resource utilization, reduces risk by diversifying crops, and provides additional food and income, reliable quantitative production and management guidelines have yet to be produced and disseminated for use as a basis for development programs. This report on the proceedings of the Fourth International Center for Living Aquatic Resources Management Conference (ICLARM 4) addresses this need. The conference was held 6-9 August 1979 in Manila, Philippines and was co-sponsored by ICLARM and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture. The conference's goals were to: (1) provide an overview of current IAA farming practices in selected Asian countries; (2) increase awareness of IAA's ability to raise farm income; (3) review available experience and technology; (4) discuss IAA's socio-economic aspects in order to identify research and development priorities; and (5) encourage governments and international donors to initiate IAA research and development projects. The report consists of 24 papers, 10 of which review broad strategies, techniques, and problems associated with IAA, such as aquaculture in rice fields and irrigation systems; the role of pesticides and health as constraining factors; and the use of animal wastes in pond management. The other 13 papers were presented as case studies on current IAA practices in Hong Kong, Hungary, India, Indonesia, Japan, Malaysia, Nepal, the Philippines, Taiwan, and Thailand. A final paper highlights the needs for research on both IAA farming systems in general and on the major factors affecting IAA performance—energy, materials, space, time, and information. Many of the papers are detailed studies, supported by charts, data, pictures, diagrams, and maps; and most are referenced with bibliographies on sources of information on IAA. A list of the authors and of the conference participants is appended.

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021

PN-AAJ-022

## MEXICO: THE FERTILIZER INDUSTRY

Allgood, J.H.; Braude, D.; Harris, G.; Hill, J.M.; Smith, R.T.; Marquez, A.V.; Alvarez, J.D.; Ariaga, A.M.P.; Ramirez, F.D.  
International Fertilizer Development Center (IFDC); Fertilizantes de Mexico (FERTIMEX).  
1979, 60 p.

A rapidly expanding domestic fertilizer market and a desire to capitalize on indigenous raw material deposits have resulted in Mexico's rapid emergence as a major fertilizer producer. This report reviews Mexico's fertilizer industry in terms of its past progress, its current resources, and its future plans for producing an adequate supply of fertilizer to meet the country's need for increased crop production. During the past decade, fertilizer use in Mexico has nearly doubled, exceeding a million metric tons (MT) of plant nutrients in 1978; it is expected to double again by 1985. Fertilizer production has also increased, with total outputs estimated at over 1.65 million MT of nutrients in 1978 versus only 0.7 million MT in 1970. Mexico's position as a net importer of nitrogen has thus been reversed, with the 1978-85 annual export potential estimated at 508,000-1,381,000 MT of nitrogen. Mexico's petroleum resources are estimated to be among the world's largest, thus insuring that nitrogen for feedstock is available. Mexico's exports of phosphates should peak in 1983 at over 350,000 MT after declining to about 100,000 MT in 1980 and 1981 due to increased domestic demand. Phosphate rock for fertilizer production must currently be imported, but deposits in Baja California are being investigated for exploitation in the 1980's. To increase fertilizer production, 11 major development projects are planned or are being implemented. These include two projects to produce potash, which is now totally imported. Most fertilizer production is under the control of two government agencies, Petroleos Mexicanos, S.A. (PREMEX), which produces ammonia, and FERTIMEX, which is responsible for producing and marketing all other fertilizers. It is government policy to make fertilizers readily available to farmers at the lowest possible price, and in recent years prices have been lower than those in other countries such as the United States and India. FERTIMEX is expanding its distribution system in order to better meet the needs of small farmers, and progress in being made in coordinating research and extension activities. Eight references (1973-79) in Spanish and English are included.

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022

PN-AAJ-023

## BOLIVIA FERTILIZER SITUATION AND RECOMMENDATIONS

Frederick, M.T.; Smith, R.T.  
International Fertilizer Development Center (IFDC).  
1979, 85 p.

The second lowest level of fertilizer consumption in South America and exorbitant fertilizer prices are impeding Bolivia's agricultural development. This report reviews Bolivia's fertilizer situation and makes recommendations to improve it. Examined are Bolivia's agricultural potential in terms of climate, soil conditions, and crop production capabilities; indigenous fertilizer raw materials (natural gas, phosphate rock, sulfur, and potash); fertilizer transportation system; future fertilizer manu-



facturing plans; fertilizer use and practice; agricultural extension services; community development programs; soil testing laboratories; present and projected consumption of fertilizer; and fertilizer marketing and distribution. The unifying theme of these topics is their impact on the supply, demand, and price of fertilizer. The following time-phased recommendations for immediate fertilizer cost reductions are made: Phase I: (1) expand imports of bagged fertilizer (mono- and diammonium phosphate and urea) rather than package loose fertilizer at port-of-entry; (2) monitor world fertilizer market conditions to determine the best time to release tenders for fertilizer purchases as opposed to paying spot prices; (3) purchase in volume for lower per-ton price; (4) handle fertilizer imports through cooperatives to keep mark-up low; and (5) use direct inland transport from the port to avoid handling losses and interim storage. Phase II: have cooperatives import loose fertilizer and initiate small-scale bagging operations at a bagging factory in Cochabamba. Phase III: have cooperatives establish fertilizer bulk-blending facilities at the Cochabamba bagging factory to complement the bagging system installed in Phase II (by this time, fertilizer use should have increased to a point allowing cooperatives to import fertilizer in bulk). Phase IV: have cooperatives incorporate indigenously-produced fertilizers into the bulk-blending arrangement. Phase V: choose new fertilizer-blending sites (preferably at nitrogen and phosphate plants) as increased demand for fertilizer outpaces the Cochabamba factory's output. Phase VI: add locally available potash to fertilizer production. A 52-item bibliography (1969-78) is appended.

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## 023 PN-AAJ-093

### FERTILIZER MANUAL

International Fertilizer Development Center (IFDC).  
1979, 364 p.

*IFDC Reference Manual R-1; this manual updates U.N. Fertilizer Manual ST/CID/15 (1967)*

To provide developing countries a state-of-the-art reference, the International Fertilizer Development Center prepared this manual on the history, chemistry, technology, and economics of fertilizer production. Part I details fertilizer use since the mid-19th century, reviews growth in the industry from 1950-76, and forecasts increased production and consumption as well as raw material shortages up to the year 2000. Fertilizer's impact on crops, soil, and moisture supply is examined. A glossary and a review of the sources and availability of raw material inputs to fertilizer manufacture are included. Part II describes the properties, production, transportation, storage, and use of nitrogen fertilizers—calcium, ammonium, sodium, and potassium nitrate; nitric acid; ammonium chloride and sulfate; and urea. Phosphate fertilizers are similarly discussed in Part III with emphasis on the production, chemistry, and use of fertilizers derived from phosphoric and sulfuric acids and nitrophos-

phates. Part IV details the use of potash, compound, and controlled-release fertilizers and secondary/micro-nutrients. Physical and chemical attributes such as particle size, segregation properties, granule hardness, moisture absorption, and caking are also examined. Part V provides a detailed view of fertilizer industry planning and economics. Pollution (e.g., gaseous, liquid, and solid wastes) and other environmental factors are explored. Information is provided on establishing a grass-roots fertilizer plant in a developing country and on planning a fertilizer industry. Process plants built using modular, platform, and barge technology are recommended for developing countries, especially in cases where hydrocarbons and other materials are accessible to water transport. Also covered is the economics of world fertilizer manufacture and the key problems facing the industry—inadequate infrastructure, underutilization of existing capacity, rising costs, and especially, the need to produce more fertilizer and provide it to small farmers at the lowest possible price. References are appended to each section, and the text is highlighted with numerous charts, tables, graphs, and diagrams.

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Paper copy \$47.32 Microfiche \$4.32

## 024 PN-AAJ-132

### RECENT DEVELOPMENTS IN RESEARCH ON NITROGEN FERTILIZERS FOR RICE

Craswell, E.T.; De Datta, S.K.  
International Rice Research Institute (IRRI); International Fertilizer Development Center (IFDC).  
1980, 10 p.

*In IRRI Research Paper Series, No. 49*

Asian governments and farmers, pressured by growing populations, have sought to increase rice production by using high-yield rice varieties and nitrogen fertilizers. Rice uses nitrogen fertilizers inefficiently, however, especially urea, which accounts for 85% of nitrogen fertilizers produced in Asia. This paper examines studies conducted in 11 Asian countries by the IRRI and the IFDC to determine the causes of nitrogen losses and ways to reduce them. Since these losses cannot be measured directly, a method was devised for measuring them indirectly by measuring losses in the balance of an introduced stable isotope,  $^{15}\text{N}$  ( $^{15}\text{N}$  balance technique). The main nitrogen loss mechanisms were identified as ammonia volatilization and, to a lesser extent, nitrification-denitrification. The potential for ammonia volatilization was measured by studying the urea and ammonium-nitrogen concentrations in the floodwater after fertilizer application. It was found that reducing these concentrations is likely to reduce losses due both to volatilization and to surface runoff. Recent IRRI measurements of nitrous oxide fluxes from wetland soils give evidence that nitrification-denitrification does occur and appears peculiar to flooded soils. IRRI also studied the effect of deep placement of urea supergranules (USG) on root and algal growth patterns. Deep placement



provided a bonus of nitrogen to the soil-plant system while not disturbing the natural algal flora as broadcast nitrogen fertilizers do. Research to increase nitrogen fertilizer efficiency shows that both deep placement of USG and conventional placement of slow-release fertilizers such as sulfur-coated urea (SCU) increase rice yields compared with split-application techniques. Data from 117 trials in Asia show a US\$4-7 return for every extra dollar spent on labor for deep USG application or the cost of SCU. Individual test results, however, vary from site to site and season to season, suggesting the need for further research before a specific fertilizer or management practice is adopted, particularly since the trials were conducted at irrigated sites with good water control—markedly different from the majority of Asian rice fields. A 17-item bibliography (1954-80) is appended.

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## 025

## PN-AAJ-559

### U.S. FERTILIZER TECHNOLOGY PATENTS

Mackey, J.J.

Tennessee Valley Authority (TVA), National Fertilizer Development Center (NFDC).

1979, 160 p.

Fertilizer patents issued in the United States provide much of the technology used in the fertilizer industry worldwide. This report contains 1,014 abstracts of selected U.S. patents previously published in the NFDC's monthly journal, *Fertilizer Abstracts*, between 1968 and 1978. The abstracts, representing those U.S. patents and U.S. equivalents of previously issued foreign patents deemed most pertinent to today's fertilizer industry, are divided into nine major sections. The first section, on nitrogen fertilizer processes, is rather substantive—due to the growing interest in coal gasification and nitrogen liquids—and discusses nitrogen fixation hydrogen, ammonia, nitric acid, ammonium nitrate and sulfate, urea, and controlled and other nitrogen fertilizers. The section on phosphorus fertilizer processes is the largest, due to the vast amount of research done on wet process acid in recent years, and covers such topics as the mining, handling, and processing of phosphate rock; phosphorus production; phosphoric acid manufacture, concentration, and purification; phosphate products; and the recovery and utilization of phosphorus byproducts. Regarding the potassium fertilizer industry, potassium recovery, handling, and processing and potassium compounds are covered. Other, smaller sections discuss sulfur and sulfuric acid in the fertilizer industry; mixed fertilizer-solids (i.e., N-P, N-K, P-K, and N-P-K fertilizers); mixed fertilizer-fluids (i.e., N, N-P, P-K, and N-P-K fertilizers); solid and fluid secondary and micronutrient fertilizers; controlled release fertilizers; and granulation, conditioning, equipment, and environmental control as related to multinutrient products. In addition to the abstract, the person and/or corporation holding the patent, the patent number, the

date of the patent, and the pagination of the patent document are included for each entry; an index of company names is appended. Complete copies of all the U.S. patents cited can be obtained for a nominal fee from the U.S. Patent and Trademark Office in Washington, D.C.

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## 026

## PN-AAJ-560

### SWAZILAND WATER AND RELATED LAND RESOURCES FRAMEWORK PLAN

U.S. Army Corps of Engineers.

1981, 436 p.

Large-scale irrigation and related industrial development can significantly contribute to the Government of Swaziland's (GOS) goals in the problem areas of employment, government revenue, foreign exchange, imports, and environmental degradation. This report is designed to provide a conceptual framework for future water resources development in Swaziland and to enable the GOS to effectively negotiate with its neighbors, particularly the Republic of South Africa (RSA), regarding development of international rivers. The report consists of: (1) an analysis of the impact of planned RSA water resources development on the supply and demand for water from the Komati, Lomati, Mbuluzi, Great Usutu, Ngwavuma, Ngwempisi, and Mkondo Rivers; (2) detailed preliminary plans and analyses of proposed water resources development projects on the Lomati and Komati rivers and in the Mbuluzi, Ngwavuma, and Usutu basins; and (3) a series of 21 baseline studies on population, soil conservation, water quality, recreation, tourism, fisheries, energy, ground water, land use, hydrology, hydropower, irrigation, water consumption, damsite screening, and the economy in Swaziland. The report points out that irrigation is the largest consumer of water and the key to the economic feasibility of water resources development; current and proposed RSA irrigation developments could significantly affect Swazi water development; and neither hydropower nor other multipurpose uses of water development will add to the viability of Swazi water resources development. The report also highlights the need for: (1) detailed analyses of flow records, crop yields, and water resource development's impact on agricultural supplies and prices; (2) reservoir surveys, site investigations, and sediment, soil, and spillway design studies; (3) mathematical models capable of evaluating complex water systems; and (4) careful research and planning regarding attainment of long-term socioeconomic and environmental goals with only minimal short-term disruption. Also included are 13 maps on transport and land tenure in Swaziland and the physiography and hydrology of the nation, and a 71-item bibliography (1965-80).

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027

PN-AAJ-359

## IMPROVING IRRIGATION WATER MANAGEMENT ON FARMS: FINAL REPORT

Skogerboe, G.V.; Reuss, J.O.; Kemper, W.D.  
Colorado State University, Engineering Research Center.  
1980, 75 p.

*Water Management Technical Report No. 66*

Inadequate onfarm water management (OFWM) is often the main constraint to agricultural production in the developing world. This final report describes the results of an AID-funded, 1968-80 research project in Pakistan by Colorado State University (CSU) to develop guidelines to improve OFWM. A 1979 USAID review estimated that the project's institutional and technological achievements could increase irrigated land production by nearly 90 million ha in developing countries worldwide. Project successes included improving crop stands and yields through bed and furrow planting, hand weeding, crust control (through mechanical means or by timing irrigation water), field drainage, and land leveling; introducing the Cut-throat flume to measure watercourse losses; developing irrigation controls; testing skimming wells to reduce salinity; use of basin and furrow irrigation; identifying poor land levelling as a major cause of overirrigation; and conducting consumptive use studies on wheat, berseem, and cotton. Poor watercourse maintenance, poor local organization, and inadequate farmer knowledge of the extent of watercourse losses and of water management techniques were identified as key socioeconomic constraints to production. In addition, extension officers from the University of Agriculture, Faisalabad (UAF), were trained to help farmers manage expanded water supplies, leveled land, inputs, and weed and pest activities. Further research needs in Pakistan are to develop technologies to decrease salinity and waterlogging; strengthen the OFWM capabilities of user organizations and the Ministry of Agriculture's Irrigation Department; and provide field research and training at UAF, other research institutes, and in Baluchistan Province. The project taught the advantages of not placing CSU in a counterpart role and of using an interdisciplinary approach; the need to conduct research with active farmer involvement and with a view to increasing production; and the need to address field problems (both for research and to provide a training ground for host country personnel) and to disseminate research results. Appendices include a brief project history and a list of research publications.

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028

PN-AAJ-212

## LIVESTOCK AND MEAT MARKETING IN WEST AFRICA; VOLUME I: SYNTHESIS, UPPER VOLTA

Arizo-Nino, E.J.; Herman, L.; Makinen, M.; Steedman, C.  
Michigan University, Center for Research and Economic Development.  
1980, 210 p.

*Volumes I-V: PN-AAJ-212 through PN-AAJ-216*

The prolonged Sahelian drought (1968-74) and the restructuring of international meat trade have made Sahelian meat producers wonder whether they will continue to dominate coastal West African markets. This report is the first of a five-part study of this market phenomenon. The report is in two parts. Part one synthesizes the findings of the study as a whole, e.g., characteristics of the coastal market and potential markets for Sahelian exports; addresses key issues, e.g., the structure of the livestock trade and the expanding world meat economy; and makes policy recommendations for the Sahelian and coastal countries. General conclusions are that increasing Sahelian livestock production is warranted—fears of a declining meat demand in coastal West Africa are unfounded; that changes in market policy should work within the current system, not replace it; and that promoting livestock trade between the Sahel and coastal countries is in the interest of both sides. Ways to implement these policies are suggested. The report's second part is a livestock sector study of Upper Volta in terms of livestock production and marketing, the government's stratification policy, herd growth and offtake into 1985, meat marketing, domestic consumption, cattle and red meat exports and their costs, and livestock export projections into 1985. The study concludes that increased production of beef and edible offals will be outstripped by domestic demand, leading to a decline in exports of both products. Small ruminant production, however, will exceed demand, resulting in increased export potential, although small ruminant production will ultimately decline due to decreasing prices and increasing domestic consumption. The relative scarcity of cattle will have the opposite effect, with lower market prices for edible offals making beef less price-competitive. Ivory Coast will remain Upper Volta's chief market, but currency convertibility problems and Ghanaian price policies will keep Volta's small trade with Ghana in decline. Togo and Benin will remain small but steady markets. Trade with Niger is unlikely to expand, but market potential does exist, especially for small ruminants, in North Africa and the Middle East. A 27-item English and French bibliography (1969-80) is appended.

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029

PN-AAJ-213

## LIVESTOCK AND MEAT MARKETING IN WEST AFRICA; VOLUME II: BENIN, GHANA, LIBERIA, TOGO

Josserand, H.; Sullivan, G.  
Michigan University, Center for Research on Economic Development.  
1979, 150 p.

*Volumes I-V: PN-AAJ-212 through PN-AAJ-216*

Drought in the Sahel, traditionally the main meat supplier of coastal West Africa, and a changing world meat economy, have thrown the future of West African livestock and meat



exports into doubt. This report, the second of a five-part study, profiles current and projected livestock and meat marketing patterns in the West African countries of Benin, Ghana, Liberia, and Togo. Each study examines domestic production and marketing systems (including transportation) and supply, demand, and import requirements. In 1966, Sahelian states, Niger in particular, supplied 83% of Benin's frozen and chilled meat imports; since 1970, they have supplied none at all. In addition, the prolonged drought severely affected Benin's imports of livestock from the Sahel between 1966 and 1976. Current restrictions on meat exports to Nigeria because of high Nigerian cattle prices have constrained Benin's domestic production and, unless rescinded, will constrain domestic production and hence domestic demand. Private livestock marketing is more efficient than its public equivalent, which should be restricted to production. In Ghana, domestic livestock production, hampered by several factors, including lack of a national policy and central organization, will be able to supply just a little over two-thirds of domestic demand for red meat by 1985. Resumed livestock trade with the Sahel may help alleviate this shortfall, although trade will probably involve different livestock and require government clearance. In the short term, poultry and fish will be likely protein substitutes. Liberian domestic production satisfied 60% of domestic meat consumption in 1977. Imports, mainly of frozen meat, were chiefly from western markets, with limited livestock imports from other West African states (Mali, Ivory Coast, Sierra Leone, and Guinea). It is not expected that the Sahel will displace either of these Liberian markets. The Sahel has been displaced as a supplier of Togo's growing meat import needs by other suppliers, especially Upper Volta and the United States, and can only recover its market position by becoming more price-competitive with those countries. Bibliographic entries totalling 57 French and English items (1968-77) are included.

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## 030

## PN-AAJ-214

### LIVESTOCK AND MEAT MARKETING IN WEST AFRICA; VOLUME III: IVORY COAST AND MALI

Delgado, C.; Staatz, J.  
Michigan University, Center for Research on Economic Development.  
1980, 455 p.

*Volumes I-V: PN-AAJ-212 through PN-AAJ-216*

Mali is the Sahel's principal meat and livestock supplier to coastal West Africa; the Ivory Coast is the latter region's main consumer of Sahelian meat products. This report, the third of a five-part study on West African livestock and meat marketing, provides sector reports for both countries. The Malian report discusses the potential for augmenting domestic production and the absorption capacity of Mali's export markets by examining livestock production systems and government sector policy; herd numbers and range production parameters (1967-

77); production of feed animals (1967-77); cattle production constraints; offtake and herd growth for 1985; domestic consumption and retail prices of red meat (1977); exports of livestock and red meat (1967-77) and projected exports for 1985; export and production costs of livestock and red meat (1977-78); and policy conclusions. The report concludes that the simultaneity of a glut of Latin American beef and an absence of Sahelian exports in 1975 was an aberration. The market for Malian exports remains strong, particularly in the Ivory Coast, and only low domestic productivity will constrain its exports. Small ruminants, especially sheep and goats, offer excellent export potential. Donor assistance for cattle feedlot operations to promote exports, however, is not warranted. The Ivory Coast report examines the nation's increasing demand for animal protein; its beef supply (1967-78); pricing and marketing structure for cattle, beef, and small ruminants; poultry, pork, and fish supplies; livestock policy and future domestic production; and demand and supply projections for 1985. Domestic demand for animal protein will grow, increasing imports of beef and small ruminants 3.1%-5% by 1985. The source of these imports will depend on European Economic Community meat policies and on the extent to which Ivory Coast has to compete with new markets for Sahelian meat. Improving the current Mali/Ivory Coast marketing system, e.g., by constructing new cattle trails, could increase the system's productivity and decrease costs. Since domestic demand for 1985 will require average quality meat, more high quality animal feedlots in the Sahel are unwarranted. Bibliographies totalling 62 French and English titles (1967-80) are included.

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## 031

## PN-AAJ-215

### LIVESTOCK AND MEAT MARKETING IN WEST AFRICA; VOLUME IV: ARGENTINA, AUSTRALIA, NEW ZEALAND

Arizo-Nino, E.J.; Griffith, J.L.P.  
Michigan University, Center for Research on Economic Development.  
1979, 244 p.

*Volumes I-V: PN-AAJ-212 through PN-AAJ-216*

As part of a five-volume study of livestock and meat marketing in West Africa (WA), this report, the fourth in the series, examines meat exports to WA by three non-African countries—Argentina, New Zealand, and Australia. The Argentine study examines the nation's domestic livestock production and market systems and its meat trade with Africa. Since 1974, Argentina's beef exports to Africa, which account for 98% of all its meat exports to the continent, have increased 25% due to WA's increase in foreign exchange, poor cattle raising conditions; unavailability of port facilities, rapid urbanization, and rising per capita income. Although this upsurge in beef imports includes WA, four non-WA countries—Nigeria, Tunisia, Egypt, Angola—import more than 60% of total beef exports to Africa. Due to a



lack of direct commercial links (which Argentina is now trying to establish) and mutual distrust between Argentina and Africa, beef transport is conducted through European trading houses. Future Argentine trade with Africa may be affected by the demise of the Argentine Meat Producers' Association, a key figure in promoting Argentine-African trade. The Australian and New Zealand studies outline the respective nation's meat industry (1967-78) and exports and the impact of Middle Eastern and African markets on country production into 1985. In 1977, Australia and New Zealand exported, respectively, 26% and 9.7% of the world's beef and 33.4% and 47% of the world's mutton and lamb. The main lamb and mutton markets of both countries are, respectively, the United Kingdom and Japan. Other key markets are, for Australia, the Middle East (live sheep and lamb since 1975) and the United States (beef); and, for New Zealand, the United States (beef). Through 1985, lamb, mutton, and beef production will increase in both Australia and New Zealand, with beef production in Australia reaching record levels. The traditional meat export markets for both countries will remain basically the same. WA neither has been nor is expected to be a significant meat importer from either country and its markets will only be affected indirectly by Australian and New Zealander exports to the Middle East and Libya. Appended is a 60-item bibliography (1969-78) of Spanish and English sources.

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**032**

**PN-AAJ-216**

**LIVESTOCK AND MEAT MARKETING IN WEST AFRICA; VOLUME V: THE WORLD ECONOMY, OTHER SUPPLIER AND CONSUMER COUNTRIES**

Arizo-Nino, E.J.; Manly, D.W.; Shapiro, K.H.  
Michigan University, Center for Research on Economic Development.  
1980, 188 p.

Volumes I-V: PN-AAJ-212 through PN-AAJ-216

A 1976 rise in West African (WA) meat imports from non-African producers has caused Sahelian producers to fear a loss of their WA customers. This four-part study, the last of a five-part report on WA livestock and meat marketing, finds a basis for this fear in world meat market changes. The study's first part describes the world beef economy as cyclically changing from high to low production as a result of meat producers' tendency to exaggerate price changes, protectionist economic policies, and the relatively small impact of imports on home country consumption. An overview of this economy from 1960 to 1978 shows that after 1972 all four major meat producing areas—Argentina, Australia, the European Common Market (EEC), and the United States—increased production, leading to massive oversupply and an increasingly competitive world market. This situation is likely to return in the medium and long term, with clear implications for Sahelian producers. The study's second and third sections describe WA meat imports from Uruguay and

from Denmark and France. The Uruguayan report examines the country's meat production and marketing sectors and exporting trends. In 1978, trade with Africa, particularly in frozen beef, accounted for 15% of Uruguay's meat exports, with Egypt (75%), Ghana (26%), Nigeria, Zaire, Morocco, and the Ivory Coast being the main markets. Nigeria in particular offers potential for expanded trade. The Denmark/France report examines meat trade with WA and the impact of future domestic and EEC policies. To date, meat trade with WA has been small, possibly excepting French trade with the Ivory Coast, and will remain so, although intra-EEC beef trading is likely to increase with projected increases in EEC membership. The study's final section examines potential markets for Sahelian producers—Algeria, Egypt, Libya, Kuwait, Saudi Arabia, and the United Arab Emirates (UAE). The greatest potential lies in trade with Algeria and Libya and to some degree with Egypt. To cut freight costs, the full use of return loads should be explored. A major promotional center for Sahelian products in the Middle East, centering on the UAE, is also advised. A total of 40 Spanish and English sources (1960-80), are appended.

REDSO/WA-77-105

Paper copy \$24.44

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**033**

**PN-AAJ-077**

**DEVELOPMENTS IN THE CONTROL OF BACTERIAL DISEASES OF POTATOES; REPORT OF THE PLANNING CONFERENCE, LIMA, PERU, 1979**

International Potato Center (CIP).  
1980, 141 p.

Despite significant progress in breeding disease-resistant potato varieties, the study and control of potato bacterial diseases remains a high priority for the CIP. This report highlights the CIP's Eighteenth Planning Conference, held in Lima, Peru from June 12-15, 1979. The Conference sought to integrate CIP's work with that of other institutions and acquaint the scientific community with CIP's resources and expertise. The 14 papers presented at the Conference, outlining the current status of potato bacterial disease research and control, emphasized that *Pseudomonas solanacearum* (bacterial wilt) is the most serious potato disease in developing and lowland tropical countries. Its presence in lowland soils, aggravated by wilt's affinity to a variety of lowland vegetation and crops other than potatoes, has necessitated planting potatoes at high elevations in tropical and semitropical areas. The classification, distribution, and origin of the pathogen are examined, and methods for field and laboratory diagnosis and sources of resistance to *P. solanacearum* are identified. Significant attention was also devoted to two soft-rotting genera of bacteria, *Erwinia* and *Clostridium*. These bacteria, which rot both stem and tubers, are examined in terms of epidemiology, sources of contamination, the effect of the environment, and methods for their control. *Corynebacterium sepedonicum*, the causal organism in bacterial ring-rot disease, is analyzed regarding potato production and storage losses in Costa Rica, Colombia, and Peru. It is recommended



that future research: (1) identify additional genes for disease resistance; (2) use resistant genes now available in clones; (3) quantitatively evaluate selected clone's resistance to different strains; (4) improve screening methods and strain selection and identification procedures; (5) establish adequate testing sites; (6) provide resistant clean seed to cooperating countries; (7) design integrated control programs for small farmer use; and (8) identify further research needs on the nature of disease resistance. The Conference's participants and agenda are appended. Bibliographies are included with each paper.

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Paper copy \$18.33

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## 034

## PN-AAJ-081

### A METHODOLOGY FOR DETERMINING INSECT CONTROL RECOMMENDATIONS

Litsinger, J.A.; Lumaban, M.D.; Bandong, J.P.; Pantua, P.C.; Barrion, A.T.; Apostol, R.F.; and Ruhendi.  
International Rice Research Institute (IRRI).  
1980, 31 p.

*In IRRI Research Paper Series, No. 46*

A cropping systems approach has recently emerged as an effective means of improving insect control—a task which, because of its complexity, high demand on resources, and location-specific nature, has impeded past efforts to produce onfarm yields comparable to those obtained at research stations. This report explains the role of cropping systems research in insect pest control and outlines a methodology for determining insect control recommendations. Cropping systems research entails specifying a given insect pest control technology by taking into account cropping patterns of individual farmers, the geographical and temporal distribution of pests, environmental parameters (e.g., rainfall, soil type, landform), cultural practices (e.g., planting, irrigation, and insecticide application methods), farmers' capabilities (e.g., his resources, beliefs, and customs), and the crop's inherent yield potential. A four-part methodology for using cropping systems data, developed in accordance with the requirements of the Asian Cropping Systems Network of research sites, is presented. The initial stage, description, entails gathering baseline economic and biological data on pests known to farmers, the level of pest control needed, the current status of insect control, and the kinds and levels of technology farmers are willing to adopt. Next, several tentative insect control technology packages compatible with farmers' resources and capabilities are designed. These packages consist of specific insect pest control recommendations—i.e., lists of insects and the insecticides effective against them, resistant varieties, and cultural control methods—pertaining to the entire spectrum of pest problems for each crop within the target area. These alternative packages are then tested for several years at each site. Finally, the costs and returns of the alternative packages are evaluated. The above method, in the authors' opinion, will allow the development of optimal insect control recommendations within

2–3 years, is highly objective, is not costly, and can be carried out by researchers with minimal experience. A 21-item bibliography (1976–79) is appended.

AID/DSAN-G-0083

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## 035

## PN-AAJ-085

### THE CONTRIBUTION OF VARIETAL TOLERANCE FOR PROBLEM SOILS TO YIELD STABILITY IN RICE

Mahadevappa, M.; Ikehashi, H.; Ponnampuruma, F.N.  
International Rice Research Institute (IRRI).  
1979, 15 p.

*In IRRI Research Paper Series, No. 43*

The erratic performance of modern rice varieties in many countries has been attributed to physical and biological environmental stresses to which the plants are not adapted. This paper compares the field performance of different rice varieties in soils with common mineral stresses—phosphorus deficiency, zinc deficiency, or iron toxicity in wetland rice fields and iron deficiency in dryland rice fields. Genotypes of comparable high yield potential but different tolerance to mineral stresses were selected on the basis of greenhouse tests and tested for field performance (growth, yield, and mineral absorption) in mineral-stressed soils during the 1978 dry and wet seasons and the 1979 dry season in the Philippines. Where possible, tests were conducted at three stress levels—no stress, mild stress, and severe stress. Results showed that tolerance varied widely with genotype and stress level. Sensitive rices suffered severe yield losses even under mild stress, whereas tolerant rices resisted the yield decline until the stress became moderate; under severe stress, both tolerant and sensitive genotypes perished. The contribution of varietal tolerance to yield ranged from 0.5 to 0.8 tons/ha for phosphorus deficiency, 0.5 to 1.5 tons/ha for zinc deficiency, and 0.2 to 0.7 tons/ha for iron deficiency at yield levels of 2.5 to 4.0 tons/ha. Results also showed a higher uptake of the deficient element by tolerant rices than by sensitive ones. Ratings in mass screening at the seedling stage correlated closely with yield in the zinc and iron deficiencies tests. However, correlation was poor in phosphorus deficiency and iron toxicity tests due to later recovery from the stress, especially by late-maturing rices, indicating the need for yield tests in the field. The authors note that, ideally, varietal tolerance should complement, not replace, soil amendments (such as the addition of fertilizers), but that in some situations soil amendments may be too costly or impractical. A system of initial mass screening of seedlings followed by field tests of promising varieties is recommended to select stress-tolerant rices. A 21-item list of references (1963–79) is appended.

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036

PN-AAJ-130

## DIFFERENTIAL RESPONSE OF RICE VARIETIES TO THE BROWN PLANTHOPPER IN INTERNATIONAL SCREENING TESTS

Seshu, D.V.; Kauffman, H.E.  
International Rice Research Institute (IRRI).  
1980, 13 p.

*In IRRI Research Paper Series, No. 52*

The brown planthopper (BPH), *Nilaparvata lugens*, has become a serious threat to rice production in several South, Southeast, and East Asian countries. This paper discusses results of International Rice Brown Planthopper Nursery (IRBPN) screening tests conducted 1975–79 with special reference to understanding biotype variations in BPH and identifying sources of genetic resistance to these biotypes. The number of rice varieties tested ranged from 41 in 1975 to 162 in 1979 and included several traditional tall varieties and improved semidwarf breeding lines; varieties containing the BPH-resistant genes Bph 1, bph 2, Bph 3, and bph 4 were included. A uniformly high susceptibility to BPH at different sites indicated a major distinction between BPH populations in South Asia (Bangladesh, India, and Sri Lanka) and those in the rest of Asia. Biotype differences of lower order within BPH populations common in East and Southeast Asian countries were also evident. Biotype differences were also evident at different sites in India, since reactions at Pantnagar were different from those at other sites. It was found that varieties which showed similar resistance patterns at the IRRI in the Philippines did not necessarily show similar patterns at other sites. PTB33, Suduru Samba, and Sinna Sivappu were found to be resistant at almost all test sites. Several improved breeding lines derived from PTB33 showed promise in all the regions of Asia and the Solomon Islands. Genes conveying BPH resistance in PTB33 seem to be different in South Asia from those in other parts of Asia, as evident from the different reactions of the semidwarf selections derived from that variety. Differences between field and greenhouse reactions for several varieties were observed, but more detailed studies are needed to provide genetic interpretation for these differences. Further international collaboration is recommended for follow-up breeding and genetic studies to develop varieties with genetic resistance to BPH in different countries. The report concludes with suggestions for breeding such varieties. A description of IRBPN's screening and scoring procedures and a 7-item list of references (1971–79) are appended.

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Paper copy \$1.69 Microfiche \$1.08

037

PN-AAH-741

## SEED HANDLING AND PRODUCTION FOR THE ACRE PROJECT (SIERRA LEONE)

Potts, H.C.  
Mississippi State University, Seed Technology Laboratory.  
1980, 33 p.

Agriculture in Sierra Leone is dominated by the production of the national staple—rice. To help increase production of other crops, A.I.D. has sponsored the Adaptive Crop Research and Extension (ACRE) project; a 5-year effort to perform adaptive food crop research and develop a replicable technology delivery system responsive to the needs of rural smallholders, particularly in upland areas. This report outlines Mississippi State University's contribution to the seed handling and production component of this project. After first providing a general overview of agriculture in Sierra Leone and the role of the ACRE project, the author discusses the need for an upgraded seed storage room and additional seed handling equipment at the 100-acre project site adjacent to Njala University College. A vapor-proof, insulated, air-conditioned storage area is needed to safely store a small volume of seeds from each of a large number of varieties for up to 30 months. However, since seed testing programs can only be justified when large numbers of farmers are able to use the improved seeds, coordination with the West German-supported Seed Multiplication Project (SMP) is essential. Thus the National Seed Board has directed that ACRE be primarily responsible for providing advice on seed and propagating materials and for maintaining a National Variety List, while the SMP is responsible for multiplying and marketing seeds from successful varieties. Although many factors affect stand establishment, which is the goal of this project, only seed quality and seed bed preparation are under the direct influence of most farmers. It is therefore recommended that future ACRE seed research concentrate on practical means of obtaining better stands. Three specific areas of research are suggested: (1) gathering information on the influence of different levels of seed quality on stand establishment given different rates of planting; (2) investigating the influence of seed treatment (fungicides and insecticides) on stand establishment for various seeds; and (3) evaluating and developing improved onfarm storage facilities. An equipment list and variety description forms are appended.

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038

PN-AAJ-071

## BEAN PROGRAM; ANNUAL REPORT, 1979

Centro Internacional de Agricultura Tropical (CIAT).  
1980, 112 p.

*In CIAT Series, No. 02EB1-79*

During 1979, CIAT's bean research program concentrated on germplasm improvement, that is, developing resistance to diseases and insects, especially to common mosaic virus (BCMV); rust, common bacterial blight, angular leaf spot, anthracnose, and leafhoppers. This report details that work, which also included an agroclimatology study, hybridization and progeny evaluation, evaluation and improvement of agronomic practices, validation of technology in on-farm trials, and other studies relating to temperature adaptation, growth habit stability, and seedling vigor. A total of 10,000 germplasm



accessions were inoculated and evaluated under screenhouse and field conditions at CIAT and in Popayan. A modification in the screening methodology—inoculating and evaluating (progeny test) individual F<sub>1</sub> or advanced selections under greenhouse conditions rather than field inoculation of F<sub>2</sub> families—considerably increased screening efficiency. Tests were made for resistance/tolerance to viral diseases, fungal and bacterial diseases, insects, moderately acid soils, and water stress. All improved lines are now resistant to BCMV. Lines resistant to multiple diseases and pests have been entered in the international yield trials. Significant differences in disease and insect pest incidence were confirmed in maize-bean associations as compared to monocultures. Farm trials were carried out in Huila, Colombia with monoculture bush beans, in the Restrepo region with monoculture bush beans, and in Antioquia with climbing beans in relay systems with maize. Materials in the 1979 IBYAN (International Bean Yield and Adaptation Nursery) were still deficient in meeting consumer acceptability, but have high agronomic value. Attention was also directed to developing tolerance to production constraints such as drought, low phosphorus availability in the soil, and biological N<sub>2</sub> fixation. Improved biological N<sub>2</sub> fixation under higher temperatures was achieved. In addition, efforts were made to strengthen the research and technology transfer network in Latin America by selecting trainees from the region, organizing meetings and workshops, distributing germplasm, and collaborating with country programs.

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**039**

**PN-AAJ-072**

## **THE LEGUME/"RHIZOBIUM" SYMBIOSIS IN TROPICAL AGRICULTURE: A BIBLIOGRAPHIC UPDATE**

Bose, J.

University of Hawaii, Department of Agronomy and Soil Science.

1980, 169 p.

As part of its AID-supported NifTAL project, the University of Hawaii published in 1978 an annotated bibliography on the legume-*Rhizobium* symbiosis in tropical agriculture. This volume updates that bibliography, with some changes in subject designations to reflect new areas of emphasis in research. A total of 699 entries are arranged according to subject under the following headings: bibliographies, general reviews and research surveys; carbon and carbon compound competition (microbial); energetics; enzymes (other than hydrogenase or nitrogenase alone); genetic factors; hormones and growth substances; hydrogen and hydrogenase; inoculant production and distribution; inoculation methods and materials; inoculation requirements and effects; leghemoglobin; legume agronomy and evaluation; legume physiology and taxonomy; light factors; macronutrients (other than nitrogen alone); methods, techniques, and statistical procedures; micronutrients and toxic elements; microorganisms (other than *Rhizobium* alone); nitro-

gen cycle; nitrogen effects; nitrogen fixation; nitrogen fixation—detection and measurement; nitrogenase; nodulation; nodules; oxygen; pests and pesticides; pH; phages and plant viruses; photosynthesis and photosynthates; polycrop systems; *Rhizobium* bacteroids; *Rhizobium* characteristics and physiology; *Rhizobium* collecting and collections; *Rhizobium* counts and populations; *Rhizobium* cultures and culture media; *Rhizobium* detection and identification; *Rhizobium* effectiveness, infectiveness, and efficiency; *Rhizobium* inhibition and stimulation; roots, root exudates, and infection by *Rhizobium*; soil factors; specificity and promiscuity; survival of *Rhizobium*; symbiosis; temperature effects; and water factors. Bibliographic listings originated from several sources, including computer search of magnetic tapes from the National Agricultural Library to October 1978; *Current Contents* listings; the Automated Science Citation Alert service; staff requests; reference lists accompanying published papers; and receipt of reprint copies from authors. Most articles cited are in English or have English summaries or abstracts. A cross-reference guide is included, as are subject and author indices.

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**040**

**PN-AAJ-079**

## **IR42: A RICE TYPE FOR SMALL FARMERS OF SOUTH AND SOUTHEAST ASIA**

Ponnamperuma, F.N.

International Rice Research Institute (IRRI).

1979, 10 p.

*In IRRI Research Paper Series, No. 44*

Barely a decade after new "miracle rices" developed during the Green Revolution prompted predictions of food self-sufficiency, developing countries are being warned that rice production is not keeping pace with population growth. This grim forecast stems from the fact that in vast areas of South and Southeast Asia, farmers have not accepted these new rice varieties. Even when improved varieties are grown, yields are about one-third of experimental yields because small farmers lack the resources to provide the water control, soil amendments, fertilizers, and pesticides necessary for high yields. This report summarizes findings on a new rice variety, IR42, which was bred to produce stable yields in unfavorable environments. IR42, one of 21 varieties tested in 1977 by the IRRI at 21 sites in eight South and Southeast Asian countries, gave the highest yield at three sites, yields that did not differ significantly from the highest in three others, and outyielded IR8 in seven countries. Tests in 1978 of 28 rice varieties at 13 Southeast Asian sites produced comparable results. IR42, a medium-grained, high-amylose rice with relatively good appearance and moderate drought and submergence tolerance, is better suited to rainfed areas than earlier improved varieties. It demonstrates good resistance to a wide range of diseases and insects including blast, rice tungro virus, rice grassy stunt, and bacterial leaf blight, but is susceptible to *Bakanae*. IR42's ability to do well in soils deficient in nutrients such as nitrogen, phosphorus, and



zinc; makes it well suited to Southeast Asian farmers who lack access to large amounts of fertilizers. IR42 also produces moderate yields under adverse soil conditions such as salinity, alkalinity, iron and boron toxicity, and excessive organic matter, enabling farmers to expand cultivation of problem lands. A 35-item bibliography (1956-79) is appended.

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**041 PN-AAJ-084**

**IMPLICATIONS OF THE INTERNATIONAL RICE BLAST NURSERY DATA TO THE GENETICS OF RESISTANCE: AN APPROACH TO A COMPLICATED HOST-PARASITE RELATIONSHIP**

Ikehashi, K.  
International Rice Research Institute (IRRI).  
1979, 19 p.

*In IRRI Research Paper Series, No. 40*

Breeding rice varieties with resistance to blast is made difficult by the wide variability of the causal organism, *Pyricularia oryzae*, and by the lack of a system to describe types of host resistance and fungal races. As a first step in developing functional differential varieties, this paper analyzes entries in the International Rice Blast Nursery (IRBN) in order to compile data on the prevailing types of host resistance. The author theorizes that rice varieties can be considered to have a common genotype only when they react uniformly to diverse races of the causal organism at different sites and in different years. To test this theory, 397 IRBN entries tested in the Philippines in 1976-77 were sorted by reaction type. As a result, 261 entries were classified into 10 major types of host resistance. Subtypes, based on reactions outside the Philippines, were composed for each major group. The more or less uniform reaction of tests in the Philippines and other locations suggested that each group was of similar genotype and that the differentials in the IRBN collection were irrelevant. The author recommends that more functional differentials be developed by identifying the types of resistance actually working in breeding programs as opposed to the previous method of selecting differentials by testing a large number of races against a small group of varieties. This would permit easier identification of resistance types of new IRBN entries since those clearly showing identical reactions to known resistance types would not be further tested while entries with different or ambiguous reactions would be retested. The author emphasizes the need for a minimum differential system to collect and maintain distinct races and thus facilitate the genetic analysis of blast resistance. It is also recommended that the next step in genetic work be hybridization among and within resistance types along with simultaneous testing of the progeny to determine the genes that differentiate types of resistance. A 12-item bibliography (1965-78) is appended.

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**042 PN-AAJ-129**

**QUALITY CHARACTERISTICS OF MILLED RICE GROWN IN DIFFERENT COUNTRIES**

Juliano, B.O.; Pascual, C.G.  
International Rice Research Institute (IRRI).  
1980, 25 p.

*In IRRI Research Paper Series, No. 48*

Next to yield, grain quality is the major objective of rice breeding programs. This report describes the quality characteristics of milled rice as assessed by IRRI's Chemistry Department since 1962. Rice samples were obtained from government rice breeding programs in 41 countries and analyzed for protein content, amylose content, alkali spreading value (gelatinization temperature index), gel consistency, amylograph viscosity (changes in paste viscosity of cooked rice flour), and cooked rice Instron hardness and stickiness. Statistical analysis yielded linear correlation coefficients that indicate amylose content is the major determinant of the texture of cooked rice. It correlates negatively with gel consistency and cooked rice stickiness and positively with amylograph viscosity values and cooked rice hardness. Gel consistency correlates negatively with amylograph setback and consistency values and cooked rice hardness; positively with cooked rice stickiness. Amylograph setback and consistency values correlate positively with cooked rice hardness and with each other and negatively with cooked rice stickiness. Hardness and stickiness of cooked rice are negatively related. Alkali spreading and protein content show a lower correlation with the texture of cooked rice than do amylose content or gel and Amylograph consistencies. Protein content is not significantly correlated with amylose content, Amylograph consistency, or cooked rice stickiness, but correlates negatively with gel consistency and alkali spreading value. Increased protein content suppresses amylograph peak viscosity during cooking and increases hardness by effecting cooking rate. Sensory evaluation of cooked samples of important rice varieties in each country is recommended to determine the preferred combination of quality characteristics. A 31-item bibliography (1958-79), data on rice quality characteristics, and rice samples identified by country of origin, variety, and crop year are appended.

AID/492-1310-T 497019800  
Paper copy \$3.25 Microfiche \$1.08

**043 PN-AAJ-868**

**FUNDAMENTALS OF RICE CROP SCIENCE**

Yoshida, S.  
International Rice Research Institute.  
1981, 279 p.

Rice is and will continue to be the primary food source of over half the world's people. This definitive text for students of rice science synthesizes current knowledge on rice physiology and attainment of high yields. Part I traces a rice plant's 3-6 month life, emphasizing the morphology and development of seeds,



seedlings, leaves, culms (stalks), tillerings (branches), roots, and panicles (flower clusters), and explaining ripening, senescence (aging), and yield. Part II describes rice's adaptability to the many different soils and climates of the world's rice-growing regions and details the influence of temperature, solar radiation, and rainfall on rice yield. Part III addresses the mineral nutrition of rice—the advantages of soil submergence; the availability and absorption of nitrogen, phosphorus, potassium, zinc, iron, manganese, sulfur, silicon, hydrogen sulfide, organic acid, iodine, and salts; the correlation between nutrient status and tillering performance; and the importance of nutrients in photosynthesis and respiration. Part IV illustrates the diagnosis and treatment of nutritional disorders (as opposed to nonpathogenic and physiological disorders), especially as applicable to Asia. Part V reviews the characteristics and maintenance of photosynthesis and respiration, focusing on the importance of the latter to the synthesis of such major plant cell components as proteins, lipids, and cellulose. Part VI discusses rice plant characteristics as they relate to yielding ability; identifies the ideal high-yielding plant as one which has short, stiff culms; narrow, thick, erect, dark-green leaves; a short, sturdy stem; and high tillering capacity; and describes modification of varietal traits to conform to less than optimal farm management. Lastly, Part VII presents a physiological analysis of rice yield as a function of the number of spikelets, the percentage of filled (fertile) spikelets, and grain weight, concluding that adequate nitrogen application, minimal culm bending, high solar radiation, moderate (20–35° C) temperatures, gentle winds, sufficient rainfall, and low soil salinity promote higher yields. Appended is a list of 243 references (1924–79).

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**044**

**PN-AAJ-870**

## **AN ILLUSTRATED DESCRIPTION OF A TRADITIONAL DEEPWATER RICE VARIETY OF BANGLADESH**

Catling, H.D.; Parfitt, S.

International Rice Research Institute (IRRI).

1981, 8 p.

*In IRRI Research Paper Series, No. 60*

During a 4-year period (1977–80), Chota Bawalia, a traditional deepwater rice variety of Bangladesh, was studied in the Keraniganj area near Dacca. This report graphically illustrates observed stages of Chota Bawalia's growth with special emphasis on nodes, nodal roots, panicles, and ripening. In addition, the report briefly assesses the impact of flooding regimes and weeding practices on the variety's productivity. Chota Bawalia is grown annually in 1.5 to 3.5 meters of water on several thousands of hectares in the southern Dacca district on the lower Januna floodplain of central Bangladesh. Farmers sow it with the first good rains in April and harvest it after floodwater has receded. Flowering, which is strongly induced by photoperiod, begins the first week of October. During the study, Chota Bawalia was harvested between October 29 and November 1, 1–2 weeks earlier than many other leading varieties. The study revealed that flooding regimes did not

seriously submerge Chota Bawalia but did reduce stand density. Rainfall and farmer's weeding practices strongly influenced Chota Bawalia's stand density in the pre-flood period, due partly to an attack of the yellow rice borer, *Tryporyza incertulas*. Mean yields from 19 crop-cuts at Keraniganj over 4 years ranged from 1.7 to 3.7 t/ha, less than six other leading deepwater rice varieties studied. Chota Bawalia yields were depressed as the maximum water depth approached 2.3 meters. No chemical fertilizer was applied; fertility was provided by leguminous crops, which are widely grown in the winter off-season and by a large complex of algae associated with the culms and nodal roots. Appended is a 4-item reference list (1980–81).

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**045**

**PN-AAJ-956**

## **SCREENING STRAINS OF "RHIZOBIUM" FOR THE TROPICAL LEGUMES "CLITORIA TERNATEA" AND "VIGNA TRILOBATA" IN SOILS OF DIFFERENT pH**

Zaroug, M.G.; Munns, D.N.

University of Hawaii, College of Tropical Agriculture.

1980, 7 p.

*Reprinted from Tropical Grasslands, Vol. 14, No. 1, pp. 28-33*

The success of phillipesara (*Vigna trilobata*) and clitoria (*Clitoria ternatea*), two potentially important irrigated forage legumes in the Sudan, will depend on the presence of *Rhizobium* strains able to persist and nodulate effectively in acid soils. This report describes tests of *Rhizobium* strains with phillipesara and clitoria grown in a neutral soil and performance of selected strains with phillipesara in an acid soil. Eleven strains for clitoria and 13 for phillipesara were tested with uninoculated and plus nitrogen (N) checks. Treatments were replicated three times in a completely random design. Large differences were found in the effectiveness of clitoria strains. Four notably successful strains (TAL 173, 29B2, TAL 200, and TAL 305) exceeded the N-treated plants in dry matter production, but the difference was significant only for TAL 173. Nitrogen content also varied between the different treatments with five strains (173, 29B2, 305, 200, and 169) showing N yields not notably less than the N-treated plants. Nitrogen yield, plant color, and dry weight yield gave similar rankings of strain effectiveness. Effectiveness bore little relationship to nodule number, weight, or distribution. Large differences were found in N content and dry matter yield among phillipesara. Effectiveness ranked similarly according to plant dry matter, N content or color, in contrast to clitoria whose nodule fresh weight correlated with N content significantly, and plant yield correlated significantly with both nodule fresh weight and number. Nitrogen yield of the plus-N plants exceeded that from any of the inoculants. While all strains of *Rhizobium* nodulated phillipesara in Goldridge acid soil (except CB1024 which failed completely), no strain gave plant yields as high as the N-control treatment. Liming the Goldridge soil reduced nodulation and also reduced growth in most treatments including the N-control treatment. Ten references (1954–77) are appended.

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Paper copy \$0.91

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046

PN-AAJ-030

## NEW LIGHT ON RURAL ELECTRIFICATION: THE EVIDENCE FROM BOLIVIA

Tendler, J.  
California University at Berkeley, Institute of International Studies.  
1980, 93 p.

Publication No. R80.5

In 1973-74, A.I.D. financed a project to expand existing municipal electrical systems in Bolivia to seven outlying rural areas with the aim of servicing an additional 81,000 rural customers within 10 years. This report evaluates the project's impact on the rural poor in terms of three project objectives: improving the quality of life; stimulating economic production; and creating viable electric utilities. The project showed that, contrary to conventional wisdom, rural electrification (RE) projects actually favor the poor over the rich because the poor are more numerous and RE projects aim at connecting as many households as possible. RE projects can also benefit the poor by providing them with power use rates subsidized by richer cities, although in this case such subsidies proved unnecessary; greater subsidization of installation costs would have been wiser. However, even though the project provided "household light" that was eagerly welcomed by the poor, the potential to introduce social services, such as health and education, never materialized (potable water was a partial exception) because prior programs in these sectors did not exist. Except in the Santa Cruz area, the project failed to stimulate rural production or slow rural-urban migration because the absence of previous growth led to few production opportunities and because project designers showed no interest in productive uses of electricity—irrigation being a case in point. Finally, despite a 60% success rate in potential electric connections, the project reached only 12-22% of the households in the target area, representing only 7% of Bolivia's rural families. A major reason for this shortfall, in a project aimed at maximizing the number of household connections, was the use of a central grid system that provided unnecessarily high-quality service instead of a less costly system such as independent microhydro generators. The author concludes by noting a two-fold deficiency in the project: a conflict between its goal of maximizing household connections and its capital-intensive and centralized technical design; and an unrealistic production goal due to failure of project designers to seek evidence of economic opportunities in the target areas.

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047

PN-AAJ-096

## TRAINING AGRICULTURAL ECONOMISTS FOR WORK IN INTERNATIONAL DEVELOPMENT

Fienup, D.F.; Riley, H.M.  
American Agricultural Economics Association.  
1980, 144 p.

Because precise knowledge has been lacking regarding the training needs of the increasing number of developing country students receiving U.S. graduate training in agricultural economics (AE), some 750 developing country alumni of U.S. AE graduate programs were surveyed to determine how they assess their training; analyze the status of AE in developing countries; and map a strategy for improving U.S. AE programs. Respondents to the survey, results of which are presented here, cited the following major strengths of U.S. graduate training programs: comprehensive training in theory and quantitative methods; flexible programs allowing breadth and depth in training; good student-faculty interaction; and a favorable climate for learning and research. Weaknesses cited included insufficient attention to political, social, and institutional factors in development; insufficient application of theory and research methods to developing country problems; inadequate appreciation of the shortcomings of traditional economic theory; too little emphasis on income distribution and equity; and inadequate emphasis on the practical aspects of primary data collection and analysis. AE, it was found, is a relatively new profession in developing countries. Among the four regions cited, Asia has the greatest institutional capacities for AE training, with graduate programs already established in Japan, India, the Philippines, Thailand, South Korea, Taiwan, and Malaysia. The profession is still new in Africa, Nigeria being the most advanced; and graduate programs are emerging in Kenya, Ghana, Tanzania, and Tunisia, already exist in Egypt, and are being revived in Uganda. In Latin America, significant institutional capacities for AE training exist only in Brazil, Chile, and Mexico. Even at best, however, AE training in developing countries is relatively weak due to a scarcity of qualified faculty, materials, and facilities and high faculty turnover to more lucrative jobs in government or with international organizations. These results point to three broad goals for the U.S. AE profession: increasing both developing country and U.S. capability for AE graduate training and establishing professional networks to facilitate cooperative research. Appended are survey questionnaires and data.

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048

PN-AAJ-478

## THE PROJECT CYCLE

Sen, K.C.  
University of Wisconsin, Regional Planning and Area Development Project.  
1981, 137 p.

State-of-the-Art Paper No. 1.

Although the socioeconomic and spatial foci of development projects have been increasingly sharpened, the overall environment in which projects are created and conducted remains complex, diverse, and uncertain. Based on the premise that project development is circular rather than linear, this state-of-the-art paper presents a conceptual framework of the project



# DEVELOPMENT ASSISTANCE

cycle, describing various project components and their interrelationship. Specific sections of the report deal with project development (identification, selection, and design); project appraisal (technical, economic, financial, commercial, management, legal, and cultural aspects); project implementation (executing agency, recipients, and donors); and project evaluation. The author concludes that: (1) there is continuous interaction between the project and its environment and among the various aspects of the project; (2) most projects are multipurpose and attempt to achieve their objectives by developing viable institutions; (3) different perspectives and power relationships exist among the various parties involved in a project; (4) project development is a learning process which can provide information useful to other projects; (5) project identification, preparation, and implementation should be based on flexible, iterative, and informal methodologies; (6) project evaluation is an on-going activity occurring both during and after the project; (7) projects should attempt to make use of host country resources, labor, services, and manufactured goods; (8) donors must make systematic attempts to break away from built-in biases toward bigness, capital intensiveness, foreign exchange and import intensity, injudicious cost recovery, and legalism; (9) selective project standardization and replication could help to ease the critical shortage of skilled management personnel in developing countries; and (10) further research is needed on the trickle-down effects of development policies. Appendices discuss basic needs; social impact evaluation and social soundness analysis; appropriate technology; local participation; and project financing, implementation, appraisal, and replicability. A 65-item bibliography (1961-81) is included.

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**049**

**PN-AAJ-817**

## **DEVELOPMENT AND INSTITUTIONALIZATION OF AGRICULTURAL RESOURCE PLANNING CONCEPTS AND PROCEDURES IN DEVELOPING COUNTRIES**

Johnson, J.B.

U.S. Department of Agriculture, Natural Resource Economics Division, Economic Research Service.

1981, 100 p.

Policies to improve agricultural production in developing countries require an adequate inventory and analysis of agricultural land resources. This report documents the development and institutionalization under A.I.D.'s Comprehensive Resource Inventory and Evaluation System (CRIES) Project of land resource inventory procedures and of information analysis and management capabilities in the Dominican Republic, Costa Rica, Nicaragua, Syria, and Honduras. For each country, land resources have been categorized according to U.S.-based soil taxonomic concepts with an accompanying description of general climatic conditions. The categorizations developed

include Resource Planning Units (RPU's), which are cartographically delineated units of land that are relatively uniform with respect to land form, patterns of soil bodies, and climate; and Production Potential Areas (PPA's), aggregates of individual soil bodies and associated microclimates within an RPU. The major data sources used to establish land use patterns and maps include census data, Landsat imagery, farmer surveys, and inferential estimates based on crop calendars and patterns. Two data management systems have been developed for each country: a Geographic Information System to capture, verify, and analyze mapped information; and an Agroecological Information System to collect and analyze socioeconomic data relevant to agricultural planning. These systems can be used to devise economic models, such as linear programming, goal programming with multiple objective functions, and single equation econometric models, to estimate crop area planting responses to government-set target prices. Short-term technical assistance and training, both in-country and in the United States, and the provision of a resident advisor are two methods used to create in-country capability to construct and operate such agricultural resource planning systems. Implementation of project components has been adapted to specific country needs and capabilities. Appended are a Dominican Republic resident advisor's final report and a 37-item (1977-81) bibliography.

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**050**

**PN-AAJ-818**

## **THE RELATIONSHIP BETWEEN THE AREA-FRAME AND CRIES PROJECTS**

Johnson, J.B.; Schultink, G.; Putnam, J.W.

U.S. Department of Agriculture, Economic Research Service, Natural Resource Economics Division.

1981, 48 p.

Diverse and separately pursued methods are preventing A.I.D.'s Comprehensive Resource Inventory and Evaluation System (CRIES) and Area-Frame (AF) projects from achieving their common aim of helping developing country planners better assess their countries' land potential. To correct this situation, this report compares the two projects and recommends their integration. The CRIES project classifies a country's natural resources (NR) into Resource Planning Units (RPU) and relates land use and agricultural performance data to these units to lay a basis for analyzing policy alternatives. The AF project, on the other hand, expands enumerated data from small and random sample areas to national or subnational levels, providing a statistically reliable account of agricultural performance variables. Both projects employ land use data, including aerial photography and LANDSAT imagery data, as well as medium-scale topographic maps. The CRIES project uses maps on soils, climate, surface water and ground water, etc., to delineate RPU's; while AF projects traditionally use such



data—by means of physical overlay procedures—only to verify the land use patterns used for stratification. Nevertheless, AF projects sometimes computerize the mapped data, while CRIES often uses physical overlay procedures to delineate RPU's, and both projects usually employ computerized information systems. The following recommendations are made for integrating the projects where they are to be implemented concurrently: (1) Both projects should determine country data needs and capabilities, select one topographic base suitable to each and a single geographically-referenced information management system (with one project including topographic/political boundary mapped data), and select classification criteria for a major land use map (with one project interpreting aerial data for the map). (2) CRIES should conduct and evaluate NR inventories and provide AF's with copies of these maps; have AF statisticians provide primary data for CRIES baseline data sets; and provide training in NR data collection, evaluation, and management and, together with AF personnel, in agricultural policy planning techniques. (3) AF should proceed with frame construction and training in project procedures.

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PN-AAJ-924

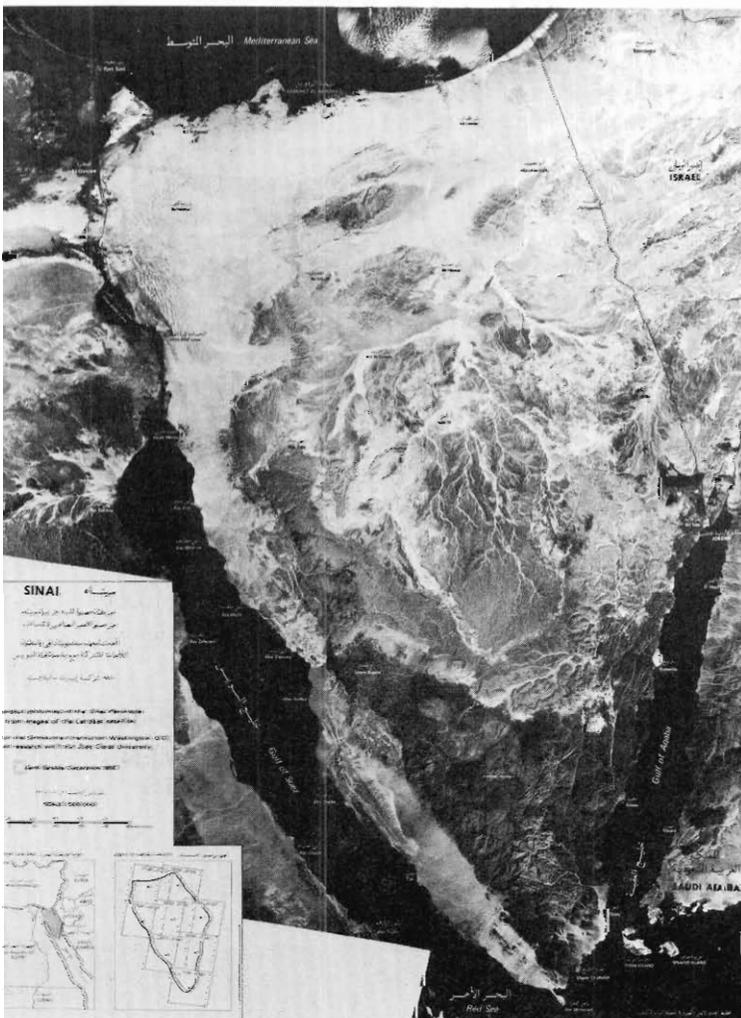
## ECONOMIC AND SOCIAL DEVELOPMENT IN WEST AFRICA

Agency for International Development, Regional Economic Development Support Office, West Africa.  
1979, 73 p.

West Africa, extending from Cape Verde to Zaire, includes 22 countries with a total land mass larger than that of the United States, but with a smaller population (190 million) and a GNP only as large as Switzerland's (\$63 billion). This report provides a brief overview of development in West Africa (in terms of demography, quality of life, agriculture, economic growth and income distribution, trade, debt service, and foreign assistance) and discusses areas of development assistance. Although most of the region's labor force is engaged in agriculture, population increases have outpaced increases in food staple production. This, combined with drought, cattle disease, inadequate agricultural infrastructure, and a shortage of trained manpower, has increased West Africa's food dependency. In fact, food imports throughout the region will have to increase five or six times above the 1975 level if past production trends continue. This condition is particularly pronounced in the Sahel, an area whose agricultural production has increased by less than 1% annually over the last 10 years. Taking note of this, A.I.D. expends more per capita in the Sahel than in any other region in the world. Adding to development problem, the oil price explosion in 1973 caused a 70% increase in posted oil prices and led to a total current account deficit for West Africa of approximately \$1.2 billion. Thus, the costs of food and fuel have been the major constraints to West African development because they rob nations of the foreign exchange needed to pay for the large foreign components of domestic programs. Donor programs should first be geared toward increasing production of staples. Also, because West African nations cannot finance the recurring costs of most international donor programs, immediate short-term productivity increases should be emphasized to give West African governments a larger tax base. Also discussed are needs and A.I.D. strategies in regard to livestock, rural development, food aid, transport, river basins, health, nutrition, women, human resources, population, housing, environment, and energy.

Paper copy \$9.49

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*Remote sensing satellites provide important data for crop, water, and land management. This photograph is a digitally-enhanced mosaic of eight LANDSAT images of the Sinai. Similar mosaics are used to develop natural resource inventories in CRIES and Area-Frame projects.*

052

PN-AAH-785

## LIVESTOCK VERSUS FOOD GRAIN PRODUCTION IN SOUTHEAST UPPER VOLTA; A RESOURCE ALLOCATION ANALYSIS

Delgado, C.L.  
Michigan University, Center for Research on Economic Development.  
1979, 447 p.

Contrary to conventional wisdom, West African Sahelian peasant farm income would not rise significantly if separate crop and livestock enterprises were integrated into a single farm operation. This report, part of a 3-year study of West African livestock economics, documents a 13-month farm management survey of 41 Mossi and Bisa farm households and a concomitant 5-month survey of 20 Fulani herdsmen in the Tenkodogo area to test the viability and income-generating capacity of integrating cattle raising into smallholder agriculture. Detailed in this report is farm-level information on labor flows, land use patterns, grain production, cattle labor requirements, and livestock ownership patterns for the 1976-77 agricultural year. A linear programming model is used to identify optimal production strategies and resource constraints under varying assumptions concerning farmers' desires for self-sufficiency in food grains. The study tests and validates the hypothesis that due to the high opportunity cost of seasonal labor in terms of food grain production loss, the desire for self-sufficiency in millet, and the high seasonal labor requirement for grazing and supervising animals, revenue-maximizing Mossi and Bisa farmers will entrust their animals to specialized Fulani herdsmen rather than care for the animals themselves. Similar conclusions would apply to other West African Savannah regions as well, as long as a cattle entrusting option exists, area population density is high, a suitable forage crop is nonexistent, there is a lack of agro-industrial by-products for use as feed-stuffs and of effective means of relieving seasonal labor bottlenecks, and land tenure and soil conditions are unfavorable to animal traction. The main policy recommendation for Tenkodogo and similar areas is to use development funds available for cattle production intensification to support the cattle entrusting system rather than encourage stockraising by sedentary peasants. To promote cattle production intensification in areas without a cattle entrusting option, there must be improvement in food grain production methods (e.g., by increasing returns to labor, eliminating labor bottlenecks, etc.). An approximately 160-item bibliography (1924-78) in English and French and survey data are appended.

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Paper copy \$58.11

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PN-AAH-879

## FORMAL CREDIT FOR FARM AND NON-FARM ENTERPRISES IN RURAL AREAS OF THAILAND

Meyer, R.L.

Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1980, 36 p.

*Economics and Sociology Occasional Paper No. 713; Presented at Workshop on Rural Finance, Kathmandu, Nepal, 1980*

An overview of recent developments in Thailand's rural financial structure shows that major improvements in extending formal credit to farms have been effected but that similar efforts for nonfarm rural enterprises are sorely lacking. This report reviews recent credit activities in Thailand relating to both rural farm and nonfarm enterprises and discusses reasons why activities for the latter have lagged. Specific government policies enacted to direct credit to rural areas include authorizing the Bank of Thailand to rediscount promissory notes issued from agricultural transactions; adopting a quota system whereby commercial banks were required to lend from 5% to 13% of their previous year's earnings to agriculture; and requiring new bank branches to lend at least 60% of their deposits to local enterprises and to make one-third of their loans to farmers. The impact of these and other policies over the course of 10 years was to increase the number of banks with agricultural portfolios from 5 to 16, increase agriculture's share of total lending to 5.5%, and extend formal credit to about 20% of Thai farmers. Conversely, nonfarm rural enterprises, i.e., pottery making, tailoring, and agricultural processing, which contribute significantly to total rural employment and income and to total output in some sectors, depend largely on informal credit sources which are thought to be less stable and more costly. This discrepancy is primarily due to political and geographical factors. Due to larger and more visible numbers of farmers and the urban population's dependency on plentiful agricultural bounty, the farm population has more political clout than do the less organized nonfarmers. To increase the amount of formal credit for nonfarm rural enterprises, the authors recommend: (1) restructuring the government-owned Small Industries Finance Office to help identify the nature of small sector credit demand and pinpoint enterprises with the potential for expansion; (2) analyzing problems of lending to the small-scale sector; and (3) reviewing other Asian country experiences in providing support to their small-scale sectors. Appended is an 18-item reference list (1972-79).

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PN-AAH-880

## RURAL FINANCIAL MARKETS AND DEVELOPMENT IN LOW-INCOME COUNTRIES: SOME INSIGHTS FOR THE UNITED STATES?

Adams, D.W.

Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1980, 17 p.

*Economics and Sociology Occasional Paper No. 712*

Despite the prosperity of U.S. rural financial markets (RFM), recent criticism has been aimed at developing country RFM's patterned after U.S. models. This paper explains why developing country RFM's have excluded small rural borrowers and identifies similar trends now appearing in U.S. RFM's. After noting the importance of RFM's in facilitating heterogeneous transactions at minimal cost, the author points out that developing country RFM's, despite heavy assistance from foreign donors, are financially weak. This problem stems, in his view, not from deficiencies inherent in the RFM's, but from development policies and political manipulation combined with inflation. The sanctioning of low interest rates requires RFM's, in times of inflation, to absorb negative returns, thus eroding their assets and forcing them to ration their services through non-market means, i.e., selecting only borrowers who have excellent collateral, are previous customers with good repayment records, and can provide a cosigner; and excluding poor borrowers by requiring bribes, delaying loan applications, and charging costs normally assumed by the lender, e.g., loan application fees. In addition, inequitable government policies are often imposed on rural entrepreneurs, e.g., overvalued exchange rates and price ceilings which depress RFM growth and create an unfavorable savings and investment environment. RFM's are also subject to manipulation by the politically powerful, especially when funds are sought from the central bank or the government during times of economic depression. By contrast, the vigor of the U.S. agricultural sector since the late 1930's has kept U.S. RFM's strong. Recent slowdowns in farm productivity, however, and the use of grain embargoes as foreign policy weapons, together with inflation and the regulation of some rural interest rates, also threaten this market. The author concludes by suggesting that, since financial instruments are liquid and naturally flow to areas of the greatest return regardless of political fiat, policymakers should focus on improving rather than on controlling the RFM process.

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**055 PN-AAH-882**

**AGRICULTURAL CREDIT AND RURAL PROGRESS IN JAMAICA: A DEVELOPMENT DILEMMA**

Graham, D.H.; Bourne, C.  
 Ohio State University, Department of Agricultural Economics and Rural Sociology.  
 1979, 39 p.

*Economics and Sociology Occasional Paper No. 633*

Jamaica's use of agricultural credit in the past decade exemplifies a classic conflict between bankers and development planners. In describing the conflict, this report examines and evaluates Jamaica's: (1) economic stagnation since the early 1970's (after a short period of reasonable growth) and the effect of this decline on the financial sector; (2) national credit

systems' growth, institutional features, and aggregate performance; and (3) public and commercial credit institutions and programs. During this period, Jamaica's major credit services were the commercial banks (dominated by foreign interests), the Agricultural Credit Board, the Jamaican Development Bank (JDB), the Self-Supporting Farmers' Development Program (SSFDP), and the Crop Lien Program (CLP). Larger farmers were serviced by the JDB and the ACB; small farmers were serviced by the CLP and (indirectly) the ACB; and medium farmers were serviced by the SSFDP. Overall, mainly larger farmers benefited from the credit programs. Although Jamaican planners designed these programs to increase domestic foodstuff production, they did not emphasize loan repayments, thereby turning the loans into income transfers. Foodstuff production increased but both large and small farmer loans are now seriously in arrears. As seen in the SSFDP, bankers emphasize institutional viability over farmer production; require strict loan disbursement and monitoring (especially with small farmers) and an interest rate that covers program costs; and keep arrears low through strong collateral and foreclosure policies. Caught between the opposed perspectives of planners and bankers, the development banks have compromised their financial viability and institutional credibility and now face a painful retrenchment period as they recover loans, foreclose on properties, and reschedule loans of salvageable projects. Given Jamaica's current economic and financial constraints, the supply of agricultural credit will increase slowly and service fewer small farmers. The costs, difficulties, and inequities of Jamaica's attempt to deliver public sector credit to small farmers suggests it is better to invest public resources in a package of agricultural policies including subsidized inputs, minimum price supports, and marketing arrangements.

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**056 PN-AAH-884**

**TESTING AN OFF-FARM LABOR SUPPLY MODEL IN A LESS DEVELOPED COUNTRY**

Smith, D.A.; Meyer, R.L.  
 Ohio State University, Department of Agricultural Economics and Rural Sociology.  
 1979, 15 p.

*Economics and Sociology Occasional Paper No. 615*

Although studies have shown off-farm labor (OFL) to be a key source of income for poor rural families in developing countries, the effect of off-farm wage rates on OFL supply remains unclear. This paper reports on a test of a model for analyzing this issue using data from 188 rural households in the Philippines. In the model, the time allocated to OFL by husbands and wives is a function of own on-farm and off-farm wage rates, nonearnings income, and several environmental variables noted below. Of husbands and wives surveyed, 25% and 12%,

respectively, performed OFL. While husbands, however, averaged 100 days annually whether their wives worked or not, wives worked twice as many days off the farm when their husbands did not work off the farm. Children spent a surprising amount of time in OFL (except where both parents did so), contributing 70% of all OFL and 50% of all off-farm income. Off-farm earnings averaged 13% of household earnings, 40% where both spouses worked. Using Tobit analysis, regression results were estimated for both husbands and wives; the former are presented in this report. It was found that: (1) wage substitution effect outweighs wage income effect; (2) response to increased off-farm wages is highly elastic; (3) farm size affects OFL negatively; (4) young and older children perform more OFL; (5) a husband substitutes for the wife's OFL when she cares for young children; (6) own on-farm wage rates, wife's on-and off-farm wage rates, nonearnings income, machinery, number of children 7-15, and dwelling size were insignificant, though predictable, variables. The similarity of predicted and observed probability of OFL and total labor supply increased confidence in the model. Results suggest that area small farmers respond to wage rates in allocating household labor time and that farm and household characteristics are significant in explaining response to off-farm wage rates. The model needs to be refined to include children's wage and time allocation and their impact on adult labor supply; to analyze the process of household response to OFL opportunities; and to relate successful OFL to migration decisions. An 11-item bibliography (1958-78) is appended.

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Paper copy \$1.95 Microfiche \$1.08

**057 PN-AAH-885**  
**RURAL NONFARM EMPLOYMENT: THE RECENT EAST ASIAN EXPERIENCE**

Meyer, R.L.; Larson, D.W.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1978, 24 p.

*In Journal of Economic Development, Vol. 3, No. 1, 1978, pp. 91-112; Economics and Sociology Occasional Paper No. 484*

Although small, rural, nonfarm firms (SRNF) are often overlooked by development strategists and have often suffered from discriminatory government policies, recent evidence suggests that SRNF's may be able to contribute significantly to farm family income and the national economy. This paper exemplifies this thesis in light of recent East Asian experience. A literature review shows that East Asian SRNF's, in contrast to larger, more "modern" enterprises, employ substantial unskilled and uneducated labor (20-30% of the labor force and more), use local resources, are less capital-intensive, require little foreign exchange, reduce interregional inequities, improve income distribution, encourage investment in agriculture, produce exports, and help link the product and labor markets to small farms. In Taiwan, Japan, and South Korea between 1960

and 1975, income earned from SRNF's accounted for 50-90% of total income for families with small farms (under 0.5 ha) and 15-30% of family income for farms over 2 ha. A survey of 329 rural Taiwanese families in 1973 indicated that relatively higher off-farm wages, small farm size, greater education, a large number of adults per household, farm mechanization, and rice and livestock farming (versus more labor-intensive vegetable, fruit, and tobacco farming) were all conducive to greater off-farm employment. The cost of commuting, at least in Taiwan where distances are short, was not a factor. After noting that these facts should induce governments to eliminate their entrenched bias in favor of large firms, the authors conclude by reviewing strategies proposed to promote SRNF's, e.g., revising commercial bank credit policies; increasing services to SRNF's by development banks; and establishing specialized SRNF financing institutions. Alternative strategies suggested by the authors include: (1) introduce farm mechanization to release labor for both increased farm and non-farm work; (2) increase rural educational opportunity; (3) improve rural transportation and encourage industrial decentralization to reduce, where necessary, commuting costs; and (4) study the broader, long-run consequences of SRNF promotion. A 31-item bibliography (1961-76) is appended.

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**058 PN-AAH-886**  
**MEASURING THE IMPACT OF AND DEMAND FOR AGRICULTURAL CREDIT; AN ANNOTATED BIBLIOGRAPHY**

David, C.C.; Meyer, R.L.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1979, 25 p.

*Economics and Sociology Occasional Paper No. 597*

The extensive use of formal credit to promote agricultural development in low-income countries has not led to expected improvements in farm income, production, and income distribution. Some researchers have even argued that certain policy instruments, especially concessionary interest rates, are responsible for the unsatisfactory performance of these credit programs. This annotated bibliography contains 83 references (1958-78) which examine the problem of agricultural credit programs, especially in low-income countries, from a two-fold viewpoint: the impact of agricultural credit at the micro-level, and the factors affecting the demand for credit. English sources predominate, although Spanish titles are also included. Most of the bibliographic items are micro-level and empirical in nature, although a number of theoretical analyses of the role of financial intermediation at the macro- and micro-level are also listed. Only the more recent and easily accessible descriptive studies which dominate the empirical literature are included, even though many other descriptive studies are available, according to the authors, as government reports or graduate student

theses. Coverage of the more analytical studies, using econometric and programming methods, is more complete and includes a few U.S.-based analyses illustrating possible methodological approaches. Included are two recent articles by the authors which discuss key conceptual and methodological problems of credit supply and demand. A synopsis of each entry is provided.

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**059 PN-AAH-887**  
**RECENT PERFORMANCE OF RURAL FINANCIAL MARKETS IN LOW-INCOME COUNTRIES**

Adams, D.W.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1979, 28 p.

*Economics and Sociology Occasional Paper No. 596*

Despite a substantial expansion in the past 30 years, rural financial markets (RFM) have contributed little to development in low-income countries. To bolster this controversial thesis, this paper reviews the recent poor performance of RFM's and identifies its causes. RFM expansion has been based on a supply-side strategy in which RFM's are force-fed large amounts of funds by central banks and interest rates are made concessionary for farmers, especially poor, small farmers. Underlying this strategy are several common assumptions: that farmers need low-income credit and cannot generate voluntary savings; that informal lenders provide the majority of farm credit—at exorbitant interest rates—and that formal lenders do and should provide credit for production purposes only; and that RFM performance can effectively be controlled by government fiat. These assumptions have led to several common problems: erosion of credit portfolios due to inflation or fixed interest rates; high default rates; reticence to lend to farmers or the rural poor; inadequate availability of medium- and long-term loans; ineffectiveness in mobilizing voluntary savings; high loan transaction costs; adverse effects on income distribution and asset ownership; and general lack of coordination and difficulty in introducing credit innovations in RFM programs. Governments use varying strategies to control RFM's: creating new institutions for special groups; increasing loan supplies; nationalizing formal RFM's; and establishing loan size limits, lending quotas, loan guarantees, or concessionary interest rates for the poor. A strategy very widely used (especially to channel foreign capital) is to have central banks rediscount loans made for select purposes at below-normal rediscount rates. The author points out the weaknesses of these strategies and suggests some major and long-overdue policy changes in the use of RFM's: initiate programs to mobilize voluntary savings; adopt flexible, nominal interest rate policies; use interest rate policies and other incentives to induce RFM's to serve rural needs; de-emphasize concessionary interest rates and allocation of loanable funds by administrative fiat; and raise interest rates of

formal RFM's. A 26-item bibliography (1949–79) is appended.  
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**060 PN-AAH-888**  
**MEASURING THE FARM LEVEL IMPACT OF AGRICULTURAL LOANS IN LOW INCOME COUNTRIES: A REVIEW ARTICLE**

David C.C.; Meyer R.L.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1979, 37 p.

*Economics and Sociology Occasional Paper No. 602; paper presented at Workshop on Rural Financial Markets and Institutions, Wye, England, 1979*

Theoretical problems prevent empirical studies from accurately assessing the impact of farm credit on farm production in low-income countries. This paper identifies these problems and suggests ways to improve farm credit impact research. A review of selected farm credit impact studies (descriptive, econometric, and mathematical) reveals that most studies have three main methodological problems: (1) They use the farm as the basic analytical unit while neglecting the interdependence of farm household (FH) production/consumption activities. (2) They fail to recognize the fungibility of money. Credit ostensibly obtained for production purposes may in fact be used for non-production purposes such as consumption or investment. (3) They have not accurately resolved the attribution problem, that is, been able to separate the effect of credit on farm production from that of other causal factors. Input and output prices, production technology, and managerial constraints, for example, may all cause differences between borrowers and non-borrowers or before and after borrowing. Especially important is nonprice rationing of credit resulting in the concentration of loans to larger, more well-established farmers. These theoretical inadequacies, in the author's view, underlie the farm resource allocation model currently in general use and lead to an under- or over-estimation of the true impact of farm credit. To improve research on farm credit impact, the most immediate need is to establish a more detailed data base by collecting quantified data on the sources and uses of FH liquidity; monitoring production expenses, investment, consumption and non-farm activities to accurately describe liquidity allocation (cross-sectional surveys are not suitable for this purpose); and collecting longitudinal data, especially from panel households, even at the expense of smaller sample size. A cost-benefit comparison of credit to other policy instruments would probably show that credit, although less cost-effective, is preferred because it is more easily administered, more controllable by larger farmers, and enables assistance agencies to meet lending quotas. A 45-item English and French bibliography (1956–78) is appended.

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Paper copy \$4.81 Microfiche \$1.08

061

PN-AAH-889

## **MOBILIZING HOUSEHOLD SAVINGS THROUGH RURAL FINANCIAL MARKETS**

Adams, D.W.

Ohio State University, Department of Agricultural Economics and Rural Sociology.

1978, 15 p.

*In Economic Development and Cultural Change, Vol. 26, 1978, pp. 547-560*

Contrary to the usual assumptions that rural families in low-income countries are either too poor to save or spend their surplus income on consumption or ceremonial sprees, this paper argues that rural households have substantial voluntary savings capacities and that rural financial markets (RFM) can strongly influence both the form and the amount of savings. According to the author, the amount of farm income saved depends on both household consumption and farm production. Although the interaction between these factors is complex and hence difficult to quantify, one can generally assume a close inverse relationship between the rates of return expected on savings and the amount of income allotted to consumption. RFM's can influence family financial behavior by increasing liquidity, e.g., through credit, for both production and consumption and by offering attractive interest rates for savings. Data from Taiwan, Japan, Korea, Malaysia, and India indicate that rural households possess a significant savings capacity. There are three strong reasons, according to the author, for mobilizing this capacity: (1) rural savings may help strengthen a country's overall financial market; (2) savings can strengthen the local service institutions which are often weakened by concessionary interest rates and so help bridge the gap between national organizations and individuals; and (3) increased savings lead to decreased household consumption. A two-level strategy to mobilize voluntary savings is suggested. At the national level, a flexible interest rate structure is needed, e.g., one that incorporates tax exemptions on interest for certain types of deposits or indexes return rates according to inflation, along with legal changes to permit cooperatives and other local institutions to handle credit and savings activities and to integrate these institutions into regular financial markets. Initiation of a nationwide deposit insurance program is also needed. On the local level, the key need is to promote attractive return rates. Programs to promote savings, it is noted in conclusion, are best pursued in areas where agricultural growth and increased income are occurring.

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PN-AAH-890

## **SAVINGS DEPOSITS AND CREDIT ACTIVITIES IN SOUTH KOREA AGRICULTURAL COOPERATIVES 1961-1975**

Lee, T.Y.; Kim, D.H.; Adams, D.W.

Ohio State University, Department of Agricultural Economics and Rural Sociology.

1977, 15 p.

*In Asian Survey, Vol. 17, No. 12, 1977, pp. 1182-1194*

Rural cooperatives can mobilize rural voluntary savings. Such is the major conclusion of this review of South Korea's rural cooperative system in terms of its historical credit/savings achievements, financial services offered by three cooperatives (Daeson, Chojeun, and Ochang), and cooperative member attitudes regarding savings. Loans generated by the system increased four-fold from 1961 to 75 and were predominantly for agriculture, e.g., 75% of 1975 lending. The change in 1965, from inflexible interest rates to rates tied to inflationary pressures, had a dynamic impact on rural lending and deposits. Prior to 1965, rates on farm loans and deposits hovered, respectively, between 8-15% and 9-15%. Following 1965, rates on both deposits and loans almost doubled. In addition, the promotion of savings mobilization resulted in significant deposits in rural cooperatives. For instance, between 1964 and 1966, total deposits tripled because farm-households placed more of their financial and liquid assets in financial instruments. Voluntary savings deposits were also mobilized much more quickly than involuntary share purchases. Since 1966, savings deposits have accounted for 66% of cooperative deposits. In all three cooperatives examined, outstanding loans and deposits have increased rapidly since 1966. Savings mobilization programs included installment savings, deposits in kind, and mutual installment deposits. Demand deposits, fixed deposits, and other deposits totalled 75%, 20%, and 5% respectively. Sample interviews to determine cooperative member's attitude toward savings revealed that half of the deposits were to increase liquidity for farm or household transactions, while the other half were for investment purposes such as education and land purchases. Deposit behavior was primarily affected by interest rates on savings or by available investments. In 1975, members placed 95% of their deposits in cooperatives, substantiating the latter's safety and convenience. In addition to the major role which cooperatives can play in mobilizing rural savings, it may be concluded from the study that the poor have a greater savings potential than previously believed; that government policies, especially interest-rate policies, affect savings mobilization; and that rational credit-savings activities can help build viable, small farmer cooperatives.

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**063** **PN-AAH-891**

**GROUP LENDING TO THE RURAL POOR IN THE DOMINICAN REPUBLIC: A STUNTED INNOVATION**

Adams, D.W.; Pablo, A.A.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1980, 29 p.

*Economics and Sociology Occasional Paper No. 682*

Many financial innovations in low-income countries prove abortive due to countervailing national policies. This report discusses one such innovation—group lending—and identifies the cause of its limited success in the Dominican Republic. Against a background of the purported advantages of group lending (a lowering of default rates and technical assistance and transaction costs) and Dominican Republic interest policies, group lending initiatives of the Dominican Development Foundation (DDF), one of the first credit organizations in the world to experiment with group lending, are analyzed. DDF has the largest group lending program in the Dominican Republic, providing production loans to groups of farmers lacking access to other formal credit sources. A recent study of a representative DDF initiative in Pablo illustrates the strengths and weaknesses of the DDF program. The study showed that group lending lowered both transaction and technical assistance costs, but that the costs to the DDF of forming and serving new and poorer groups (including the cost of collecting delinquent loans) were substantial. Joint liability worked as a sanction to encourage loan repayment with well-formed groups, but such sanctions proved ineffective with groups formed solely to obtain access to the loan or where the group had difficulty in obtaining the loan. To encourage commercial group lending, DDF initiated a loan guarantee program, covering defaults on a declining percentage basis over a 3-year period. After initial success, the program failed when banks pulled out of the program due to increased inflation and a jump in returns from loans to other sectors. DDF now faces increasing default rates, a decrease in the quality of its services, and reduced lending funds. The concessionary interest rates promoted in the Dominican Republic to spur agricultural production seem to be a major reason for DDF's problems. A six-item bibliography (1968–79) is appended.

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Paper copy \$3.77 Microfiche \$1.08

**064** **PN-AAH-892**

**FUNDING AND VIABILITY OF RURAL DEVELOPMENT BANKS**

Bourne, C.; Graham, D.H.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1980, 28 p.

*Economics and Sociology Occasional Paper No. 720*

Using the Jamaican Development Bank as an example, this paper examines the impact of existing funding sources on the viability of rural development banks (RDB) in low-income countries and suggests new sources for RDB funding. Currently, the two major funding sources for RDB's are foreign and domestic governments. The terms imposed by these sources, however, (as well as by subsidiary sources such as private financial institutions), significantly restrict RDB credit policies and operational efficiency in ways that can affect RDB viability. Such restrictions are the recommendations, usually accepted by RDB's, that RDB clients adopt modern technology, or that financing of short-term working capital be prohibited, or that lending be made at concessionary interest rates. Taken together, these restrictions create a bias in favor of labor-displacing imported capital goods and larger farmers. Concessionary interest rates in particular lead, according to the World Bank, to resource misallocation, wealth gains by larger farmers, losses for RDB's, and political corruption and abuse. In addition, the tendency by RDB sources to extend funds on the basis of loan disbursement rather than on loan management quality encourages RDB's to accelerate disbursements without paying sufficient attention to clients' credit worthiness. This ultimately leads to an evaporation of external source funding, undermining the RDB's long-term viability. One solution to these problems is to develop new sources of funding that are not subject to the above limitations. Three such possible sources are examined: deposit mobilization, which would afford RDB's a steady return flow of funds; the use of local and foreign bond issues; and earmarking government revenues. It is concluded that the first two of these are preferable and are also potentially more successful methods of funding, provided they are initiated at an early stage in a RDB's life-cycle. A list of 8 references (1971–78) is appended.

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Paper copy \$3.64 Microfiche \$1.08

**065** **PN-AAH-893**

**RECENT ECONOMIC GROWTH AND RURAL FINANCIAL MARKETS IN JAMAICA: ANALYSIS OF PERFORMANCE, PROBLEMS AND RECOMMENDATIONS**

Graham, D.H.; Bourne, C.; Begashaw G.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1978, 179 p.

Against a background analysis of the Jamaican economy's accelerating decline from 1965 to 1978, this paper studies the recent performance of Jamaica's rural financial markets (RFM's). From 1970 to 1977, credit increased rapidly, 6.7 fold, in nominal terms, but real growth was only 2.6 fold. Most of the increase came from new programs such as the Self-Supporting Farmer's Development Program (SSFDP) and the Jamaican Development Bank (JDB) with the help of foreign funds as inflation eroded the credit base in older domestic sources such as the Agricultural Credit Board (ACB). This rapid increase in

credit within a declining economy has led to delinquency and arrears which have compromised future access to foreign funding sources, and to negative real interest rates which have benefitted large farmers while undermining the viability of the credit institutions themselves. More detailed analysis of the performance of the commercial banks, the overall main source of farm credit; the JDB, the major vehicle for official farm credit; and the three government programs designed to provide small farmer credit—People's Cooperative Banks (PCB), the SSFDP, and the Crop Lien Program (CLP)—confirm the above conclusions. Analysis of the impact of public financial policies on RFM's leads to the conclusions that government assistance has been irregular and has directly benefitted only a narrow range of industries and that central banking policies have not succeeded in providing an adequate flow of private sector credit to agriculture. A final section discusses the main problems caused by the above factors: negative interest rates that benefit large farmers and penalize savers; inefficient use of credit and arrears by large farmers, due to lax loan administration; and high delinquency rates that threaten the viability of the small farmer credit programs. Recommendations include raising interest rates according to the rate of economic recovery; improving loan appraisal and collection procedures, especially of the JDB; and transferring parts of the CLP to the SSFDP and of ACB-PCB services to the Ministry of Agriculture while supporting ACB-PCB's participation in the new Farmer Savings Program. Specific areas of USAID/J assistance are suggested.

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Paper copy \$23.27 Microfiche \$2.16

**066 PN-AAH-894**  
**A CRITIQUE OF TRADITIONAL AGRICULTURAL CREDIT PROJECTS AND POLICIES**

Adams, D.W.; Graham, D.H.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1980, 26 p.

Despite good intentions, a majority of developing countries' rural financial market (RFM) projects have generally contributed to overall resource misallocation, inequitable wealth distribution, and political sabotage. This paper reviews common problems and erroneous assumptions associated with RFM projects, outlines new policy approaches and suggestions for making improvements, and offers explanations as to why new ideas may not be accepted by local policymakers. Many of the problems cited, such as loan repayment delinquencies, medium- and long-term formal credit unavailability, high loan transaction costs, and credit flow distortions, are due mainly to inaccurate assumptions about how RFM's operate and about the factors which determine borrower and lender behavior. Credit institutions are created and RFM policies designed largely in response to beliefs that the rural poor cannot save

and therefore will not respond to saving incentives; that most farmers need cheap loans before they will adopt new technologies or make major investments; that informal lenders charge exorbitantly high interest rates; and that cheap credit is an efficient way of off-setting production disincentives such as low product and high input prices. Based on converse assumptions about RFM's, the authors forcefully argue the merits of stable and positive interest rates which allow profitable returns to both lenders and borrowers and reduce inflationary speculation; suggest designing policies to guarantee loans or adjust reserve requirements to stimulate lending to target populations rather than injecting exogenous credit into the system; and recommend that RFM's be induced to lower the social costs—caused by bureaucratic red tape—of financial intermediation. The most important of the explanations offered for the intransigence of RFM policymakers is that the local political system is satisfied with RFM performance because it gives political leaders tools with which to allocate "spoils" to favored patrons. Assistance agencies are urged to counteract inefficient and distorting RFM policies by conditioning their assistance with requirements for positive real interest rates. Appended is an 18-item reference list (1959–79).

AID/ta-BMA-7 931116900  
Paper copy \$3.38 Microfiche \$1.08

**067 PN-AAH-898**  
**STRUCTURE AND PERFORMANCE OF RURAL FINANCIAL MARKETS IN THE PHILIPPINES**

David, C.  
Ohio State University, Department of Agricultural Economics and Rural Sociology.  
1979, 37 p.

*Economics and Sociology Occasional Paper No. 589*

Small farm production in developing countries often depends on the ability of rural financial markets to provide farmers with access to credit. This paper examines the structure and performance of such markets, especially supervised credit programs (SCP), in the Philippines in terms of credit delivery, loan repayment, and impact on farm productivity and income. With the implementation of SCP's such as Masagana 99, farm lending by public and private banks increased during the 1960's, then declined in real terms during the 1970's. Private institutions (development, rural, and commercial banks and savings and loan associations) continue to dominate farm lending, although their share has declined relative to public lenders such as the Philippine National Bank (PNB) and the Development Bank of the Philippines. Rural banks, encouraged by incentives, e.g., tax exemptions, and the PNB have led SCP activities. Informal markets such as moneylenders, friends, and relatives, have also been active, although on a declining basis relative to formal lenders. Under SCP's, supervision and group lending increased administrative costs without reducing delinquency rates. Distribution of credit under SCP's has not favored



**The loan this Filipino farmer is receiving from a Laguna Rural Bank under a rice production credit program of the Philippine Central Bank will be used for costs incurred in transplanting, weeding and harvesting high-yield rice seedlings.**

the small farmer, nor have SCP's significantly increased farm productivity and income. The study concludes by recommending increased emphasis on establishing viable rural financial markets by using more flexible interest rates and by increasing flexibility in loan use and timing. Improved resource allocation within farm households, an increased ability by rural banks to mobilize savings, and lowered administrative costs and default rates are presented as potential benefits of these policy changes. It is also noted, however, that further research on borrower and lender behavior is needed to influence policy-makers to adopt these changes.

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Paper copy \$4.81

Microfiche \$1.08

**068**

**PN-AAH-899**

**LENDING TO RURAL POOR THROUGH INFORMAL GROUPS: A PROMISING FINANCIAL MARKET INNOVATION?**

Adams, D.W.; Ladman, J.R.

Ohio State University, Department of Agricultural Economics and Rural Sociology.

1979, 8 p.

*Economics and Sociology Occasional Paper No. 587*

Informal group lending is a recent innovation introduced to increase the rural poor's share of agricultural credit in developing countries. To help determine the value of this innovation,

this paper examines five advantages claimed for group lending. (1) The claim that joint liability (peer pressure on recalcitrant members) provides lenders with loan security is generally untrue. In many countries, e.g., the Philippines, groups are hastily formed to gain access to credit and thus lack the solidarity needed to generate peer pressure. Repayment is high where preexisting groups borrow and when a percentage of a loan is placed into a blocked, interest-bearing account held by the lender. Studies suggest that the quality of loan services (e.g., loans arriving on time) affects the borrowers' willingness to repay. (2) The claim that group lending lowers lender costs requires clarification. The direct cost of making, administering, and collecting the loan can indeed be reduced, especially when technical assistance is provided by national extension services, but the lender may also have to absorb the costs of technical assistance needed to form a group. These latter costs are reduced when lenders generate groups from existing organizations, e.g., in Nepal. (3) Few data exist to substantiate or disprove the claim that group lending improves the efficiency of technical services. Although groups in regional or pilot projects do receive timely assistance, assistance offered through national extension services is inadequate. When assistance costs are assumed by an outside agency, service improves. Assistance is most effective when groups produce a single commodity, are well-established, and are homogeneous. (4) The claim that group lending reaches more borrowers with the same administrative manpower has been true in several countries, e.g., Ghana; but it has also been shown that spreading a staff too thinly and lending to many untested borrowers

can seriously affect repayment and sharply increase loan collection costs. (5) Group lending does, as claimed, reduce borrower transaction costs, since productive time lost, travel expenses, etc., are shared among group members, as in Bolivia. The authors conclude by noting that more realistic and flexible interest rates are needed to make group lending a viable innovation.

AID/ta-BMA-7 931116900

Paper copy \$1.04 Microfiche \$1.08

**069 PN-AAJ-018**

## **WHEAT, ALLOCATIVE ERROR AND RISK: NORTHERN TUNISIA**

Roe, T; Nygaard, D.  
Minnesota University, Economic Development Center.  
1980, 26 p.

Although often considered constraints to both greater productivity and the adoption of new technologies, the total impact of risk, uncertainty, and resource misallocation on agricultural production has yet to be empirically established. To fill this knowledge gap, this study analyzes how farmers' knowledge and perception of risk affects resource allocation in the production of ordinary and high-yield varieties (HYV's) of wheat. Two different production functions—one linking expected with actual yield and the other relating actual yield and inputs—were fitted to data gathered from 125 Northern Tunisian wheat farmers during the 1976–77 crop year. The authors then compared the two functions in order to quantify and explain errors in resource allocation and to analyze the impact of these errors on yield and land area planted in HYV's. The analysis showed that most farmers were averse to risk and were especially wary of HYV's. As a result, they were deterred from planting "riskier" HYV's and underutilized fertilizer and machinery. High risk aversion was positively related to age and the farming of valley land and was negatively related to farm size. Although farmers were quite knowledgeable of the correspondence between input use and yield, they significantly overestimated yield, especially for HYV's, because they did not anticipate less than favorable weather. In addition, not only were allocation errors greater in the production of HYV's, but, when the weather was poor, HYV's out-yielded ordinary varieties only with high input use. The report thus recommends that: (1) extension programs emphasize the relationship between yield, inputs (fertilizer, machinery), and weather and take into account farmers' resources and age as well as farm size and environment; (2) inter-variety planting be encouraged to maintain sufficient risk diversification; (3) further consideration be given to establishing crop insurance programs; (4) fertilizer and machinery services be made more readily available; (5) crop price controls be instituted; and (6) plant breeders attempt to develop new varieties which, while having a higher yield, are otherwise similar to traditional varieties. Appended are a 22-item bibliography (1974–79) and research formulae and data.

AID/DSAN-XII-G-0012 931128200

Paper copy \$3.38 Microfiche \$1.08

**070 PN-AAJ-035**

## **THE OUTLOOK FOR NATURAL RUBBER IN THE 1980's**

Man, A.B.; Blandford, D.  
Cornell University, Department of Agricultural Economics.  
1980, 70 p.

*Cornell International Agricultural Mimeograph No. 78*

The rising price of oil, the main source of synthetic rubber, has given natural rubber, a key developing country export, a new economic lease on life. This paper describes the natural and synthetic rubber industries and markets and estimates a model to calculate the prospects for natural rubber. The world's natural rubber market is dominated by Asia, especially Malaysia, Indonesia, and Thailand; Africa, led by Liberia and Nigeria; and South America. Most of this natural rubber is exported to industrialized countries, particularly the United States, Japan, and China, although exports have declined in some traditional markets like Eastern Europe due to increased use of synthetic rubber. Synthetic rubber only began to be mass-produced during World War II, but accounted for 67.6% of the world's rubber market by 1975, with the United States leading the way. The dependence of natural rubber production on weather and time—it can take a rubber tree 7 years to mature—gives synthetic rubber a competitive edge, as does the synthetic rubber industry's tightly controlled and oligopolistic character. Extensive research has led to a technical superiority of synthetic over natural rubber in major end-uses in which the two are interchangeable. This superiority has kept synthetic rubber prices low and is forcing natural rubber to be increasingly price competitive. To analyze natural rubber's future prospects, an econometric model to explain production, consumption, and inventories and prices of both natural and synthetic rubber is estimated for the period 1960–1977. By 1985, natural rubber demand should increase 9–13% above 1977 levels, with the largest relative increase coming from the Japanese tire sector (although demand will decrease in other Japanese sectors). U.S. demand will basically stagnate. Production will increase in Malaysia and Thailand, but decline elsewhere. Prices of natural rubber will increase in low- and high-income growth areas by 100% and 150% respectively. These increases, combined with rising oil prices, should double the real price and hence the value of natural rubber to exporting countries by 1985. A 39-item bibliography (1939–80) is appended.

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Paper copy \$9.13 Microfiche \$1.08

**071 PN-AAJ-038**

## **THE EFFECTS OF P.L. 480 WHEAT IMPORTS ON LATIN AMERICAN COUNTRIES**

Hall, L.  
Cornell University, Department of Agricultural Economics.  
1980, 88 p.

Food aid has long been an important U.S. foreign policy tool and its popularity is likely to continue as worldwide poverty and the need to manage grain supplies in developed countries persist. However, because an increase in local grain supplies provided by food aid can depress local prices and/or lead to inadequate food production and dependence on food imports, the price and policy disincentives of food aid in recipient countries should be evaluated. This study analyzes the effects of U.S. Public Law (P.L.) 480 wheat imports on the agricultural development of Brazil, Colombia, and Peru from 1952 to 1975 and provides a basis for evaluating the effects of future food aid policy decisions. An econometric, multiequation commodity model is presented for measuring P.L. 480's effect on supply and demand for cereals, income generation, commercial grain imports, market clearing, the interrelationships of production and consumption, and government policies affecting agricultural production, consumption, and trade. Both the Brazilian and Colombian governments set commodity import prices and use the revenue generated to finance domestic support prices. The Peruvian Government, which rarely intervened in grain marketing before 1970 and has received small amounts of P.L. 480, is used as a control case against which to measure Brazil and Colombia. Analysis revealed that the effect of P.L. 480 on producer prices and on domestic production could be positive because these governments have control over commercial and P.L. 480 wheat imports and use revenues from the resale of these imports to support prices to local producers of wheat or other grains; and because of P.L. 480's role in increasing government import revenues. Specifically, wheat support prices and production were bolstered in Brazil, while in Colombia rice production benefited because rice producers possessed greater political power than did wheat farmers and because of rice's higher price elasticity. A 54-item reference list (1958-78) in English and Spanish and country data results are appended.

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Paper copy \$11.44 Microfiche \$1.08

**072 PN-AAJ-131**  
**CHANGES IN COMMUNITY INSTITUTIONS AND INCOME DISTRIBUTION IN A WEST JAVA VILLAGE**

Kikuchi, M.; Hafid, A.; Saleh, C.; Hartoyo, S.; Hayami, Y.  
International Rice Research Institute (IRRI).  
1980, 15 p.

*In IRRI Research Paper Series, No. 50*

Villages in Java, Indonesia have recently shown signs of a growing income disparity between rich and poor. This report analyzes the results of a household survey in Subang, a typical West Java rice village, to determine the causes of this disparity. The survey revealed a rapid decline in population growth, non-expansion of cultivable land, an expanding labor force, and a rise in landlordism. To determine the causal links between these phenomena, the village's rice technology and harvesting systems were analyzed. It was found that the high susceptibility

to insects and pests of the modern rice varieties introduced in the 1960's has led 83% of farmers to return to traditional rice varieties and that modest increases in crop yields are due not to new varieties but to fertilizer subsidies. Recent changes in the rice harvesting system dramatically evidence another finding—that manual labor has increased, but that the real wage rate has declined. The traditional bawon system of sharing harvest output widely in the community has been replaced by the ceblokan system in which participation in the harvest is limited to workers (often landless poor hired by the rich) who do extra work gratis. The ceblokan system can be considered an institutional innovation allowing employers to reduce the wage rate for harvesting to a level equal to the market wage rate in order to accommodate a more abundant labor supply. Although not all sense of moral continuity with the past was lost with the ceblokan system, e.g., widows were exempted from harrowing, the final picture of the village's economy that emerges is a dismal one: modest crop growth, labor force increases against limited land resources, declines in real wages for land preparation and harvesting—in short, a decreasing return to labor relative to land leading to a polarization in income distribution. This growing inequity, in the authors' view, is due to stagnating technology, namely, the failure to raise the relative productivity of labor by developing land-saving and labor-using technology. A 15-item bibliography (1925-80) is appended.

AID/ta-C-1466 931102600  
Paper copy \$1.95 Microfiche \$1.08

**073 PN-AAJ-133**  
**ECONOMIC GROWTH, EQUITY AND AGRICULTURAL DEVELOPMENT IN THE DOMINICAN REPUBLIC**

Fletcher, L.B.; Graber, E.  
Iowa State University, Department of Economics.  
1980, 476 p.

Agricultural sector analysis is basic in devising strategies to improve farm production and ensure equitable growth in developing countries. This study, the twelfth in a series on Latin American and Caribbean countries, analyzes the Dominican Republic's (DR) agricultural sector and suggests priorities for a national sector development program. To identify key constraints to small farm production, analysis is made of the DR's macroeconomic structure and performance and of the impact of current growth on rural incomes, employment, and standards of living; land and water resource utilization; agrarian structures, farm production, and rural income distribution; consumption patterns for foods and exports; food marketing, input supply, and credit systems; and public sector institutions and programs. Past growth in the DR has been biased toward nonagricultural urban sectors due primarily to government policies such as overvaluation of the peso and industrial investment incentives. Because priority in resource use is given to major foreign exchange earners (sugar producers) and those most able to pay resource prices (large land owners),

small and medium farmers receive inadequate water and fertilizer for high yield production. Although agrarian reform has existed since 1962, the actual latifundio-minifundio land holding structure is the major structural cause of widespread underemployment in rural areas. To achieve equitable growth for the poor (on whom the impact of past economic growth should be carefully documented), an agricultural strategy designed to increase small farm output, income, employment, and nutrition is proposed. The strategy's two key elements are: (1) introducing improved technology on existing small farms; and (2) making more land available to small farmers by creating small farms from newly irrigated and currently underused land and by redistributing land under the agrarian reform. Corollary elements of this strategy are programs in land and water resource management, input supply and food marketing, farmer organizations, public works for the poor, and training university-level agricultural professionals. Appended is a 96-item bibliography (1962-78) in English and Spanish.

AID/ta-BMA-3 931023600  
Paper copy \$61.88 Microfiche \$5.40

## **074 PN-AAJ-251**

### **PRODUCTION LOANS TO GROUPS OF FARMS: EXPERIMENTS IN HONDURAS**

Parks, L.; Tinnermeier, R.  
Oklahoma State University, Department of Agricultural Economics.  
1980, 37 p.

*In International Development Series, No. 80-5*

Small farm credit programs, hampered by high administrative expenses, limited farmer collateral, poor loan repayment rates, and inability to reach large numbers of farmers, are trying to solve their problems by group lending. This report details the experience of the Banco Nacional de Desarrollo Agrícola (BANADESA) of Honduras in extending credit to two types of groups—agricultural committees (AC), composed of independent farmers living in one town; and informal groups of small farmers organized solely to obtain loan credit. A number of potential advantages of group lending were anticipated, including lower transaction costs, improved repayment through joint liability, less required collateral through group guarantees, and assistance given to illiterate farmers from the more educated. BANADESA agreed to a trial extension of credit (not cash) to three AC's for inputs of seed, fertilizer and chemicals. After making adjustments in the first loan procedures, the bank authorized 18 additional loans to AC's. Following the AC experiment, BANADESA agreed to a trial cash loan to an informal group of farmers. Lack of group cohesion, personality conflicts between group members and bank officials, and contingencies such as a costly medical emergency combined to make loan repayment difficult. From the BANADESA experience, five conclusions are drawn: (1) The complexity of borrower group dynamics requires that much attention be given to identifying group functions and to forming groups. Groups,

which ideally should consist of 10-20 members, are less stable if organized solely to obtain credit. (2) Group lending does not always reduce loan forms, requirements, collateral, etc. Some loan requirements are set by law or are deeply ingrained in the institution itself. (3) Joint liability, while essential, is not easily accepted by farmers or easily implemented by credit institutions. Farmers are reluctant to cover another's debt and good borrowers may be disqualified because their group defaulted. (4) Factors outside the group's control may cause serious group delinquency problems. (5) Farm record keeping is more readily accepted by groups receiving cash credit. It is concluded that group lending, while not a panacea for small farm development, holds promise if existing problems can be eliminated.

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Paper copy \$4.81 Microfiche \$1.08

## **075 PN-AAJ-252**

### **MANAGING SMALL FARMER CREDIT PROGRAMS: A CASE STUDY IN HONDURAS**

Parks, L.L.; Mapp, H.P.  
Oklahoma State University, Department of Agricultural Economics.  
1980, 99 p.

*In International Development Series, No. 80-4*

The rising cost of agricultural inputs and farmers' limited funds make successful credit extension services essential to small farm ownership and operation in the developing world. This study, part of A.I.D.'s Small Farmer Credit Project, details an effort to improve the credit management and lending practices of the National Agricultural Development Bank of Honduras. The information collecting and processing component involved several activities. Loan files were investigated to determine the relation of the Bank's use of enterprise budgets to loan authorization, cash disbursement, and loan default. Farm records were analyzed for information on prices, resources, profitability, cash flow, and other variables. Next, a recordkeeping system was developed, tested, and modified in Jutiapa, Las Playitas, Ajuterique, and El Matazano. Simple, accurate crop and livestock enterprise budgets and a system for collecting input and product prices were then instituted in the 13 Bank regions. The loan administration and evaluation component involved many policy and procedural changes, such as adding fixed costs to production cost estimates and including living expenses in calculating loan repayment, only some of which were implemented. A client classification scheme was created to tailor loan processing to different clients and amounts. New, standardized forms and procedures were designed to replace the existing tedious small loan application system. Loan officer field books and activity logs with information on enterprise budgets, product and input prices, and clients were also developed. To take advantage of the lower overhead on group loans, a methodology for their administration was developed and implemented in three areas. The training component was heavily oriented to farm management and concentrated on farm finan-

cial analysis, investment analysis, and farm recordkeeping as well as on training a cadre of teachers. Although the project's narrow focus and short duration did not impede achievement of objectives, its future impact is dependent upon the Bank's strength and commitment to keeping trained people in key positions. A list of 7 English and Spanish references (1979-80) is appended.

AID/ta-BMA-2

931113400

Paper copy \$12.87

Microfiche \$2.16

**076**

**PN-AAJ-341**

**ANNOTATED BIBLIOGRAPHY ON AGRICULTURAL CREDIT AND RURAL SAVINGS: PART VI**

Adams, D.W.

Ohio State University, Department of Agricultural Economics and Rural Sociology.

1980, 69 p.

Providing access to agricultural credit and promoting rural savings are two essential elements of rural development strategies. To determine the effectiveness of these interventions, A.I.D.'s Office of Rural Development and Development Administration (DS/RAD) has contracted Ohio State University to prepare a series of annotated bibliographies on agricultural credit and rural savings. This document, the sixth in this series, is divided into two parts. The first section contains 157 English and Spanish titles (1962-80) concerning the growth, application, and consequences of agricultural credit; the second section presents 22 English-language titles (1966-80) pertaining to studies on rural savings. While both sections cite studies pertaining to developed countries (West Germany, Canada, South Africa, Iceland, and the United States), the majority of the studies cited pertain to developing countries in Africa (Ethiopia, Ghana, Kenya, Nigeria, and Tanzania), the Caribbean (Dominican Republic and Jamaica), East Asia (China, Indonesia, Korea, Malaysia, the Philippines, and Taiwan), South Asia (Bangladesh, India, Nepal, and Sri Lanka), South America (Bolivia, Brazil, Chile, Colombia, El Salvador, Guyana, Nicaragua, Surinam, and Venezuela), and the Near East (Pakistan). Each entry is accompanied by a synopsis to assist the reader in making appropriate selections. Author, organization, and geographical indices are appended.

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Paper copy \$8.97

Microfiche \$1.08

**077**

**PN-AAJ-477**

**AN ANALYSIS OF THE VARIABLES THAT AFFECT THE ECONOMIC BEHAVIOR OF FARM-HOUSEHOLDS IN THE SOUTHERN VALLEYS AREA OF BOLIVIA**

Van de Wetering, H.

Experience, Inc.

1981, 221 p.

As part of an AID-funded agricultural sector analysis in Bolivia, this report presents results of a 1977-80 socioeconomic survey of 699 representative farm households in Bolivia's southern valleys to determine the factors affecting farm household economic behavior. The survey presents descriptive information on the farm producer and his/her household (e.g., the farm; crop production, consumption, and sale; technology and crop production expenditures; livestock production; processed products; nonfarm income and expenditures; and credit) and provides a basis for establishing causal relations between rural net income and employment and the following independent variables—agricultural wage rates, relative efficiency of labor and land, size of household, rural nonfarm employment opportunities, size of area operated, prices received by farmers, and the cash outlay on off-farm produced inputs. Most important among the survey's findings are that: (1) in 1977, the average annual per capita farm household income was \$92; (2) off-farm income accounts for 44% of net farm household income; (3) farm households with members employed off-farm have substantially higher incomes than farm households relying on farm income exclusively; (4) substantial mobility of labor between farms exists within the region and between Bolivia and contiguous countries; (5) time to market exerts a significant influence on net farm income yet prices received for basic food crops are not systematically related to it; (6) only 1.5% and 3% of the region's farm households receive technical training/assistance and bank credit, respectively, despite higher net farm incomes for those households that do receive training and credit; (7) cash expenditures on agricultural inputs are approximately 75% of the average farm-household's cash income; (8) yields per hectare on farms using modern inputs (fertilizer, pesticides) are not systematically higher; and (9) yields per hectare are significantly higher for farms less than 1 hectare. The author recommends that future studies be focused more on specific agricultural issues and that farm household livestock sectors be analyzed separately from crop sectors. A 14-item reference list (1955-80) is appended.

AID/SOD/PDC-C-0219

511048500

Paper copy \$28.73

Microfiche \$3.24

**078**

**PN-AAJ-563**

**SINGLE-EQUATION ESTIMATION OF FOOD CONSUMPTION CHOICES IN RURAL SIERRA LEONE**

Smith, V.E.; Strauss, J.; Schmidt, P.

Michigan State University (MSU), Department of Agricultural Economics.

1981, 123 p.

*MSU Rural Development Working Paper No. 13*

Predicted nutritional effects of economic policies must account for the significant role played by income and price variables in influencing food consumption of rural households. This study, based on data collected during the 1974-75 growing season from 138 households, uses a single-equation least squares

regression analysis to study the determinants of food consumption choices in semi-subsistence households in rural Sierra Leone (SL). The regressions represent the combined effects of household production and consumption decisions in response to economic and demographic variables. Two classes of regression are used: quantity equations, which estimate the quantity of food available for consumption; and share equations, which predict the share of total annual expenditure a household devotes to specific foods. Fifty-two variables are examined as determinants of food quantities available to the household—2 relate to total household expenditures; 21 are price variables; and 29 describe household characteristics such as size, age, and sex distribution. Analysis reveals that household expenditure or income levels, prices, household size and composition, regional location, and ethnic identity all affect food consumption choices of rural SL households. Whether and what a household produces for the market or for its own use affects consumption. For example, households that produce mostly for themselves consume more palm oil and groundnuts, while households producing for market eat less cassava, sorghum, and other cereals. No such relationship is noted for rice. However, regional and ethnic groupings do reveal significant differences in rice consumption. Positive expenditure elasticities are noted for rice, palm oil, fish, vegetables, and alcoholic beverages; for rice and palm oil, these elasticities generally fall as expenditure levels rise. While food preferences, climate, and soil are major consumption determinants, households also adapt their consumption practices to crop sale and food purchase prices. For example, households, especially those with low incomes, compensate for high rice prices by reducing their consumption of several other foods. An 11-item bibliography (1974–80) and a list of 31 MSU rural development papers are appended.

AID/DSAN-C-0008 931131500  
Paper copy \$15.99 Microfiche \$2.16

## 079 PN-AAJ-700

### DUALISM, TECHNICAL CHANGE, AND RURAL FINANCIAL MARKETS IN DEVELOPING COUNTRIES

Iqbal, F.  
Rand Corporation.  
1981, 40 p.

Research to date on rural financial markets (RFM) in developing countries has failed to explain the relationship between the growing dualism of RFM's into formal (banks, cooperatives) and informal (private moneylenders) credit sources and farmers' acceptance or rejection of new farm technology. This report, based on a 1968–71 survey of 3,000 Indian farmers, examines this relationship and its implications for Indian policymakers. An overview of India's current rural credit situation reveals the growing importance of both formal credit sources and of technological change in the demand and supply of credit and the tendency for less-progressive farmers to seek credit from informal moneylenders. The determinants of infor-

mal credit interest rates are then analyzed with the help of an empirical model based on the opportunity costs of providing a loan, the administrative costs of handling a loan, and the risk factor assigned to various types of borrowers. Analysis indicates that informal credit interest rates, especially for consumption loans, which constitute 85% of all informal loans, are reduced to the extent that farmers possess more land, adopt new technology and so have greater yields, and are educated, thus posing less of a credit risk. This view contrasts sharply with the view that presupposes a greater risk factor in the new technology to explain why farmers are reluctant to adopt it. Analysis indicates further that the presence in a village of a formal credit source which provides—according to government regulation—low interest rates, reduces the informal interest rate 2.7%–3.6%. This finding confirms the hypothesis that the presence of such formal sources forces informal sources which formerly monopolized the village credit market to become competitive by reducing their "monopoly surcharge". Although this competition is healthy, government interest-rate policies appear to be overcompensating for the "monopoly surcharge" which is, in fact, comparatively low. Finally, policymakers are invited to adopt the study's main finding—that credit interest rates are lowered to the extent that technical change is adopted. Appendices include a 29-item bibliography (1957–80).

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Paper copy \$5.20 Microfiche \$1.08

## 080 PN-AAJ-877

### AN ANALYSIS OF FACTORS AFFECTING THE ADOPTION OF MODERN VARIETIES IN EASTERN NEPAL

Rawal, T.  
Agricultural Development Council, Inc.  
1981, 18 p.

*In Research Paper Series, No. 11*

Due to land constraints, Nepal requires yield-increasing technology to maintain food self-sufficiency. Although rice is Nepal's main farm income crop, yield per hectare is less than 2 tons due to the lack of modern seed varieties (MV's), fertilizer technology, and controlled irrigation. This paper analyzes variability in the adoption of rice and wheat MV's and in the use of chemical fertilizer in Nepal's Morang and Sunsari provinces. Data were collected and analyzed with the help of multiple linear regressions. Rice MV's were found to have a 30% higher yield than local varieties (LV's); a comparison of wheat varieties was impossible as wheat LV's are no longer grown. The factors identified as influencing MV rice adoption include farm size; proportion of low land to total land; proportion of farm irrigated; size of available family labor force; operator's education; contact with extension agents; number of years since MV rice was first used; and the farmers use of institutional credit. These same factors, especially irrigation, influenced the adoption of

MV wheat. Possible explanations for the slow adoption of MV rice are the existence of established markets for LV rice and the difficulty of drying high-moisture MV rice during monsoon periods. Furthermore, the main MV rice variety grown in Nepal is IR8, considered less palatable and more susceptible to insects than LV's. Labor requirements are similar for LV and MV rice production, but hired labor, as distinct from family labor, is used to a greater extent with MV's. Variability factors on the use of chemical fertilizers include cost, experience use, area planted with MV's, farm size, and credit. Research is needed to replace IR8, while investment in irrigation, education, and extension programs could expand the type of environment in which MV's are best adopted. Five illustrative tables and a 13-item reference list (1954-79) is included.

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**081 PN-AAJ-878**

**THE IMPACT OF MODERN VARIETIES OF RICE ON FARM INCOME AND INCOME DISTRIBUTION IN EASTERN NEPAL**

Karki, B.B.  
Agricultural Development Council, Inc.  
1981, 20 p.

*In Research Paper Series, No. 12*

Despite general agreement that modern rice varieties (MRV's) are higher yielding than traditional rice varieties (TRV's), researchers differ sharply on whether adoption of MRV's favors large over small farmers and capital over labor. To help resolve these issues, a survey, results of which are here presented, was conducted of 180 farmers in Eastern Nepal to identify the relationship between farm size and the adoption of MRV's and to estimate the costs and benefits of MRV and TRV technologies. A Chi square test indicated that larger farmers did not adopt MRV's to a significantly greater degree than did small farmers. A study of cost components showed that although expenditures for MRV's were 56% higher than for TRV's due to needed inputs such as irrigation pumpsets and fertilizer, MRV's had a 42% higher yield, resulting in a 22% increase in net income per hectare. A higher proportion of hired labor is used in MRV production (78% compared to TRV's 56%) and is accompanied by an absolute decline in total family labor. To determine whether MRV benefits have been distributed equitably—a key aim of the Government of Nepal's agricultural development policy—the elasticity of substitution between capital and labor was measured through a constant elasticity of substitution production function for both MRV and TRV technologies. It was found that the elasticity of substitution did not differ significantly, indicating that MRV technology is neither labor- nor capital-biased compared to TRV technology. Thus, the goals of increased agricultural production and equitable distribution seem to be attainable. Researchers argue, however, that mechanization and MRV adoption could polarize rural communities into large commercial farmers and landless peasants. To date, tenants are not adopting MRV's to the same degree as

owner-operators, because tenants, while having to bear the full increased cost of MRV's, are forced to share increased production with the land-owner. Effective implementation of Nepal's Land Reform Act and caution regarding mechanization could help popularize MRV's while helping to reduce income disparities. A 16-item reference list (1961-79) and 7 illustrative tables are included.

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Paper copy \$2.60 Microfiche \$1.08

**082 PN-AAJ-879**

**RICE PRODUCTION IN THE TARAI OF KOSI ZONE, NEPAL**

Karki, B.B.; Rawal, T.; Flinn, J.C.  
Agricultural Development Council, Inc.  
1981, 28 p.

*In Research Paper Series, No. 13*

To determine the comparative profitability of the adoption of modern rice varieties (MV's) in Nepal for owner-operators, tenant farmers, and hired labourers, this paper analyzes the impact of MV's on the income and employment of these three groups in the Kosi zone of Nepal, a major rice-exporting area and target zone for Nepal's land reform and MV extension services. MV's, particularly IR8, are grown on 25% of the Kosi rice land, predominantly by owner-operators on the basis—as indicated by a standardized discriminant function—of tenure, farmer's education, and access to irrigation and production credit. Tenants are obliged to share over 44% of their crops with the landlord, but failure to enforce the rent system and land reform laws makes owners' gross margins even higher. Until tenants are able to pay a fixed rent or are allowed cost-sharing arrangements, it will be unprofitable for them to grow MV's. While not directly benefiting from MV's, as owners do, tenants and landless labourers do possess increased employment opportunities due to the need for high labour inputs in MV crop management, irrigation, harvesting, and threshing. Since MV's mature in the wet season, and not in the dry, as do local varieties (LV's), additional labour is required for timely harvesting to prevent crop spoilage and loss. As compared with yields for LV's, which are generally rainfed (1.8 tons/ha), MV's produce higher yields both when rainfed (2.1 t/ha) and when irrigated (2.8 t/ha). A budgetary analysis divides total production costs into labour (40-50%), seed accounts (10-14%), bullock power (16-24%), and fertilizer (up to 25% for irrigated MV's). This analysis concludes that although the benefit-cost ratio is higher for irrigated MV's than for LV's, the MV's lower unit value of grain and straw and higher input costs make rainfed MV's less cost-effective than LV's. Experiments with irrigated MV's have produced yields of over 3 t/ha, indicating that limitations on MV production (e.g., climate, availability of fertilizer, unsuitability of local soils) can be overcome to further increase yields. A 34-item list of references (1952-80) is appended.

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Paper copy \$3.64 Microfiche \$1.08

083

PN-AAJ-926

## CAPTURING THE ECONOMIC SURPLUS CREATED BY IRRIGATION

Easter, W.K.  
Minnesota University, Department of Agriculture and Applied Economics.  
1980, 25 p.

*In Staff Paper Series, No. P80-14*

Irrigation projects, once economic assets to developing countries, are now financial burdens that draw on general revenues to pay rising construction, maintenance, and operating costs. This report concludes that irrigation projects should net an economic surplus as long as planners use a price-flexible design responsive to regional irrigation needs and governmental revenue requirements. The report first describes the two goals of irrigation pricing policy, namely, to recover operating costs and to control water allocation. Next, the six types of water charges are examined. Volumetric charges are suited to countries where water is scarce and allocation must be efficient. Water share pricing is used in areas where it is more efficient to charge for the number of irrigations or the amount of time water flows into irrigated plots. Charging a fixed rate per acre is recommended for areas with large water resources because it has no effect on water use efficiency. Levying a tax on the output of irrigated land makes fee collection easier but also has no effect on water use efficiency. A developmental fee is applied to areas where greater irrigation use over time is desired; here, low fees will be raised incrementally as more farmers increase the output of the irrigated region. Finally, taxes may be levied on all lands in the irrigated area under the assumption that irrigation expands the entire region's economy and that everyone benefitting should contribute to covering costs. Factors affecting irrigation pricing policy, treated next, include water value, demand elasticity, dependability of supply, ability to contain water return flows, irrigation system capacity, traditions of ownership and water law, training, desires to subsidize agriculture, and indigenous experience with irrigation. Finally, five alternative criteria for setting irrigation fees are presented: meeting target revenues; benefit pricing to recover the economic surplus generated; taxing net returns; and recovering total cost or marginal costs. Incorporating price flexibility into project design is recommended to permit control of water allocation and to allow fee revisions over time. A 23-item list of references (1960-80) is appended.

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084

PN-AAJ-916

## THE POLITICAL ECONOMY OF BOLIVIAN AGRICULTURAL CREDIT

Ladman, J.R.; Tinnermeir, R.L.  
Ohio State University, Department of Agriculture.  
1979, 30 p.

Although developing country governments ostensibly provide agricultural credit for purely economic purposes, they also do so for political reasons that may influence economic performance. To substantiate this view, this paper explains the structure of developing country credit programs and presents supporting evidence from Bolivia. Developing country governments typically control formal credit by creating public agricultural development banks or by establishing private credit portfolio requirements. Money is lent to farmers at concessionary terms to compensate for structural injustices, such as low crop prices, inherent agricultural risks, and the paucity of rural infrastructure. Repayment schedules are often lax, allowing long-term delinquency and default. This policy results in substantial transfers of income from taxpayers and savers to rural borrowers, thus giving government officials significant political leverage over agricultural land holders and credit seekers. Unfortunately, misuse of credit distribution also gives rise to resource misallocation, government corruption, and diversion of credit from agricultural to nonagricultural uses. During the period 1966-75 in Bolivia, evidence suggests that the government manipulated agricultural credit to favor large farm owners in the politically and economically eminent region of the Oriente (eastern lowlands). Of Bolivia's Agricultural Bank's (BAB) credit, 76% was directed to cotton, sugar, and rice farmers in the eastern Department of Santa Cruz, and of those loans, 50% were delinquent, and more than one-third had been refinanced, indicating credit diversion. Virtually no credit was directed to the numerous peasants in the Altiplano (highlands). Although calculations are lacking, it is suspected that this policy has worsened personal and interregional income distribution within the country and that overall economic development has suffered. While the economic merits of scrapping concessionary financing are clear, the political consequences will dictate against it.

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085

PN-AAJ-019

## PRELIMINARY GUIDE TO AUDIOVISUAL MATERIALS ON ENVIRONMENTAL AND NATURAL RESOURCE ISSUES IN DEVELOPING COUNTRIES

Natural Resources Defense Council.  
1980, 43 p.

*A Survey for the U.S. Agency for International Development's Man and the Biosphere Program*

A.I.D.'s focus upon environmental problems is still relatively new, and there remains a need to increase understanding among A.I.D. personnel and their host country counterparts of the importance of maintaining environmental quality and a sound resource base. Audiovisual materials can play an important role in this task. This guide, compiled by the Natural Resources Defense Council, includes references to 84 audiovisual materials suitable for use in programs which address the relationship between the environment and natural resources and development. In compiling this guide, requests for information about such materials were sent to over 100 government agencies, academic institutions, environmental organizations, and commercial film distributors in the United States and abroad. The items listed in the guide were chosen on the basis of whether they discussed and/or illustrated: (1) the effects of economic development upon the human environment; (2) the impacts of natural resource degradation upon human well-being; or (3) an approach to the protection and management of natural resources. Consideration was also given to whether the material considered such issues in a developing country setting or in a context relevant to A.I.D. and developing country concerns. The guide does not include recommendations on the quality or usefulness of any of the items, but does provide the following information for each entry: the title of the material; name of producer; date of production; a description of the content; format (16 or 35 mm film, slides, videotape, or cassette); length in minutes; color or black and white; language (most are in English, but a few are available in Spanish, Japanese, or French); name and address of distributor; purchase and rental prices; and loan availability. Subject and geographic indices and a list of 21 sources of information and materials are appended.

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086

PN-AAJ-317

## DEVELOPMENT ASSISTANCE IN FORESTRY: AN A.I.D. POLICY BACKGROUND PAPER

Simmons, E.  
A.I.D.; Forest Resources Group.  
1980, 53 p.

A.I.D. has both the mandate and the experience to help developing countries address the serious global environment problem of deforestation. This A.I.D. policy background paper identifies current forestry issues, describes A.I.D. forestry-related experiences, and sketches an A.I.D. forestry strategy

for the 1980's. Most forestry problems occur when ecosystem use is changed in non-sustainable ways, i.e., ways which render forests continuously unproductive. Rapid population growth rates and inadequate technologies give rise in developing countries to four unsustainable forest use patterns: excessive fuelwood collection; shifting cultivation; replacement of forest lands with pasture and forage production; and unrestrained timber harvesting. In addressing these problems, past A.I.D. projects have concentrated on analysis, planning, and policy formulation including natural resource inventories and land use assessments, land capability classification, and evaluation of tenure law and its applications; institution-building for natural resource management and conservation, including training and establishing management and service support systems; incorporating forestry activities into agricultural and rural development programs; reforestation and protection of natural and induced vegetation; and developing alternative energy strategies. The author recommends that future A.I.D. forestry projects aim at: (1) raising the level of developing country awareness of the forestry problem; (2) supporting direct forestry development initiatives such as identifying critical catchment areas and training local people for local forestry projects; (3) reducing the causes of deforestation by developing renewable and alternative energy sources and appropriate and sustainable cropping systems; (4) increasing efficiency in the use of forestry and other natural resources by technological improvements and controlling resource use rates; and (5) improving institutional capabilities for forestry and natural resource management. Implementing this strategy will require a careful identification of priority activities by USAID's, accommodation to the longer time span required for forestry development, and marshalling the necessary funds, technology, and personnel.

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087

PN-AAJ-322

## ENVIRONMENTAL DESIGN CONSIDERATIONS FOR RURAL DEVELOPMENT PROJECTS

Harza Engineering Company.  
1980, 189 p.

The success of rural development projects largely depends on the appropriateness of project design to the target area's natural and social environment. This manual, intended for use by A.I.D. field officers, development consultants, and host-country planners, presents guidelines for identifying potentially desirable and undesirable environmental effects that may accompany small rural projects (with some attention given to situations in larger villages and periurban areas) and applies these guidelines to specific types of rural projects. Rural communities are generally small and self-sufficient, making it especially important to consider, at the design stage, a project's impact on all members of the community and the need to remove obstacles so that villagers can advance themselves without becoming unduly dependent on others. Environmental effects may be expected in several areas including human



ecology, health, air and water quality, pesticide contamination, and endangered species. Consideration of indirect effects is important, including the effects on groups other than the intended beneficiaries. Projects should be treated in an integrated regional or national context since individual projects may compete for resources or may supplement each other. Interagency coordination may also be needed. Steps in environmental planning include project definition, understanding of area characteristics (baseline conditions), analysis of potential impacts, and planning to mitigate adverse impacts and enhance benefits. Five specific types of rural projects are discussed in detail: roads, electrification, water supply and sanitation, irrigation and on-farm water management, and small-scale industry. Project description, environmental considerations, mitigation and enhancement measures, operational evaluation and monitoring, and planning information required are discussed for each project type. Appendices discuss human ecology, environmental health, and water quality. Ninety-five references (1954–80) are listed in four bibliographies.

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**088**

**PN-AAJ-431**

## **THE ECONOMICS OF VILLAGE-LEVEL FORESTRY: A METHODOLOGICAL FRAMEWORK; FINAL REPORT**

Shaikh, A.M.; Larson, P.S.  
1981, 77 p.

Many of the small-scale, decentralized energy projects intended to meet the developing world's deepening deforestation crisis lack a thorough economic analysis at the design stage and consequently are economically unsound. This report enunciates an economic methodological framework for energy project formulation and development, broadening the traditional tools of cost/benefit analysis to fit the complexities of village-level forestry programs (VLFP). The author accordingly considers the project's investment and benefit levels, distribution of incentives and decision-making, allocation of burdens and outputs, property rights/land tenure relationships, and specific resource scarcities; especially as pertaining to individual evaluations of the risk of project participation. To be economically sound, a VLFP must be financially attractive to investors (on local, private, and governmental levels) and to society as a whole, and be efficient, that is, replicable within reasonable time, financial, and institutional constraints. Government subsidies should at least equal a VLFP's societal benefits and should also be proportional to the project's overall contribution to national objectives and to long-term budgetary resources. When quantified in economic terms, these ratios can provide an approximate figure adequate to assess a given project design's budgetary implications. VLFP's are to be economically evaluated on both investor and social levels in terms of initial/recurrent inputs and direct/indirect outputs. Values of all items are identical on both levels except the input of peak-season

labor and the indirect output of environmental and soil fertility benefits. After summarizing the information needs for estimating the input/output valuation, the author applies the analytical model to two projects in Mali's Mopti region to create a community woodlot and to plant trees on individual farmlands. A comparison between the two efforts indicates that woodlots require high commercial output and are less attractive from the investor, social, and project efficiency viewpoints. Appended to the report is a 60-item (1975–81) bibliography in French and English.

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**089**

**PN-AAJ-889**

## **WORKSHOP ON ECOLOGY AND ENVIRONMENTAL PROGRAMS IN THE SAHEL, BAMAKO, MALI, JANUARY 22-26, 1980; STAFF SUMMARY REPORT**

National Academy of Sciences, National Research Council, Board on Science and Technology for International Development, Advisory Committee on the Sahel.  
1980, 60 p.

The accelerating degradation of the Sahel's ecosystem urgently requires research on controlling desertification. This report reviews a workshop held to address this need at which the National Academy of Sciences assisted the Sahel Institute (INSAH) of the Inter-State Committee for Combating Drought in the Sahel (CILSS) to prepare its First Quinquennial Research Program (1981–85). The workshop assigned highest priority to three research themes from the CILSS's Plan to Combat Desertification: (1) evaluation of the impact of development activities and policies on the Sahelian ecosystem; (2) assessment of the Sahel's natural resources and their evolutionary tendencies; and (3) investigation of genetic improvement as a means to diversify, restore, and rationally manage vegetation. In each of these Program areas workshop participants called for both fundamental and applied research, improvement of research methods and techniques, evaluation of policies, collection of scientific and technical information, dissemination of research results, and integration of training into research efforts. Above all, the participants declared that the Program must be compatible with ongoing national and regional projects. The Program will be conducted by a team consisting of an ecologist, a natural resource planner, and a forest manager who will briefly tour each CILSS country. NAS proposed, subject to final agreement and adequate manpower and funding, in part from A.I.D., cooperation with INSAH in further defining the Program; strengthening regional networks, possibly in cooperation with other donors; and designing and evaluating projects. In conclusion, it was noted that planners in the Sahel must more aggressively introduce and test arid zone food and cash crops; focus on collecting indigenous, adapted species; undertake revegetation around well-points in cooperation with pastoralists; promote greater stability in agriculture in marginal areas; seek local participation; emphasize the northern zones of the Sahel; and heed local social and environmen-



tal adaptations. Appendices include a list of the workshop's participants and French-language copy of the Plan to Combat Desertification.

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Paper copy \$7.80

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## 090

**PN-AAJ-395**

### **DRAFT ENVIRONMENTAL REPORT OF HONDURAS**

Silliman, J.R.; Hazelwood, P.

Arizona University, Office of Arid Land Studies.

1981, 117 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*

Honduras suffers major environmental problems which, due to the increasing exploitation of marginal lands by a rapidly expanding population and the implementation of more ambitious natural resource exploitation programs, are currently reaching crisis proportions. So concludes this AID-funded draft report on the country's environment and natural resources. Against background descriptions of the Honduran geography, climate, population, and land use, the study outlines the country's environmental resources (geologic and soil, water, and flora and fauna) and current conservation measures and details major problem areas. The country's main environmental problem is soil erosion and loss of soil fertility due to uncontrolled agricultural settlement and the widespread use of traditional slash and burn cultivation systems by small farmers migrating to increasingly marginal and sloping lands. In addition, alluvial and valley soils best suited to intensive cultivation are frequently used for less productive and less labor-intensive pastureland. If forest resource depletion—caused by major lumber and pulp cutting projects, increased use of timber among rural populations for fuel, and accelerated clearings for agricultural development—continues at its current (1980) annual rate of 60,000 ha, forest resources will be completely exhausted by the year 2000. Other environmental problems are the unintentional results of rural and urban development. Although not widespread in Honduras, problems associated with the indiscriminate use of agricultural pesticides such as human and animal poisoning and malaria, have been discovered in neighboring countries. Surface water contamination leading to contagion of disease through drinking water plagues Tegucigalpa and threatens other urban and semi-urban areas having inadequate sewage and water treatment systems. To help preserve remaining resources, the authors recommend establishing a national policy to manage and control land use; reserving land tracts for prioritized land uses; and enforcing current environmental law. Appendices include a summary of Honduran environmental law and policy and a 111-item bibliography (1927–80) in English and Spanish.

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## 091

**PN-AAJ-396**

### **DRAFT ENVIRONMENTAL PROFILE ON THE GAMBIA**

Silliman, J.R.

Arizona University, Office of Arid Land Studies.

1981, 90 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*

Agrarian-based economies that rely on single commodity production are particularly vulnerable to environmental mishaps and natural disasters. This study, a preliminary review of information available in the United States, profiles The Gambian environment to assist USAID and host country officials in preventing such calamities and in using natural resources for advantageous and environmentally-sound purposes. The Gambia's geography, climate, population, and land use patterns are described, its environmental resources assessed, and its current and potential environmental problems exposed. The Gambia is a small, densely populated West African nation with an agrarian economy based on the rain-fed cultivation of groundnuts. Its dominant geographic feature is the Gambia River, a tidal estuary flanked with tall mangrove forests in the western half of the country. Saline waters extend far upstream during the dry season, preventing the use of river water for irrigation. The Organization for the Development of the Gambia River Basin plans to construct a salinity barrage to increase rice production by irrigating double-cropped rice, but more census information is needed to assess the environmental effects of the barrage, as well as of a proposed dredging project between Banjul and Kau-ur and between Kau-ur and Fatoto. The Gambia's major environmental problems are caused by increased pressure on the country's limited land from growing human and livestock populations and include a shortage of fuelwood due to increased clearing of forests for cultivation, cutting for fuelwood, and a lack of well-managed forest plantations; and soil degradation and loss of natural diversity. Water-borne diseases such as malaria and intestinal parasites are also posing major health problems. The author concludes that although lacking in trained staff to implement environmental programs, the governing authorities are environmentally enlightened and The Gambia is sufficiently small and homogeneous that its environmental problems are manageable. Appendices include a 134-item bibliography (1892–1980), an overview of Gambian environmental policy, agencies, and law; and a list of current donor-funded environmental programs.

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## 092

**PN-AAJ-625**

### **DRAFT ENVIRONMENTAL PROFILE ON SYRIA**

Library of Congress, Science and Technology Division.

1981, 89 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*



Despite a steadily rising standard of living, Syria, according to this draft environmental report, faces increasingly ominous problems in regard to its water, soil, and forest resources. Water pollution is Syria's most important water-related problem. A lack of sanitary sewerage disposal systems and the increased dumping of industrial wastes have caused significant ecosystem damage to the Euphrates, Oronte, and Barrada river basins. Unfortunately, little progress has been made in eliminating water pollution since 1972 when the U.N. Conference on the Human Environment named it one of Syria's worst environmental problems. Syria's semi-arid climate forces it to use 94% of its water for irrigation. This has led to overpumping followed by drought conditions in some areas and saltwater intrusion in the coastal plains. Syria's climate also threatens its soil resources. Only 31% of the land is cultivable, and although Syria has reclaimed some of the vast eastern desert, salinity and water-logging are an ever-present scourge in the battle against desertification. Underscoring the desertification threat is Syria's loss of surface vegetation through deforestation. Today, forests cover only 2.4% of Syria's surface area. Strenuous efforts have been made to preserve these forests by restricting animal grazing on saplings, checking erosion, reforesting the land (60,000 hectares as of 1978), and intensively growing poplars. Poplars, because of their fast growth compared to average Syrian forest vegetation, have increased the availability of wood products without seriously impinging on the forest conservation program. Air pollution from car, factory, and refinery exhausts is also a problem in Syria's major cities (Damascus, Homs, and Aleppo), but is not yet as serious as the threat of pollution to water and soil. Syrian wildlife resources appear to be scanty. Although the wolf, the Anatolian leopard, the Syrian wild ass, and the Saudi Arabian dorcas gazelle are listed as endangered species, little information on these or any other species could be found. Basic social and economic data are provided, as are information on Syrian environmental legislation, a list of Syrian environmental and natural resource organizations, and a 44-item bibliography (1967-80).

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**093**

**PN-AAJ-626**

## **DRAFT ENVIRONMENTAL PROFILE ON UNITED REPUBLIC OF CAMEROON**

Arizona University, Office of Arid Land Studies.  
1981, 84 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*

As part of an A.I.D./U.S. Man and the Biosphere Program effort to assist developing countries in environmental planning, this report provides a preliminary profile of Cameroon's environment and natural resources. The report begins by profiling the great natural diversity of Cameroon's four major geographic regions—the Western and Coastal Lowlands, the Southern and Central Plateaus, the Western Highlands, and the Northern

Plains. The marked south-north gradation of both climate and vegetation (tropical rain forest to semi-desert regions) is analyzed with the help of maps and charts. The body of the report reviews Cameroon's socioeconomic characteristics, environmental resources, soil types, water resources, fauna, national parks, and vegetation. Cameroon's main environmental problems are forest destruction, range degradation, and waterborne diseases. Most of Cameroon's forest resources may already be destroyed, and this destruction is endangering wildlife. Although a number of forestry reserves have been set aside, logging concessions and uncontrolled poaching within their boundaries have made them ineffective. Development of a national forest policy, based on an assessment of the extent of deforestation, is a top priority, as is protection of the montane forests in the heavily populated western highlands. The range in the northern semi-arid region has been severely degraded by drought, the overcrowding of stock animals, and extensive underutilization due to tsetse fly infestation. A pilot range management program in the Chari Delta and on the Diamare Plain is recommended, along with trypanosomiasis research on cattle, range seeding projects, and the rotation of livestock water supplies. Schistosomiasis, trypanosomiasis, intestinal parasites, and especially malaria (90% of adults infected) are Cameroon's greatest waterborne diseases, but neither control of malaria (carried by the Anopheles mosquito) or trypanosomiasis (carried by tsetse flies) nor significant improvement in rural water supplies appears likely in the near future. Appendices include a 40-item reference list (1944-80), a 59-item bibliography (1942-75), and a list of host country environmental organizations.

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Paper copy \$10.92

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**094**

**PN-AAJ-805**

## **DRAFT ENVIRONMENTAL PROFILE ON GUATEMALA; PHASE II**

Cooley, J.L.; Farnworth, E.G.; Hoy, D.R.; Jordan, C.F.  
Georgia University, Institute of Ecology.  
1981, 88 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*

Guatemala's expanding population and the resulting demand for wood, cultivable land, and sewage disposal facilities has greatly strained the nation's natural resources. Watershed deforestation, especially on the steep slopes of the Central and Western Highlands, has caused severe soil erosion; animal populations are declining, with many species near extinction; sedimentation from deforested watersheds and sewage dumped directly into rivers and streams has degraded water quality in rural and urban areas, respectively; and pesticide-related human health problems are extensive in the country's cotton growing areas. Besides outlining these major environmental problems, this draft report profiles Guatemala's natural resources, outlines existing environmental policies and institu-

tions and constraints to their effectiveness, and offers short- and long-term recommendations for arresting environmental damage. Suggested short-term responses include implementing a model integrated watershed-village management project; conducting an experimental comparison between till and no-till agriculture; establishing an agricultural/ecological experiment station in the Peten to develop innovative agricultural management systems; setting up at least one forest ecology experiment station; instituting cooperative efforts between conservationists and planners to preserve economically important species in the Transversal lowland rain forest; expanding the Guatemalan "biotope" in the Atlantic montane rain forest to assure preservation of the Quetzal, the national bird; conducting economic analyses of the market and non-market benefits and costs of sewage treatment and of the non-market costs of deteriorating air quality in Guatemala City; and instituting a demonstration project to divert sewage into settling ponds and use the treated sewage and water for agricultural land enhancement. Two long-term recommendations are also suggested: establishing a national institute responsible for environmental policy, research, management, education/extension, and enforcement; and developing economic strategies to replace subsistence agriculture and thus alleviate environmental hazards (e.g., deforestation, soil depletion) associated with it. A list of 18 references (1970-81) and a 50-item Spanish and English bibliography (1950-81) is appended.

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095

PN-AAJ-806

### DRAFT ENVIRONMENTAL PROFILE OF THE ISLAMIC REPUBLIC OF PAKISTAN

Varady, R.G.

University of Arizona, Office of Arid Lands Studies, Arid Lands Information Center.

1981, 235 p.

*Sponsored by A.I.D. through the U.S. National Committee for Man and the Biosphere*

The Islamic Republic of Pakistan faces a population rapidly approaching 100 million, a deteriorating environment, and depleted natural resources in its efforts to improve the standard of living of its people. This report reviews information available in the United States on the status of Pakistan's environment and natural resources. The report's initial section provides a general overview of Pakistan's geography and climate, population characteristics, and land use practices. Section two details the country's mineral, energy, soil, water, and vegetation resources. Specific government agencies, as well as pertinent legislation and policy, are outlined for each resource. Four environmental problem areas are identified. (1) Water-related problems, the most serious being waterlogging, salinity, and sedimentation have been caused by poor drainage of irrigated land, unlined canals, and the proliferation of canals, dams, and



**A nursery worker in northern Pakistan sorts seedlings in preparation for planting. Small tree nurseries such as this are scattered throughout Pakistan.**

barrages. Flooding, drought, and water/ marine pollution are additional concerns. (2) Rural environmental problems include natural disasters, underuse and misuse of lands, and excessive pesticide use, but deforestation and desertification caused by conversion of land to agriculture are of most concern. These result in gully and topsoil erosion, increased flooding, destruction of faunal habitats, elimination of natural predators of pests, and eventual abandonment of the land. In addition, overgrazing is rapidly reducing the potential of Pakistan's vast rangelands. (3) Urban environmental problems include increased industrial and noise pollution, but the greatest concern is for the dramatic increase in malaria after a period of apparent control in the late 1960's. Mosquitoes are becoming more resistant to insecticides and their breeding places are increased by irrigation projects. (4) Environmental management problems include interagency rivalry, inefficiency, manpower shortages, and communication problems among government environmental agencies. Public apathy also interferes with effective control. Appendices include overviews of Pakistan's demography, economy, and environmental legislation, and a 104-item bibliography (1966-80).

SA/TOA-01-77

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096

PN-AAJ-100

**REPORT OF STRATEGY ADVISORY GROUP ON ANTI-MALARIA SUPPORT STRATEGY FOR TROPICAL AFRICA**

Dalmat, H.T.; Eason, J.C.; Farwell, A.E.  
American Public Health Association (APHA).  
1980, 176 p.

Malaria is the greatest threat to life and socioeconomic development in tropical Africa. Given a problem of such magnitude, A.I.D. convened a Strategy Advisory Group to determine if donor assistance can avert or at least blunt malaria's devastating impact in the area. This report summarizes the Group's findings, identifies achievable malaria control goals, techniques and approaches to reach those goals, the steps which African countries must take, and the response required of donors. Since the eradication of malaria is currently unfeasible in all but the coastal islands of Africa, a more limited goal must be adopted, namely, of "controlling" or reducing the prevalence of malaria so that it is no longer a major public health problem in tropical Africa. The report lists 18 constraints to this goal while highlighting four of them: inadequate training facilities, limited resources, inflation, and inadequate assignment of priority to malaria problems. Malaria control techniques and strategies in rural and urban-periurban areas and for atypical situations (by reason of geographical area or a program not directly related to malaria) are restricted to the parameters set by these constraints. Priority is given to curative (versus preventive) administration of an effective drug to all suspected cases of malaria and extension of malaria chemoprophylaxis to the most vulnerable groups—children under five and pregnant women. While techniques vary in different situations, general strategy requirements remain constant: (1) an organizational structure; (2) advance planning on all levels; (3) coordination of in-country activities; (4) training on all levels; (5) applied and developmental research, with emphasis on developing new anti-malarial drugs; (6) small-scale projects; and (7) ongoing evaluation. Donor support for these seven areas is recommended. Similarly, donors are unwilling to assist without evidence of a long-term national commitment to a goal-oriented, well-planned, and technically feasible anti-malaria program. The study concludes by stressing the importance of cooperation among African countries and among donors. A.I.D.'s questions to the Strategy Advisory Group are appended.

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097

PN-AAJ-112

**STRATEGY AND GUIDELINES FOR IMPROVEMENTS IN SANITATION AND WATER SUPPLY IN SELECTED AREAS OF THAILAND**

Pineo, C.; Barokas, R.; Batavia, M.  
American Public Health Association (APHA).  
1980, 135 p.

In an effort to expand its rural water supply and sanitation (RWSS) program in Thailand, A.I.D. contracted APHA to assess the impact of past A.I.D. RWSS projects in the country and to develop a strategy and options for further A.I.D. RWSS projects. Focusing their attention on the poorest of the rural poor, the APHA team, whose findings are here presented, visited 40 villages with an average population of 753 and representing 0.42% of 10 of the 20 provinces in which A.I.D. is participating in the Accelerated Primary Health Care (PHC) Project. Factors favoring implementation of an RWSS program in villages of less than 1,000 included the existence of the Ministry of Public Health (MPH) and its RWS/S Divisions, with their experience and their structure targeted to the local level; the success of past and present A.I.D./MPH programs, especially the ongoing PHC program; the existence of national RWSS targets; and the pressing need and desire of villagers for improved RWSS facilities. Constraints to an RWSS program are a lack of: trained personnel (including supervisory personnel) and transportation; adequate maintenance even for simple hand pumps; an adequate data base (including data on villagers' preferences regarding potable water sources); and a coordinated plan and funding. The following strategic actions were suggested: (1) assist in a detailed study of RWSS in all 20 provinces in the PHC program and develop an RWSS component for the project, arranging for four expatriates and 20 Peace Corps Volunteers to help develop and implement the component; (2) develop an MPH/USAID/T public health program and an RWSS project that can be implemented by MPH's RWS/S divisions; (3) provide training and transportation for MPH sanitationists; (4) train villagers in RWS/S; (5) help the RWS Division complete the proposed program's piped water supply portion and reestablish its maintenance responsibility; (7) train two RWS/S staffers, one each in the respective technical programs, and one each in management, supervision, organization, and logistics; and (8) develop options for water supply and excreta disposal interventions responsive to village needs (specific suggestions are included).

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PN-AAJ-134

**HEALTH FOR HUMANITY: THE PRIVATE SECTOR IN PRIMARY HEALTH CARE**

National Council for International Health, 6th International Health Conference, Washington, D.C.  
1979, 127 p.

*Sponsored by the National Council for International Health*

Focusing on primary health care (PHC) delivery has, over the past five years, markedly improved the health status of the world's poor. These proceedings of the sixth international conference of the National Conference for International Health document the key role played by private voluntary organizations (PVO) in this process. Under the general heading of the private sector's role in PHC, consideration was given to the economic constraints faced by PVO's in PHC delivery; the need



## HEALTH

to emphasize village-level delivery of PHC; stimulating community response; and fielding PHC pilot projects. Funding PVO health projects was discussed from the viewpoint of A.I.D. and PVO managers. A section on recruiting, training, and retaining PHC personnel includes papers on the training programs of CARE and the Canadian University Service Overseas, and on Save the Children Foundation's strategy for developing community PHC awareness. The latter subject was also discussed from the viewpoint of the Pan American Health Organization (PAHO), Canadian and Guatemalan PVO's, and, more generally, as a requisite to promoting village health and well-being. Other papers treated PVO interaction with the World Health Organization (WHO) in achieving good health for all by the year 2000; Catholic Relief Services' experience in maternal and

child health programs; primary eye care delivery; requirements for an effective health worker; and the use of oral rehydration therapy in PHC. Finally, case studies were presented on community PHC delivery by mission hospitals in Haiti; the role of mission hospitals as agents of change in Zaire; and the use of PVO's in Tanzania. Questions that run throughout the papers included: whether access to the community is best accomplished through direct PHC programs or through interventions in other areas of need such as education; how political factors aid or impede PHC programs; and how best to use limited health assistance financial resources. A list of conference participants is appended.

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***The report of the 1978 WHO-UNICEF Conference on Primary Health Care identified immunization against the major infectious diseases as one of nine key basic components in primary health care. Here, a health worker administers an oral polio vaccine to a young Thai child.***





099

PN-AAJ-253

## **WHOLESOME AND PALATABLE DRINKING WATER: A BACKGROUND PAPER ON WATER QUALITY ASPECTS OF WATER SUPPLY; VOLUME I**

Chamberlin, C.E.; Boland, J.; Malik, A.; Shipman, H.  
1979, 108 p.

*Volume II, Appendices, published separately: PN-AAJ-254, 61 p.*

To provide background material for A.I.D.'s participation in the World Water Supply and Sanitation Decade, a panel of experts prepared a two-volume report (text and appendices) on water quality—defined in terms of wholesomeness and palatability—and its role in devising rural water supply (RWS) programs in developing countries. Discussed in turn are the historical development of water quality standards; contemporary techniques for assessing water quality and the difficulty of applying these standards in developing countries; and trade-offs between the quality and availability of water in RWS programs. Contemporary water quality assessment relies heavily on the same techniques, albeit more sophisticated and complex, employed since the turn of the century. The principal techniques are sanitary surveys—field investigations examining environmental surroundings and potential routes of water source contamination—and multivariate chemical and biological analyses to detect bacteria and toxic contaminants. In the United States and Europe, regulatory standards (based on laboratory analysis guidelines) have been adopted to ensure water quality. Considerable controversy exists, however, on the uniform application of these highly sophisticated, urban-based standards and techniques to developing country RWS programs. Strict application of developed world standards may unnecessarily condemn developing country RWS's and lead to the use of more peripheral and lesser quality sources. Development experience shows that, in addition to chemical and biological requirements, water quality standards should depend on the availability and costs of water treatment technology, the plausible alternative investments in public health (waste removal, health education), the number of persons exposed to the water source, and local practices concerning palatability and water use. In designing RWS systems, the managerial and operational requirements contingent to water quality (i.e., continuous treatment of the water) must be guaranteed because the simple provision of water can be counterproductive if its quality is harmful.

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PN-AAJ-254

## **WHOLESOME AND PALATABLE DRINKING WATER: A BACKGROUND PAPER ON WATER QUALITY ASPECTS OF WATER SUPPLY; VOLUME II, APPENDICES**

Chamberlin, C.E.; Boland, J.; Malik, A.; Shipman, H.  
1979, 61 p.

*Volume I, Main Report, published separately: PN-AAJ-253, 108 p.*

To provide background material for A.I.D.'s participation in the World Water Supply and Sanitation Decade, a panel of experts has prepared a two-volume report (text and appendices) on water quality—defined in terms of wholesomeness and palatability—and its role in developing rural water supply (RWS) programs in developing countries. This second volume consists of two appendices to the main report. Appendix A is a 211-item bibliography with one item in German and the others written in or translated into English. Appendix B describes the history of contemporary drinking water standards, including those of the U.S. Treasury Department, U.S. Public Health Service, and U.S. Environmental Protection Agency; as well as those designed for Europe and the international community by the World Health Organization (WHO). Types of water supplies to which the standards apply, recommended analytical methods, requirements regarding water source and protection, and bacteriological, virological, physical, chemical, and radiological standards are discussed.

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101

PN-AAJ-692

## **THE COST OF PRIMARY HEALTH CARE**

Gaspari, K.C.  
1980, 34 p.

Estimating the cost of primary health care (PHC) for a developing country is a deceptive and complicated task, and efforts to apply benchmark estimates to specific programs can lead to misuse of health care resources. This paper addresses this problem by providing a conceptual framework for estimating PHC costs and illustrating the importance of program-specific cost projections. The key to costing out PHC is to determine the factors which contribute to costs and then to measure them accurately. The first step in factor cost determination is to define the function and scope of desired services by defining the size and specific health needs of the target population and the number of them to be affected by the proposed service. Second, costs associated with the actual services rendered to meet the PHC objective need to be determined. Other cost factors include: (1) the extent to which current health care infrastructure (health education, training, transportation, domestic manufacturing) must be expanded or created to facilitate delivery of the proposed services; (2) the effects PHC produces in competing with other sectors for like resources, e.g., building materials, energy, etc.; (3) the duration of the proposed project in order to ensure that both one-time and recurrent costs are included; and (4) indirect costs caused by the spillover effects of a PHC project, e.g., increased water usage in a village. To ensure accurate measurement, costs



should be divided according to function and then separated in terms of one-time or recurrent, direct or indirect, in accordance with the principles of full, differential, and responsible cost accounting. After applying his guidelines to an actual PHC plan in Senegal to illustrate common mistakes and deficiencies in PHC cost estimation, the author concludes by noting that despite the need to determine PHC costs on the basis of the specific size and health needs of the target population, PHC projects can be categorized and compared according to their similarities, e.g., in regard to population, duration, and services, while still avoiding the concept of set costs per person. A 57-item bibliography (1961-80) is appended.

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Paper copy \$4.42

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102

PN-AAJ-882

THE NONPHYSICIAN AND FAMILY HEALTH IN SUB-SAHARAN AFRICA; PROCEEDINGS OF A CONFERENCE

Waife, R.S.; Burkhart, M.C.

Pathfinder Fund, Family Planning Evaluation Center.

1981, 150 p.

Proceedings of a Conference held September 1-4, 1980 in Freetown, Sierra Leone

Due to a shortage of trained medical personnel, most health care in Sub-Saharan Africa is dispensed by nonphysicians (NP's). This report presents the proceedings of the first international conference on NP's and family health in Sub-Saharan Africa. At the conference, held in Freetown, Sierra Leone September 1-4, 1980, representatives of 24 nations discussed the health needs of Sub-Saharan Africa, the need for NP's, the roles and training of NP's, and needed policy changes. The participants agreed that in employing NP's to improve health in Africa (especially maternal/child health, the most frequently cited problem) efforts should first be made to treat the root causes of low health status—high pregnancy rates, poor health facilities, poverty, and ignorance. Specific problem areas requiring NP services are infertility, female circumcision, immunization, nutrition, and environmental sanitation. Specific NP programs in Kenya (child malnutrition), Mississippi (reduction of infant mortality), Thailand (family planning), and Togo (Family Welfare Program) were discussed. Noted as constraints to effective NP action were physician resistance, a lack of support structure, poor management, irregular flow of supplies to the field, and the lingering faith in useless or harmful traditional medical practices. The conference suggested that the NP's role as an agent of social change might be expanded by providing training in effective communication and motivation techniques. Other recommended changes in NP training included: (1) training teams of NP's in which each team member is first trained in one task and is later exposed to the other tasks; (2) emphasizing preventive medicine; (3) encouraging the use of effective traditional remedies; and (4) matching training to local needs by consulting local health care officials. Alternative

strategies for adopting policy changes supportive of NP's include reassigning certain medical duties to NP's, altering ministerial rules and regulations affecting NP's duties, and passing legislation in support of NP's. Four workshops were also held during the conference—one each on rural and urban health needs, one on a child spacing program, and one dealing with high-risk pregnancies. A list of conference participants is appended.

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103

PN-AAJ-901

TWO-WAY RADIO FOR RURAL HEALTH CARE; AN OVERVIEW

Goldschmidt, D.; Hudson, H.E.; Lynn, W.

Academy for Educational Development.

1980, 63 p.

Increasing attention is being devoted to developing innovative ways of extending health care to rural areas. Toward this end, two-way radio is an effective tool which embodies technology appropriate to rural needs, is easy to maintain and use, and is relatively inexpensive. Based on developed and developing country experience, this report outlines the operation, uses, and possible problems of applying two-way radio to rural health care delivery. Experience has shown two-way radio to be most useful in medical consultation, referral, and administration; coordinating patient transport; providing continuing education to rural health workers; relaying non-health messages; and responding to disasters. A radio systems' actual use, however, will depend on the design of both the health care system and the radio network, the health workers' training and degree of isolation, and the type of assistance available by radio. When implementing a communication system, both capital costs—the cost of buying and installing the equipment (i.e., a transceiver and an antenna), and operational costs—the cost of power (e.g., AC current, a battery, a small generator, solar collector panels), maintenance, personnel, and equipment depreciation must be considered. While it is often difficult to establish precise causes when a radio system fails, poor system design, failure to meet the user's perceived needs, insufficient training of users, inadequate operation and maintenance procedures, lack of spare parts, and/or power supply problems are likely contributors. In addition, although using contractors may ensure technical competence, the cost and quality of operations can still be quite variable. Summaries of North American projects using narrowband technologies for transmission of visual information, heart sounds, EKG's, and patient record data are also given. Appended are a breakdown of radio system costs in Guyana, Bangladesh, and Nicaragua; a summary of two-way communication technologies; summaries of 53 two-way communication projects for health services delivery; and a 47-item bibliography (1973-80).

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104

PN-AAH-806

## **BALANCED URBANIZATION, SPATIAL INTEGRATION, AND ECONOMIC DEVELOPMENT IN ASIA: IMPLICATIONS FOR POLICY AND PLANNING**

Rondinelli, D.A.  
1980, 17 p.

*In Urbanism Past and Present, No. 9, 1979-1980, pp. 13-29*

Although 12 of Asia's metropolitan centers are among the world's 35 largest cities, and half of all Asians are expected to be urbanites by the year 2000, this report on urbanization and spatial patterns in East and Southeast Asia argues that it is not the pace but the pattern of urbanization which poses problems for developing countries. Asian nations are characterized by pervasive economic dualism and spatial polarization because past development efforts and investments have favored primate cities (the main urban center, usually the capital), and "trickle down" processes have failed to spread to rural areas. Tendencies toward polarization originating in the colonial era have become self-perpetuating, further aggravating the situation. As a result, primate cities are now islands of modernization dominating over secondary cities and stagnant rural areas. Migration from rural to urban areas reinforces this primacy. The pace of urban growth in Asia is fast and increasing, but most primate cities are severely limited in their ability to absorb larger populations without creating or exacerbating such problems as extensive slums, large-scale unemployment, air pollution, and strained public facilities. Although some theorists argue that as economic growth accelerates, equity problems will be ameliorated and spatial polarization will be reversed automatically, this author argues that a deliberate strategy of decentralized urbanization is needed to disperse urban growth, accelerate rural development, and promote and absorb development impulses already strong in primate cities. Such a policy must aim to: (1) maintain and improve critical services and facilities in metropolitan centers; (2) control growth in the primate city; (3) stimulate growth of regional metropolitan areas and intermediate-size cities; (4) strengthen existing and incipient market towns as rural service centers; (5) create strategic villages as agricultural service centers; (6) tie decentralized urbanization policies to integrated rural development programs; and (7) strengthen the linkages among settlements in regional and national spatial systems.

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105

PN-AAH-869

## **REPORT ON PERUVIAN "PUEBLOS JOVENES" PROBLEMS AND POSSIBILITIES FOR USAID IIPUP TECHNICAL ASSISTANCE**

Dicker, H.; Giraldo, A.; Rivkin, G.W.  
Rivkin Associates, Inc.  
1979, 89 p.

The residents of pueblos juvenes (low-income squatter settlements) suffer the worst effects of Peru's economic crisis and are

often deprived of essential public services. This survey identifies the service needs of Lima's pueblos juvenes and recommends alternatives wherein A.I.D.'s Integrated Improvement Program for the Urban Poor (IIPUP) can provide technical assistance, training, and identify projects to upgrade service delivery. The report details the major problems faced by the pueblos juvenes in the fields of housing, health, education, child care, and community organization. Analysis is made of public and private institutions with programs that impact on the quality of life in the pueblos juvenes in order to identify resources and to suggest ways in which these institutions may be strengthened. To relieve a major constraint to the present study and in view of the transitional political situation in Peru prior to the 1980 elections, it is recommended that in FY80 IIPUP funding be used to collect data regarding: (1) typologies of the target population; (2) the shelter sector in terms of needs, standards, access to credit, etc.; (3) vocational training and employment prospects; (4) the range of private voluntary organizations; (5) health status of pueblos juvenes populations; and (6) women's socioeconomic status and needs. An aerial photographic survey is recommended as the most efficient means of identifying locations, sizes, perimeters, and population of the pueblos juvenes. IIPUP projects in the six above-mentioned areas are recommended for post-election funding. Specific areas of assistance include: (1) project management training for the Ministry of Housing; (2) the development of vocational training to meet the employment needs of the population; (3) income-generating projects; (4) coordination of private and public institutions' resources; and (5) ancillary studies on the extent and means of improving sanitation and housing facilities. Information on aerial photographic surveys, individuals contacted by the consultants, and a 32-item bibliography (1975-79) in English and Spanish are appended.

AID/otr-C-1636

Paper copy \$11.57

Microfiche \$1.08

106

PN-AAJ-078

## **GUINEA: SHELTER SECTOR ASSESSMENT**

National Savings and Loan League.  
1980, 97 p.

To help the Government of Guinea (GOG) address a severe urban housing shortage caused by an urban population growth rate twice the national average, this report assesses Guinea's shelter sector and offers recommendations to the GOG to improve this situation. Against background descriptions of Guinea's national economy and the living conditions of the urban poor, the urban shelter problem is analyzed in terms of settlement patterns, extant housing stock and public utilities, and available institutional and noninstitutional housing resources. The report projects a need for 30,000 new housing units over the next 5 years to accommodate urban growth (the GOG currently plans 10,000). It is recommended that the GOG stress the use of underutilized domestic materials and financial resources to reduce the drain on public housing resources caused by importing building materials and by the subsidized system of public housing construction which favors GOG



employees. Because replication of current housing standards is not feasible in urban centers, where institutional capability is lacking, incomes are lower, and service costs higher, it is recommended that the GOG stimulate activity in the informal housing sector. Financially, the GOG should: (1) reactivate the housing finance role of the National Bank for Commerce, Industry, and Housing to make credit available to low-income urbanites who suffer most from the housing shortage; (2) provide seed capital and assure the supply of external funds to the proposed system of neighborhood council housing loan guarantees; and (3) move towards full cost recovery in existing and proposed public housing programs. In terms of building materials, the GOG should: (1) encourage the production and use of local materials on both an artisanal and industrial scale; and (2) rehabilitate and improve the operation and maintenance of the existing building materials industry. Finally, regarding land use, the GOG should: (1) better coordinate responsibility among its land use ministries; (2) speed up provision of land under public leasehold; and (3) price land to recover enough revenue to reinvest in new development and to recoup the surplus value resulting from its intervention.

AID/otr-C-1453 912046800  
Paper copy \$12.61 Microfiche \$1.08

## 107 PN-AAJ-374 URBAN POVERTY IN GUATEMALA

Haeckel, B.; Farber, M.; Cuadrado, L.  
Abeles, Schwartz, and Associates.  
1980, 358 p.

Guatemala's urban poor may be better off materially than her rural poor, but they feel poorer because of the stark contrast between themselves and the urban rich. This study examines the characteristics and distribution of urban poverty in major Guatemalan cities and the measures being taken to alleviate this poverty. Included are a brief analysis of the major population shifts contributing to urban poverty in Guatemala; a profile of the urban poor, their work, income, expenditures, homes, and perceptions; an analysis of key institutions serving the urban poor, with emphasis on the access of the poor to the benefits of public programs; and a brief review of spatial trends in public investment. Over the past 30 years, population has grown almost twice as fast in Guatemala's cities as in her rural areas, largely because of migration from rural areas and smaller cities, with the focal point of growth being Guatemala City. A majority of the urban poor work in small-scale industry, especially construction, and income from formal work is often supplemented by side jobs. Evidence, while sketchy, suggests that income distribution is among the most unbalanced in the hemisphere. In addition, the construction of minimum-standard urban shelter currently reaches only 25% of the current national goal of 26,000 units. Those not serviced by public or private housing resort to squatting on the outskirts of urban areas or to building their own shelter from precarious materials in areas providing little access to public water and disposal services.

The ability of city governments to render municipal services required by law (potable water, sewers, street cleaning) suffers from several major institutional weaknesses, including poor coordination of public services, undefined responsibility for planning, poorly qualified personnel, an inadequate system of municipal finance, and a lack of citizen participation. The 37-fold increase in public investment over the past 9 years has focused mostly on agriculture, transportation, energy, and health, with investments largely concentrated in the Department of Guatemala and in the Southern Departments of Escuintla and Santa Rosa. Housing and education have received only modest attention. Survey data and a 59-item bibliography (1972-80) are included.

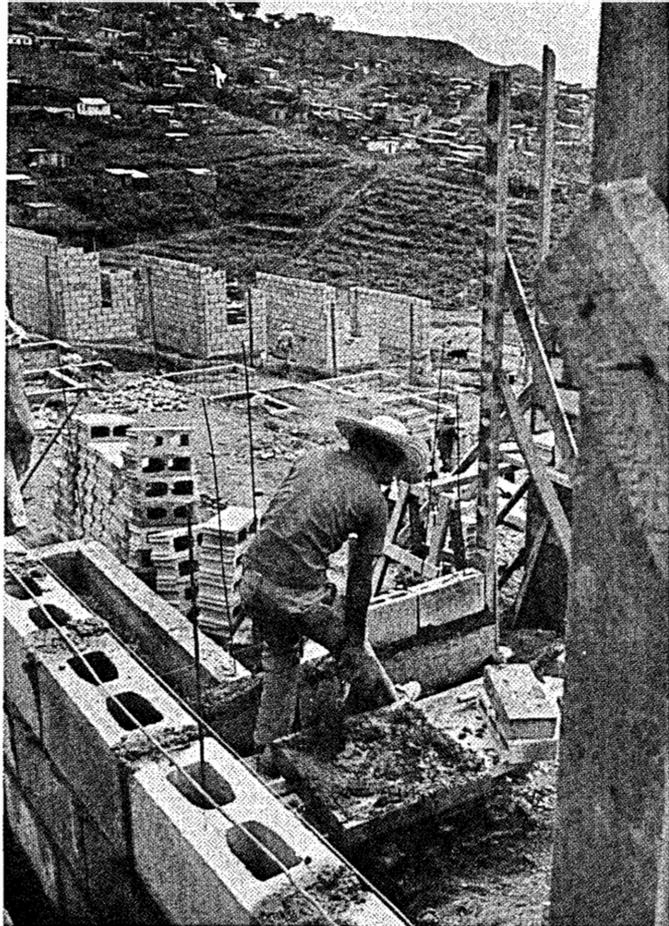
AID/otr-C-1637 912000700  
Paper copy \$46.54 Microfiche \$4.32

## 108 PN-AAJ-399 DISASTER ASSISTANCE MANUAL FOR TRANSITION HOUSING

Oakley, D.  
Planning and Development Collaborative International  
(PADCO), Inc.  
1981, 246 p.

*Disaster Assistance Manual, Volume I*

Following a disaster, A.I.D. often provides housing both to meet victims' immediate shelter needs and to create a base from which to reconstruct permanent housing. This manual for A.I.D. and host country disaster assistance and housing officials focuses on expeditious planning and implementation of conventional, contractor-built, low- and middle-income, transitional housing. Emphasis is placed on A.I.D.'s potential contribution and lessons learned from past experience in the following areas: (1) disaster assessment; (2) operational responsibility; (3) project beneficiaries; (4) project timing; (5) environmental considerations; (6) land ownership and financing; (7) site selection, location, layout, and access; (8) phased occupancy and implementation of infrastructure; (9) safe housing program components; (10) cyclone-, flood-, and earthquake-resistant design; and (11) project management and evaluation. A.I.D. can make the greatest contribution in the areas of supply procurement, quality control, project oversight, training, site preparation, and information sharing and by assisting the disaster victims prior to project start-up. In conclusion, the author cautions that contractor-built housing—not always the type of post-disaster assistance preferred by A.I.D.—may not be the best strategy for providing transitional, post-disaster housing, since such shelter can by its very nature serve only a limited number of victims and meet only a small portion of their total post-disaster needs. The author also points out that implementing such a housing project should not preclude providing post-disaster assistance to other sectors. In addition, care must be taken to plan for the staged occupation of the housing site and for beneficiary relocation, as well as for providing basic infrastructure and services. Appendices include a discussion of core housing and progressive upgrading,



**Workers construct earthquake-resistant housing based on avoidance of poor ground conditions, faulted ground, or potential landslide areas as well as on use of small building design criteria which results in structural integrity in all dimensions.**

building guides for A.I.D. reconstruction projects, an investigation of recipients' views of finance systems, a housing project budget estimation form, a list of 37 organizations and 14 journals in the field of relief and development, and a 17-item general bibliography (1973-80). Additional references are included with each chapter.

AID/otr-C-1829

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Paper copy \$31.98

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**109**

**PN-AAJ-815**

### **INTEGRATED IMPROVEMENT PROGRAM FOR THE URBAN POOR: AN ORIENTATION FOR PROJECT DESIGN AND IMPLEMENTATION; VOLUME I**

Planning and Development Collaborative International (PADCO), Inc.  
1981, 167 p.

*Volume II, Annexes, published separately: PN-AAJ-816, 116 p.*

A.I.D.'s Integrated Improvement Program for the Urban Poor (IIPUP) aims at alleviating the severe shortages in shelter and other essential areas (e.g., employment) suffered by the poor who constitute the growing majority of urbanites in developing countries. This state-of-the-art report presents guidelines for designing and implementing IIPUP projects. Fundamental assumptions of IIPUP are that assistance programs should address both the causes and consequences of urban poverty in ways that are comprehensive (to address many different needs simultaneously) and integrated (to minimize duplication and improve efficiency). Besides establishing appropriate goals and purposes, IIPUP project designs should identify beneficia-

ries and select those project components most likely to meet the former's needs; choose appropriate ways to integrate services in concrete circumstances; provide adequate funding and ensure continuity of financing after the initial project phase; plan for gradual project implementation in accordance with the degree of host country acceptance; and, if need be, initiate changes in existing laws. A wide range of organizational, operational, and personnel problems face IIPUP project management. Pre-planning may remove some causes of conflict between participating agencies. Appointment of an appropriate project manager or chairperson of the project executive committee is a key element in successful implementation. Training components must often be included to provide adequately trained personnel for project implementation. A large amount of information, most of it available from secondary sources or interviews with host country officials, is required to plan and evaluate IIPUP projects. It is important, however, to limit data collection to what is actually needed. Several survey methods are available, including a simple method using aerial photographs. Effective project evaluation is important to improve the design of later projects.

AID/otr-C-1627

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**110**

**PN-AAJ-816**

### **INTEGRATED IMPROVEMENT PROGRAM FOR THE URBAN POOR: AN ORIENTATION FOR PROJECT DESIGN AND IMPLEMENTATION; VOLUME II: ANNEXES**

Planning and Development Collaborative International (PADCO), Inc.  
1981, 116 p.

*Volume I: PN-AAJ-815, 167 p.*

Rapid urban growth in developing countries has led to serious deficits in the provision of shelter and other essential goods and services to the poor who constitute the vast and growing majority of urban dwellers. To help A.I.D. alleviate the plight of these poor, a state-of-the-art report has been prepared on the design and implementation of A.I.D.'s Integrated Improvement Program for the Urban Poor (IIPUP). This companion volume contains four annexes to that report. The first annex discusses IIPUP project components—shelter provision, assistance to small-scale enterprises, other employment assistance, informal adult education, environmental sanitation, urban health services, public transportation, participant mobilization, and improvement of the welfare of the neediest groups. The second annex presents case studies from U.S. and international (India, Honduras, Zambia, Indonesia, and Kenya) experience in urban improvement projects. The third annex offers a comprehensive checklist of data requirements (demographic, social, economic, housing, health, welfare, labor, education, transportation and communications) for designing and evaluating IIPUP projects. The final annex is a 90-item bibliography (1959-80).

AID/otr-C-1627

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Paper copy \$15.08

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## A REVIEW OF ISSUES IN NUTRITION PROGRAM EVALUATION

Sahn, D.E.; Pestronk, R.M.  
Community Systems Foundation.  
1981, 231 p.

*A.I.D. Program Evaluation Discussion Paper No. 10*

Despite agreement that evaluation is integral to development programs, substantial diversity exists on the best methods of evaluating nutrition interventions. This report, based on the present practices of several multilateral, bilateral, and private donors, reviews these methods. The authors propose standardized evaluation terms and concepts for examining nutrition education, supplementary feeding, food fortification, multisectoral, and planning programs. Presented are two models of nutrition programming—A.I.D.'s logframe, outlining a causal progression of events at the input, output, purpose, and goal

levels; and the Nutrient Flow Model, depicting nutrition as a function of activities such as food production, trade, loss, and distribution. Linked to each of these models, respectively, are process and impact evaluations. For process evaluations (often conducted along with impact evaluations), information is collected on pre-existing indicators, project components, and intervening events in order to reveal nutritional improvements attributable to a program. Impact evaluations seek to determine improvements in overall nutritional status. Various impact evaluation designs (e.g., situation assessment, before/after, recurrent institution cycle, comparison groups) and threats to their internal and external validity are reviewed. The authors also discuss alternative evaluation methodologies which combine aspects of both evaluation types to assess such program aspects as effort, adequacy, appropriateness, etc. They also differentiate operational program evaluation (analysis of a program's specific impact and performance), the subject of this report, from basic research (knowledge gained using scientific

***Dietary nutritional measurements are one way of evaluating programs designed to make sure that poor children under five years of age in the developing world, such as these African children, will avoid malnutrition and the morbidity or mortality that are all too often its consequences.***





# NUTRITION

methods and controlled experimentation) and evaluative research (field testing applications of existing knowledge). Anthropometric, biochemical, clinical, and dietary nutritional measures are examined in terms of objectivity, coverage, directness, completeness, and precision. Also presented are 70 abstracts of published evaluations, emphasizing methodology over outcomes, and brief descriptions of the programs and approaches of several donors involved in nutrition programs. A 171-item bibliography (1955-80) is appended.

AID/otr-147-80-91

Paper copy \$30.03

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112

PN-AAJ-321

## **NUTRITIONAL ANEMIA RESEARCH; A REPORT ON A FIELD PROJECT CONDUCTED IN GUYANA FROM JUNE 23 TO AUGUST 6, 1980**

Johnson, A.A.

Howard University, School of Human Ecology, Department of Human Nutrition and Food.

1980, 57 p.

Nutritional anemia constitutes an important public health problem affecting all age groups in Guyana. This paper reports on a field study conducted to investigate the roles of iron deficiency, folic acid deficiency, and intestinal parasitic infestation in contributing to this anemia. Anthropometric (height and weight) and hematological (red blood cell count, hematocrit, hemoglobin, plasma and red cell folate, and serum ferritin) measurements, and stool investigations for intestinal parasites were performed for 257 anemic or nearly anemic subjects representing all age groups and both sexes in urban and rural areas. Socioeconomic data, data on the frequency of consumption of foods rich in the erythropoietic nutrients, and information on use of iron and vitamin supplements were also obtained. A limited amount of obstetrical information was obtained from women of childbearing age. Iron and folic acid deficiencies were found to be the major nutrient deficiencies contributing to nutritional anemia. Intestinal parasite infestation did not play a major role. The author recommends an applied intervention program involving nutrition education, an improved system of distributing iron and folic acid supplements to pregnant and lactating women, and fortification of a suitable vehicle with iron and folic acid. Also recommended is focusing nutrition education on the nature, symptoms, and causes of nutritional anemia and on how anemia can be prevented by a proper diet incorporating local foods. Radio, newspapers, posters, pamphlets, demonstrations, and cinema advertising are suggested as possible educational tools. Problems and possibilities associated with use of wheat flour, sugar, rice, and salt as the vehicle for iron and folic acid fortification are discussed. Iron (III)-EDTA is suggested as the most promising compound to use for iron fortification with ascorbic acid added to promote the absorption of iron from the food and to prevent folic acid deterioration. A 17-item bibliography (1956-78) is included. The protocol for

collecting and processing blood samples and a copy of the questionnaire used in the study are appended.

AID/504-C-80-5

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113

PN-AAJ-375

## **A STRATEGY FOR FOCUSING A.I.D.'S ANTI-HUNGER EFFORTS**

A.I.D., Technical Program Committee for Agriculture.  
1981, 58 p.

*A.I.D. response to "Overcoming World Hunger: The Challenge Ahead—Report of the Presidential Commission on World Hunger": PN-AAJ-482, 276 p.*

The *Report of the Presidential Commission on World Hunger* concluded that the main focus of U.S. policy towards developing countries should be the elimination of chronic malnutrition caused by poverty. In this paper, A.I.D.'s Technical Program Committee for Agriculture (TPCA) proposes a strategy to maximize A.I.D.'s anti-hunger efforts. After reviewing the current hunger situation, the TPCA concludes that hunger must be attacked on a double front—improving production while increasing the purchasing power of the hungry. The proposed strategy is aimed at helping developing countries build, over decades, the human and institutional capacity needed to promote small-scale or broad-based, labor-intensive, commercial agriculture, thus employing more people while improving production capacity. To implement such a strategy, A.I.D. should focus on Human and Institutional Resource Development (HIRD) projects, stressing applied agricultural research (especially regarding dry farming) and the establishment of self-sustaining agricultural institutions. A.I.D.'s ability to implement such a strategy faces several challenges: lack of trained technical assistance personnel and funds both by A.I.D. (despite U.S. public opinion support for an anti-hunger campaign) and by developing countries; the general lack of political will to eradicate hunger; and A.I.D.'s inability to define nutrition goals clearly and pursue them cohesively. Mounting an effective anti-hunger campaign will require that A.I.D. change its structure, especially regarding the management of its own resources and those allocated to other international agencies. This change is essential for building public and political support while attaining a position of credible leadership in the global anti-hunger effort. A total of 15 recommendations concentrate on developing an operational focus, articulating a full commitment, training effective personnel, seeking alternate funding, revising selected regulations, and increasing public education on hunger issues.

Paper Copy \$7.54

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114

PN-AAJ-693

### NUTRITION IMPACTS OF LIVESTOCK DEVELOPMENT SCHEMES AMONG PASTORAL PEOPLES

Teitelbaum, J.M.

U.S. Department of Agriculture, Food and Nutrition Service.  
1980, 174 p.

In many instances, livestock projects have wrought, albeit unintentionally, adverse effects on the food supply and way of life of nomadic peoples. This report discusses the traditional diet and way of life of the pastoralists and examines the impact on these of livestock development strategies. Rather than relying on their herds for food, pastoralists derive the greater part of their diets from cereals (millet, barley, maize, sorghum, etc.). However, milk-based foods provided by the herds do play a critical part in their diet and health by enhancing the lower protein content of their starchy cereal staples and, as suggested by some researchers, by providing protection against malaria and other diseases. Development projects have clashed with the herding practices and culture of the pastoralists in a number of ways. For example, development aimed at husbandry of a single cash-crop species such as cattle or sheep denies pastoralists the advantage of having a number of milk yielders productive under a variety of conditions. Destocking rangelands in order to adjust animal numbers to the theoretical carrying capacity of the land or to cull diseased and aging stock places herd management beyond the reach of the pastoralist. Strategies promoting sedentary living require infrastructure and services not as critical to, and therefore absent from, the nomadic way of life. For the pastoralists, livestock provide immediate offtake and serve as a renewable resource investment—in contrast to the Western view that rangeland is the basic resource, with meat as a cash-crop. In addition to a general discussion of A.I.D. development efforts, the report includes specific project case studies in Morocco and the Sahel. The author concludes that livestock project designers should focus on real and immediate food needs; take into consideration existing land use and water access rights; recognize that the herding of mixed species is necessary to the pastoralist milk supply system; and encourage cultivation of rangelands. Also, livestock projects should include health care and adult education components, and beneficiaries should be given greater decisionmaking powers.

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115

PN-AAJ-694

### NUTRITIONAL CONSEQUENCES OF RURAL-URBAN MIGRATION

Graedon, T.

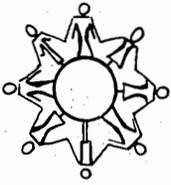
1980, 83 p.

Available data indicate that rural-urban migrants in developing countries enjoy a nutritional status as good as, if not better, than those they left behind. In examining the consequences of internal migration on nutrition, this study considers the major factors contributing to migration, the linkages between migration and nutritional status, and some resulting policy implications. People migrate from rural areas to the cities mainly for economic reasons such as higher wages and better job potential, although urban family ties and better education and health facilities are also factors. Linkages between migration and nutritional status generally stem from major lifestyle changes involved in migrating. Among migrants, the major changes affecting their nutritional status involve the availability of jobs and the average wage rate in the city, the woman's position as wage earner and/or mother (assuming a traditional family migrated as a unit), the availability of food in the city, and the migrant's general state of health. The few studies available indicate that most migrants benefit from living in the city; employment and total household income among migrants are higher than among urban-born; higher-volume city markets provide greater accessibility and lower product costs; and urban health facilities and education are superior. The effect of outmigration on the sending areas, however, appears detrimental to rural nutritional levels because subsistence farming is often replaced by cash crop production because it is less strenuous for the nonmigrating workforce (usually women and the elderly). Intense outmigration can also result in rural labor shortages, increased stratification, and occasionally social and cultural dislocations. To mitigate the negative effects of migration, agricultural planners should avoid introducing technology which reduces the local need for labor, e.g., mechanization; take into account current and projected dietary intake of various sectors of the population; and preserve crop diversity while avoiding disruptions to food production and to infant and child care. Appended are a 72-item reference list (1961-80) and several hypothetical scenarios illustrating the migration-nutrition relation.

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PN-AAJ-242

## RESEARCH ON SIMPLIFIED TECHNIQUES OF FERTILITY MANAGEMENT; SEMI-ANNUAL REPORT, APR-SEPT, 1980

Johns Hopkins University, School of Medicine.  
1980, 201 p.

The status of six AID-sponsored research projects on simplified techniques of fertility management is reviewed in this semi-annual report. Project I examines effective inexpensive methods of reversing tubal sterilization. The first 18 of 28 female pairs have been subject to randomized treatment. The results, however, are inconclusive as data is still accumulating. Project II seeks to develop improved tubal ligation methods. The examination of 79 previously ligated fallopian tubes suggests that oviductal ligation within 4 cm of the uterine cornua may predispose to the development of endometriosis and subsequent fistulization. Project III, to identify and evaluate safer and more practical abortifacients, is now starting after equipment delivery delays. Animal testing of chemical abortifacients is the subject of Project IV. Four substances are considered: D-Trp<sup>6</sup>-Pro<sup>2</sup>-Net, an LRH analogue, will be injected into pregnant monkeys and followed to determine its antifertility effects. Allenic alcohol, a "suicide substrate" that irreversibly binds and inactivates enzymes, will be tested in pregnant rats for antifertility and progesterone and corticosterone induction effects. Epsilon amino caproic acid, a fibrinolytic inhibitor, was injected into pregnant rats and found to interfere with fibrinolytic activity important at the time of implantation for pregnancy maintenance. Experiments in which 1% silver nitrate was injected into the uterine cavity of pregnant monkeys showed it to be effective in terminating early pregnancies. Project V is aimed at evaluating three agents previously determined by animal studies to be effective chemical abortifacients. Azastene studies have been halted due to lack of volunteers for the 7-8 days treatment. Clinical trials of ethanol will begin pending protocol approval. Finally, the use of analgesic agents not associated with respiratory or cardiac depression is being studied for abortion and other local anesthesia procedures. Project VI, to assess the safety and efficacy of cervical dilatation methods such as the International Fertility Research Program's osmotic cervical dilator, is just beginning. Included is a 6-month work plan, graphs of anticipated expenditures, and copies of manuscripts currently in press or being finalized.

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117

PN-AAJ-373

## REASSESSMENT OF THE PROSPECTS FOR FERTILITY DECLINE IN EGYPT: IS DEVELOPMENT A PREREQUISITE?

Omran, A.R.  
North Carolina University.  
1980, 69 p.

Is socioeconomic development more effective than family planning (FP) in reducing fertility in developing countries? This

report explores this question by analyzing Egypt's demographic history since 1800 and recent trends in its population policy. Pre-1973 efforts chiefly consisted of providing contraceptives. This resulted in a drop in the birth rate from 43.0 to 34.4 per 1,000 from 1963-72. In 1973, Egypt reoriented its population policy to emphasize the developmental approach, i.e., aiming to reduce fertility through higher living standards, education, female employment, agricultural mechanization, rural industrialization, reduced infant mortality, improved social security, information dissemination, as well as the provision of FP services. Despite these efforts, birth rates rose to 41 per 1,000 in 1979. This rate, if continued unchecked, would lead to a doubling of Egypt's population in 23 years, exhaust cultivable land, and increase dependence on foreign aid and imported food. Weaknesses in the FP program in Egypt under the developmental approach include a low participation rate (only 8-10% in rural areas, where the population is most concentrated); irregularity of contraceptive supply; underuse of the outreach approach; provision of FP services by only a few health or social service units; and general program inefficiency and lack of coordination. Proponents of the developmental approach cite the declining birth rates in 18th and 19th century Europe which accompanied industrialization and socioeconomic improvement to support their position. The author, however, questions the transferability of the European experience to contemporary developing countries. He explores instead the relationship between fertility and development which is unique to the Arab world, making note of Tunisia, Lebanon, and Egypt where, because of FP programs, fertility has declined without drastic changes in societal values or substantial socioeconomic development. He concludes that FP programs, by themselves, can have a significant impact independent of and greater than the impact of socioeconomic improvements. A 52-item bibliography (1936-80) is appended.

AID/ne-G-1576

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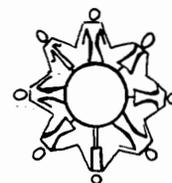
118

PN-AAJ-384

## 1979 MEXICO NATIONAL FERTILITY AND MORTALITY SURVEY: A SUMMARY OF RESULTS

North Carolina University, International Program of Laboratories for Population Statistics.  
1980, 22 p.

In 1977 Mexico established a national family planning plan aimed at reducing the country's 3.2% annual population growth rate to 2.5% by 1982 and to 1.0% by 2000. This report summarizes the findings of a 1979 National Fertility and Mortality Survey indicating progress towards these goals. The survey was multipurpose and used a two-part questionnaire: one part seeking basic demographic data from 18,505 representative households; the other collecting information on fertility, infant mortality, and related matters from 20,482 women aged 15-49 years in those same households. The survey showed that, despite evidence of a slight tendency towards aging in comparison with 1970 and 1976 data, Mexico's population is still relatively young, with 45.3% under age 15 and only 3.9% aged



65 and over. The crude birth rate was estimated at 33–37/1000 as compared with 43.4/1000 in 1977. In its most dramatic finding, the survey estimated the total fertility rate at 4.73 children per woman—a decline of 18% since the 1976 survey. Furthermore, estimates of age-specific fertility rates for single years from 1971 to 1979 showed a general downward trend for all age groups. The crude death rate, which was estimated indirectly due to incomplete reporting, was approximately 8/1000, while estimations of infant mortality rates showed a 20–25% decline over the previous 12–15 years. To estimate adult mortality rates, the death distribution, widowhood, and orphanhood methods, which, in addition to making estimates according to the age of the respondent, also delineate survivorship probabilities from birth to specific ages, were used. Despite discrepancies between methods in regard to the general level of mortality, all methods showed that mortality rates are higher for males than for females, corresponding, respectively, to levels 17–18 and 18–19 on the Coale-Demeny West Family model life tables. These estimates also allowed the crude death rate to be adjusted to 6.8–7.4/1000 and annual growth rate to be adjusted to 2.8–3.1% in the population 5 years and over. A 24-item list of references (1955–80) in Spanish and English is appended.

AID/DSPE-C-0025

932062300

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**119**

**PN-AAJ-512**

## **FERTILITY AND MORTALITY CHANGES IN HONDURAS, 1950-1974**

Hill, K.

National Research Council, Committee on Population and Demography.

1980, 68 p.

*Committee on Population and Demography Report No. 3*

Honduras, a small country having only 2.66 million people in 1974, experienced a marked decline in mortality from 1950–74. This fact, plus the wealth of various types of demographic data available, make Honduras an ideal subject for this case study, one of a series of national population studies, of changes in mortality, fertility, and population growth during the period 1950–74. Estimated fertility rates were gleaned from birth registers and the age structure of the population and were adjusted to account for inflated registration of births and underregistration in the 1974 census. Comparison of the resulting fertility estimates for each year from 1951 to 1974 shows fertility rising from 6.74% in 1951 to a peak of 7.75% in the early 1960's and then declining somewhat in the mid-1970's. Despite possible inaccuracies, primarily due to increasingly complete enumeration from 1945 to 1961 followed by a less complete enumeration in 1974, it is clear that fertility is very high and has been high—approximately 50 per 1,000—since the early 1950's. Useful information on mortality is scarce since the registration of deaths was not consistent throughout this period.

Stable population analysis of the 1950 age distribution using a 1.5% annual growth rate yields a crude death rate in excess of 30 per 1,000 for that year. Although doubts about the accuracy of the 1950 data on age distribution make these estimates uncertain, it does appear that mortality fell to 19 per 1,000 during 1950–61 and further decreased to 14 per 1,000 by 1974. Although lack of data on birthplace for both Honduras and the surrounding countries make it difficult to discern the impact of international migration, it appears that the number of migrants—mostly from El Salvador—has been small. Thus, overall population growth is equal to the population's net increase, i.e., the base population as increased by births and decreased by deaths. On the basis of this assumption, the annual growth rate was estimated at 1.5% for 1950, 3.3% for 1961, and 3.6% for the early 1970's. A glossary of terms and a 14-item bibliography (1964–81) are appended.

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Paper copy \$8.84

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**120**

**PN-AAJ-555**

## **RURAL DEVELOPMENT, LAND, AND HUMAN FERTILITY: A STATE-OF-THE-ARTS PAPER**

Stokes, C.S.; Schutjer, W.A.; McCoy, T.L.; Wood, C.H. Research Triangle Institute; South-East Consortium for International Development. 1979, 122 p.

Human fertility may be reduced by altering the human-to-land (HTL) relationship, widely acknowledged as a key behavioral influence in agrarian societies. This state-of-the-art report reviews existing literature on the fertility impact of the HTL relationship and on development efforts to alter the relationship. Although the data are neither extensive nor geographically balanced, several tentative conclusions emerge concerning land/fertility relationships. All evidence indicates that greater land availability increases fertility rates by encouraging marriage. Farm size also raises fertility rates, although larger families may also be a way of acquiring larger holdings. Institutional patterns regarding access to land affect fertility indirectly and either positively or negatively, e.g., land tenure programs can be combined with fertility incentives or, conversely, increase women's education and postpone their age of marriage. Data limitations prevented even tentative conclusions on the fertility effects of land distribution or land quality. A review of rural development literature shows that most agrarian reform and colonization/settlement programs have had a minimal effect upon the HTL relationship due to support of traditional land access systems by political interests. Technological change can alter the HTL relationship by affecting land tenure, e.g., large landowners, who generally control technological change, tend to reclaim more productive land by evicting tenant farmers. Technological change also alters women's roles. While the net fertility effect of this is difficult to determine, it can no longer simply be assumed that rural development reduces fertility, e.g., by providing women with



# POPULATION

socially acceptable alternatives to motherhood, and can even be fertility-stimulating. The authors conclude by posing further research questions in regard to land availability and access, inheritance, and the effects of rural outmigration; and by noting the need for adequate primary data for developing countries, especially at the household level, and for an adequate theoretical framework for interpreting the literature. Appended is a 174-item (1957–79) annotated bibliography.

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Paper copy \$15.86

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**121**

**PN-AAJ-808**

## **INCENTIVES, FERTILITY BEHAVIOR, AND INTEGRATED COMMUNITY DEVELOPMENT; AN OVERVIEW**

David, H.P.  
1980, 73 p.

Developing country population policies are often reinforced with incentives to reward those who limit the number of births. The range of incentives used in Bangladesh, China, India, Indonesia, Korea, the Philippines, Singapore, Sri Lanka, Taiwan, Thailand, and regions of Africa and Asia are reviewed in this paper. Both financial incentives (e.g., cash, preference in housing and land assignments, additional pensions and medical care) and disincentives (e.g., salary deductions) are utilized. A review of pertinent literature indicates that the use of incentives and disincentives to control population growth, if implemented in a balanced, non-discriminatory way, is not incompatible with human rights policies. Illustrating this point, Thailand's Planned Parenthood Association has pioneered an imaginative and successful community-based family planning (FP) service program (CBFPS) which has evolved into a broader program integrating FP initiatives into a broad range of community development projects. Most important among the author's findings are: (1) little knowledge exists about what type of incentives are actually effective in reducing births; (2) disincentives are more readily accepted when other forms of fertility control are available, when FP policies are based on a consensus between citizens and government officials, and when discrimination against children born in disregard of official policies is avoided; (3) FP policies are better received when they are oriented to community development, are sensitive to local needs, and allow local autonomy; and (4) consideration of the psychosocial and economic determinants of fertility is a necessary FP program ingredient. To ensure better FP program planning, the author recommends that: (1) the uses of U.S. Government funds for FP programs be reviewed, particularly for the integrated community development schemes that enjoy local support; (2) the psychosocial and economic determinants of fertility behavior in successful FP programs be determined; (3) an interdisciplinary seminar of FP programmers be convened to discuss problems and to determine successful program ingredients; and (4) financing for Thailand's CBFPS

program for Cambodian and Laotian refugees be continued. A 183-item bibliography (1957–80) is appended.

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Paper copy \$9.49

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**122**

**PN-AAJ-691**

## **THE CONSEQUENCES OF ACCELERATED MORTALITY DECLINES FOR FUTURE POPULATION GROWTH AND ECONOMIC PROGRESS IN DEVELOPING COUNTRIES: A PRELIMINARY EXPLORATION**

Brandel, S.K.; Gwatkin, D.R.  
Overseas Development Council.  
1980, 56 p.

*Includes illustrative projections for Bangladesh and Mexico*

Must reduced mortality be achieved at the expense of future generations' economic well-being? This study of the demographic and economic impact of efforts to accelerate mortality declines in developing countries concludes that these efforts lead to a real but manageable reduction in future economic growth. Using conventional cohort-companion methods, the authors project population growth consequences for the year 2100 of increases in life expectancy 1.5 and 2 times greater than those predicted by the United Nations for the period 1975–2100. These more rapid mortality declines would lead to a global population 2–4% larger than currently predicted for the year 2000 and 6–8% larger than expected in 2100. Regionally, the population of all developing countries would be 5.7–8.3% larger, East Asia's population would be 1.6–2.6% greater, Latin America's 1.8–2.6% higher, South Asia's 7.1–10.9% greater, and Africa's would be 9.2–14.1% larger than presently envisioned. To determine the economic effect of a larger than currently anticipated population on employment, capital growth, and technological progress, the RAPID (Resources for Awareness of Population's Impact on Development) economic forecasting model was employed using alternate scenarios of mortality and fertility change for the period 1975–2000 in two representative developing countries—Mexico and Bangladesh. These projections indicate that while both total and per capita GNP would still rise slightly, economic growth would be less than if mortality were to decline more slowly. Specifically, reducing infant mortality in Bangladesh by 60% rather than the expected 40% would slow per capita income growth by 15–20%. Reducing Mexico's infant mortality rate 30% instead of 20% will cause per capita income to increase 4–5% less than expected. The authors conclude that although faster reductions in mortality do hamper economic growth, their negative impact is less than might be anticipated. Data on the fertility and mortality assumptions underlying the population projections and on the magnitude of the actual demographic and economic consequences are appended.

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Paper copy \$7.28

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PN-AAG-786

### TRENDS IN U.S. FERTILIZER TECHNOLOGY: IMPLICATIONS FOR GLOBAL TRANSFER

Young, R.D.; Achorn, F.D.  
National Fertilizer Development Center.  
1977, 43 p.

The U.S. and world fertilizer industries, producers of the single most important input to food production, face great problems and challenges in the 1980's. This report summarizes the historical development of the U.S. fertilizer industry and suggests future technological innovations and probable trends. The report opens with the history and geographic distribution of phosphate, nitrogen, potassium, mixed, bulk blended, granular, and fluid fertilizer production in the United States. The report next outlines important innovations which occurred in the 1970's—development of efficient production processes for granular urea, powdered MAP, and high-polyphosphate liquid fertilizers. Also provided are a discussion of storage practices at phosphate, nitrogen, and finished fertilizer plants; environmental safeguards in phosphate, nitrogen, potash, and finished fertilizer production, shipment, handling, storage, and application; and recent trends in fertilizer production energy use. Many fertilizer products and processes such as those for granular ammonium phosphate, granulation of urea and ammonium nitrate, urea synthesis, and bulk blending have been disseminated to developing countries over the past 40 years, largely through the efforts of USAID, other donors, and groups such as the Tennessee Valley Authority's National Fertilizer Development Center. Although no new fertilizers are likely to soon become important, some modified products such as sulfur-coated urea, urea phosphate, and nitrogen solutions and new processes such as melt-type granulation and fertilizer compaction, flaking, tableting, and extrusion may become significant. The U.S. fertilizer industry in the 1980's will likely witness: (1) continued segmentation of production and marketing of basic fertilizers; (2) greater use of coal as a feedstock for ammonia production; (3) increased bulk handling and shipment of all fertilizers; (4) a rise in production of fertilizers containing pesticides and herbicides; (5) greater emphasis on energy savings; and (6) more study and greater utilization of marginal phosphate ores. A 42-item bibliography (1954–77) is appended, and the text is highlighted by numerous diagrams and pictures.

Paper copy \$5.59

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PN-AAH-477

### GUIDELINES FOR DEVELOPMENT OF WATER/ SANITATION COMPONENTS OF URBAN FRINGE AND RURAL VILLAGE PROJECTS

Fountain, B.; Shipman, H.  
Urban Resources Consultants, Inc.  
1979, 128 p.

*Companion Report: PN-AAH-478, 114 p. Bound with: Patents, Proprietary Processes and Methods Specific to Water Supply, Waste Disposal and Sanitation*

In response to the U.N.'s declaration of 1980–90 as "Drinking Water Decade", A.I.D. commissioned a two-volume state-of-the-art study to identify existing technology and determine the need for new technology in providing water supplies and sewage systems (WS/SS) to developing countries. This second volume reviews literature on urban and rural WS/SS's; suggests strategies for WS/SS project development, particularly as components to urban, urban fringe, and rural development projects; and discusses whether WS/SS patents and proprietary processes hinder the transfer of WS/SS technology to developing countries. The literature review uncovers various WS/SS technologies for developing country use that generally are cost-effective and can be operated, maintained, and upgraded by available personnel. Water supply options, e.g., public fountains, courtyard and house connections, and hand pumps, are presented with notes on water sources to be considered in these options and with the proviso that local and USAID sanitary engineers should be consulted before final decisions on project design. To provide for sewage/excreta disposal, the options range from bore holes and vault latrines to septic tanks and conventional sewer systems. Several key needs for developing a WS/SS strategy are noted: (1) create a development blueprint to prevent the recurrence of past and present problems; (2) prioritize target locations; (3) incorporate local people, as well as their beliefs and cultural practices into WS/SS projects; (4) involve host countries in WS/SS projects from the outset, especially through pilot projects; (5) conduct preliminary engineering and feasibility studies; (6) provide for necessary staffing and construction, e.g., contract national and international experts; and (7) provide for efficient and decisive operation and maintenance of WS/SS facilities and systems. In a concluding section, the primary classes and subclasses of WS/SS equipment, devices, and processes covered by U.S. and foreign patents are listed, and it is shown that patents are only minimally effective in preventing developing countries from gaining access to technologies which they need. Included are a WS/SS patent classification, a WS/SS product directory, a list of patents of particular interest for WS/SS applications, and a 285-item bibliography (1929–78) of predominantly English titles.

AID/otr-C-0015

Paper copy \$16.64

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125

PN-AAH-637

### APPROPRIATE TECHNOLOGY (AT) IN BOLIVIA: RESULTS, RECOMMENDATIONS AND REPORTS; THE VITA SURVEY OF AT IN AGRICULTURE, SMALL SCALE INDUSTRY AND ARTISANRY, WATER SUPPLY AND SANITATION AND ENERGY

Volunteers in Technical Assistance (VITA).  
1980, 388 p.

The application of appropriate technology (AT) in Bolivian rural development projects has been hampered by the failure of involved institutions to coordinate their efforts. This detailed survey report, prepared by VITA, reviews the background,



issues, and current status of AT in Bolivia's sectors of agriculture, rural small enterprise, sanitation, and energy; and describes the domestic and international organizations active in Bolivian AT and rural development. AT—a self-help effort using local resources to meet local needs in a local environment—entails, according to the VITA model, a process of technology transfer, adaptation, diffusion, acceptance, and implementation. In terms of this model, AT efforts in Bolivia are generally weakest in the transfer and diffusion stages, and are concentrated in the adaptation and initial localized acceptance/implementation stages. Although these AT programs display a vigorous variety, they reflect a top-down style of planning not responsive to campesino needs and lack referral mechanisms, knowledge of AT research findings, and a systematic approach for integrating AT into other development projects. VITA recommends a 4-year technical assistance program to upgrade the capability of the Bolivian Government's Office of Science and Technology (OCT) to coordinate the use of AT in rural development. Under the program, OCT will: (1) develop linkages with Bolivian and non-Bolivian AT institutions; (2) establish a centralized AT document center; (3) assist Bolivian institutions interested in integrating AT components into their development projects and establish a bank of AT consultants; (4) create a small projects fund to provide funding up to \$20,000 to individuals or organizations for AT research, development, and diffusion efforts or related activities; and (5) manage programs in the agriculture, energy, rural small industry and artisanry, and water/sanitation sectors, with a series of pilot subprojects including data collection programs, feasibility studies, and implementation projects. Recommendations for AT activities within each sector are made. Appended is a list of 41 references (1948–79).

AID/511-179-T

Paper copy \$50.44

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**126**

**PN-AAJ-102**

## **TELECOMMUNICATIONS ALTERNATIVES FOR DEVELOPING COUNTRIES**

Rice, R.E.; Parker, E.B.

Stanford University, Institute for Communication Research. 1979, 12 p.

*In Journal of Communications, Autumn 1979, pp. 125-136*

Although the benefits of satellite communication for developing countries have been well-documented, few studies exist on the barriers to actually applying such technology to meet existing needs. This study—which notes from the outset that satellite communication should be considered within the local context and as only one element in indigenous development—addresses general requirements for low-message, low-cost satellite communication that incorporates rural and secluded areas inadequately serviced by current terrestrial communication modes. This paper's primary thesis is that geosynchronous communication satellite systems (satellites orbiting at the same speed as earth and so being able to remain stationary over one

portion of earth) can provide a viable alternative to traditional terrestrial telephone links if the systems are designed specifically for rural use, i.e., to accommodate a large number of low-traffic circuits and low-cost ground stations. Major requirements for developing such a system include increasing the size, cost, and output of the orbiting satellite; introducing smaller ground station antennas; choosing a ground station site which avoids terrestrial signal interference; and adopting lower ground station power requirements. Three satellite system models, one using existing INTELSAT facilities, another using separate equipment and managed by a global or regional consortium of developing countries, and the third using separate equipment but managed by INTELSAT, are identified and compared to establish a viable combination of satellite and ground station design; cost, access technique, and management technique which will provide the lowest-cost, appropriate rural telephone service. Given respective terrestrial and satellite telephone costs, the optimum structure would be one in which satellite networks provide supplemental capacity to existing terrestrial networks, especially those in rural areas. Before such a system can be designed and implemented, however, there is a need, on the policy level, to demonstrate the socioeconomic benefits of rural telecommunication; work out a multinational cost-sharing procedure; alleviate orbital congestion and allocation disputes; and find international funding for the initial capital investment. A 28-item bibliography (1967–79) is appended.

AID/ta-C-1472

931110900

Paper copy \$1.56

Microfiche \$1.08

**127**

**PN-AAJ-103**

## **SITE UNSEEN: IMPLICATIONS FOR PROGRAMMING AND POLICY**

Block, C.; Foote, D.R.; Mayo, J.K.

Stanford University, Institute for Communication Research. 1979, 11 p.

*In Journal of Communications, Autumn 1979, pp. 114-124*

To determine whether the use of low-cost satellite broadcasting for rural educational programs in developing countries is a viable policy option, this paper analyzes the first large-scale use of satellites for such a purpose, India's SITE (Satellite Instructional Television Experiment) program. Prior to SITE, scepticism about the large-scale use of satellites was widespread, centering on whether on-the-ground hardware would remain operable; whether broadcasts would be reliable and on schedule; and whether bureaucratic support could be sustained. SITE dispelled these doubts convincingly by using community broadcast satellites to reach large numbers of widely dispersed and heterogeneous populations. Both the hardware (the number of receptors, 2,300, was unprecedented) and program delivery proved highly reliable, rivalling U.S. experience under much easier circumstances. SITE's success was largely due to superb technical management, especially by ISRO (Indian Space Research Organization), the project coordinator; the availability of a large pool of skilled personnel; and a combination of detailed system planning, rapid adapt-



**The water being distributed from these storage tanks was desalinated by renewable energy in the 90-bay solar still at Awania, India. Facility production averages 1,300 gallons of water/day from brackish groundwater for Awania's 1,400 people.**

ability to technical adversity, and insistence on local responsibility for local problems. While SITE's time-frame did not permit a clear assessment of its social impact, SITE did provide experience and confidence to Indian technicians and stimulated India's electronics industry and national television service. Programmatic shortcomings were not absent, however. These included: (1) fragmented broadcasting (to accommodate regional clusters) which prevented selective viewing and the development of audience loyalties; (2) a failure to identify clear social objectives, as distinct from mere entertainment, especially for evening programs; (3) discontinuity in broadcast content; and (4) lack of sustained follow-up, e.g., through planned group activities. An ambitious audience monitoring program had limited success due to the generality of viewer responses and time-lags in collating them. SITE's success, the authors conclude, should therefore be tempered with the realization that the fruitful use of satellites as a development tool requires identifying precise program goals.

AID/ta-C-1472

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Paper copy \$1.43

Microfiche \$1.08

**128**

**PN-AAJ-122**

**THE U.S.A.I.D. DESALINATION MANUAL**

Buros, O.K.; Cox, R.B.; Nusbaum, I.; El-Nashar, A.M.; Bakish, R.

CH2M Hill International Corporation.  
1980, 463 p.

As the world's population has grown, demand for fresh water has dramatically increased, straining available supplies and

impeding development. Desalination, the removal of salts from water, offers an increasingly feasible and necessary solution to this problem. This manual outlines major desalination processes and evaluates their development, performance, potential, problems, and economics to give planners a better understanding of the applicability of desalting in developing countries. Four major desalination processes—distillation, freezing, reverse osmosis, and electro dialysis—are examined. Distillation utilizes a three-step process of vapor production, transportation to a condenser, and condensation to separate dissolved salts from water. Freezing relies on the natural fact that when ice forms in a saline solution, it leaves ice crystals of pure water. Although freezing is currently not a commercial success, there is potential for its development and future use. Reverse osmosis is a membrane separation process in which water from a pressurized saline solution is separated from solutes as it flows through a membrane. Electro dialysis utilizes alternately fixed charged membranes placed in brackish water that has been charged by electrodes to attract and trap ionized salts and leave behind fresh water. The manual details, in regard to each process, theoretical background, commercial development, engineering considerations, state-of-the-art, applications, health aspects, environmental constraints, future prospects, process experience, and applicability for developing countries. The high cost and limited supply of conventional fuels has spurred the use of renewable or alternate energy sources for desalting. The use of solar, wind, wave, and hand energy are briefly considered and examples of existing uses are given. Factors to be considered in gathering data, making potential cost estimates, and selecting processes, particularly in developing countries, are examined. Appendices include a selected



list of U.S. desalination equipment manufacturers, worksheets and cost curves to assist in cost-estimating, guidelines for desalting process selection, a glossary of terms, and a 196-item bibliography (1946–80).

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936250200

Paper copy \$60.19

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**129**

**PN-AAJ-170**

## **KOREAN POTABLE WATER SYSTEM PROJECT: LESSONS FROM EXPERIENCE**

Chetwynd, E.; Dworkin, D.; Kim, S.U.

A.I.D., Bureau for Program and Policy Coordination, Office of Evaluation.

1981, 69 p.

*A.I.D. Project Impact Evaluation Report No. 20*

To address the potable water needs of semiurban communities (population 5,000–10,000) overlooked by rural and urban development projects, A.I.D. joined CARE in 1977 to sponsor a piped water system (PWS) project for six South Korean communities. This report, based on interviews with PWS operators and users, evaluates the project's impact and lessons for the future. The project was generally unsuccessful, failing to achieve any of its objectives completely. Only four of six targeted PWS's were fully operational by project completion date (1979) and two of these were technically deficient, failing to treat water sufficiently or to locate adequate water sources. In addition, only one village committee had been formed to operate their PWS system; the public education program was poorly conceived and managed; a lack of baseline data made it impossible to measure the project's impact on community health; and a user requirement to pay for connections and meters put the system beyond the reach of many poor households. There was also an indirect negative effect: runoff from flush toilets (the installation of which the project facilitated) created a potential for transmitting waterborne diseases. The project's major shortcoming, however, was that its design lacked any features allowing it to be replicated nationally or even regionally. On the positive side, the project did save time and make life easier for users, especially women. Chief lessons learned and accepted by the Government of Korea were that PWS project priority need not necessarily go to the poorest towns since these often experience shrinking populations and prefer traditional water sources; PWS's should be accessible to the poor while avoiding subsidization; project design should entail a regional or national focus to serve as a model; and environmental assessments should accompany all PWS's. Using identical data but focusing on the piped-water supply throughout all of Korea, an attached second evaluation recommends, among other things, servicing urban industrial and polluted rural areas before those with traditional, but sanitary water supplies. Other recommendations are included in the appendices.

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Paper copy \$8.97

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**130**

**PN-AAH-478**

## **THE TRANSFER OF TECHNOLOGY TO WATER SUPPLY, SANITATION, AND WASTE DISPOSAL SYSTEMS IN DEVELOPING COUNTRIES**

Urban Resources Consultants, Inc.

1979, 114 p.

*Companion report: PN-AAH-477, 128 p.*

More than half the world's people have no reliable and safe water supply, while 70–80% have no sewage disposal. To help decisionmakers develop feasible options to improve these dreadful conditions, which are responsible for 80% of all illnesses in the Third World and are the major cause of infant mortality, this paper, one of a series of state-of-the-art reports, reviews the possibilities for improving developing country water supply, sanitation, and waste disposal (WS/S/WD) systems through the transfer of technology. A World Bank study on low-cost technology options for WS/S/WD systems reveals that a majority of research reports are of no practical value to developing countries because they focus on developed country technologies inapplicable to developing country situations, e.g., septic tanks and sewage treatment instead of pit latrines and stabilization ponds. It is concluded that differences in climate, socioeconomic conditions, and magnitude of the problem make appropriate technology transfer from industrial to developing countries difficult. WS/S/WD customs and practices in developing countries are reviewed to provide a general perspective for appropriate technology transfer. Also outlined are governmental program options, technical and planning considerations, and capitalization requirements for the design and adoption of appropriate WS/S/WD technology. The study found that few developing countries have adequate water policies, especially for rural areas; that local participation, and especially knowledge of local customs and beliefs, is essential to any improvement in WS/S/WD systems; that improvements can be made in assessing water supplies, conserving their use, and influencing their distribution; and that appropriate technology need not be capital-intensive. The study also found that certain U.S. technologies could be directly transferred to developing countries given appropriate host country administrative structures to assure proper maintenance and operation. Included are a detailed program for planning a village water supply program, guidelines for evaluating technology options, excerpts from a Guatemalan case study, and a 300-item reference list (1921–78).

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Paper copy \$14.82

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**131**

**PN-AAJ-564**

## **INTERNATIONAL COOPERATION IN MARINE TECHNOLOGY, SCIENCE, AND FISHERIES: THE FUTURE U.S. ROLE IN DEVELOPMENT: PROCEEDINGS OF A WORKSHOP, JANUARY 18-22, 1981, SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIFORNIA**



National Research Council, Commission on International Relations.

1981, 408 p.

To help both developed and developing countries explore the vast economic and scientific potential of the world's oceans, A.I.D. sponsored an international workshop in 1981 on the need for international cooperation in the fields of marine technology, science, and fisheries, with emphasis on the future role of the United States in these fields. Papers were prepared on marine resources for each major region of the developing world (Africa, Latin America/Caribbean, Southeast Asia/Oceania, and the Near East/India) as well as on the following topics: federal support for marine technical assistance and related activities; the future of ocean science and marine technical cooperation; current developing country needs and programs; non-U.S. donor programs; and other possible avenues of technical assistance. Priority needs identified in the regional reports include assisting developing countries to learn the extent of their marine resources through analysis of currently available information and from detailed surveys of marine resources within their 200-mile economic zones; increasing the number of local scientists, engineers, and technicians; establishing regional training centers and research facilities; including economists and social scientists in marine-related projects; providing technical assistance according to priorities set by the host countries; promoting regional coordination of marine-related research and the dissemination of findings; encouraging links between public and private sectors; including mechanisms for ongoing supervision and evaluation of projects; and promoting future scientific leadership by encouraging the participation of younger scientists. Recommendations directed to U.S. agencies include establishing a U.S. Government-based information clearinghouse on marine technical assistance; encouraging cooperation between U.S. and developing country scientists; promoting greater flexibility and continuity of funding for assistance projects; increasing emphasis on fisheries and marine science in U.S. foreign aid programs; and addressing the language constraints of non-English speaking personnel and students. Many of the papers include bibliographies. A list of workshop participants is included.

AID/DSAN-G-0168

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Paper copy \$53.04

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**132**

**PN-AAH-946**

## **RENEWABLE ENERGY IN EGYPT: AN ANALYSIS OF OPTIONS**

Mitre Corporation.  
1980, 285 p.

*Analysis by AID/NE/TECH published separately: PN-AAH-945, 25 p.*

Development of Egypt's renewable energy (RE) resources can help alleviate the country's balance of payments deficit by freeing additional petroleum for export; provide employment

through development of local manufacturing facilities for RE resources; and allow dung and agricultural residues, now burned as fuel, to be used for soil conditioning and fertilizing. This paper reports the findings of a USAID-sponsored study to analyze the options for the use of RE resources in furthering Egypt's economic development and to suggest strategies for USAID/E assistance in the next 5-10 years. The basic unit of study was a combination of RE resource, technology, and end-use. Through preliminary analysis of 22 such combinations, the following six areas were identified as having outstanding potential for program development: solar water heating for industrial process heat and for agricultural, institutional, and domestic applications; solar crop and food drying; rural biogas digesters; wind machines for irrigation, electric generation, and perhaps desalination; solar refrigeration and cooling; and photovoltaic remote applications. Each of these areas is analyzed in greater detail (technology used and relative costs; utilization potential; social, environmental, and economic impacts; and infrastructure needed), and recommendations for programs and USAID/E support are presented. The other energy options considered in the preliminary analysis are briefly discussed as having good or limited potential or as needing further study. An appendix contains details of the information gathered and the analyses performed for the resource/technology/end-use combinations that were considered, including reasons why some combinations were not selected for detailed analysis. Other appendices describe the economic analysis methodology, give the criteria used for evaluating energy options, and analyze Egyptian energy-related agencies in terms of their institutional capabilities and their potential roles in recommended programs. A 31-item list of references (1974-79) is included.

AID/SOD/PDC-C-0146

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Paper copy \$37.05

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**133**

**PN-AAJ-101**

## **ASSISTANCE TO THE THIRD WORLD ON URBAN ENERGY**

Howe, J.W.; Tarrant, J.J.  
Overseas Development Council.  
1980, 191 p.

Since increased urbanization usually entails increased energy use, the 5-10% growth rate of developing country urban areas has ominous implications for these countries' future energy needs. This report assesses major urban energy uses and problems and recommends strategies and a methodology for A.I.D. assistance in helping to meet these needs. An analysis of energy use by sector indicates that in general, industry consumes far more commercial energy in developing countries than in developed countries. In the service sector (i.e., retail trade shops, government activities, utilities), developing countries' energy costs are higher due to these countries' limited infrastructure. Within the informal sector (those individual or group enterprises which are loosely characterized by high labor and low capital intensity, irregular hours, erratic work



conditions, and high labor mobility), human labor substitutes for commercial energy sources and capital requirements, while in the household sector, one-fourth of family budgets are spent on heat-related, energy-using tasks, such as cooking, heating, and lighting. Within both the construction and transportation sectors, more labor-intensive, energy-saving technologies could be employed to replace the developed country, energy-monger methods currently in use. A major barrier to designing effective energy-saving policies is the lack of comprehensive data on patterns of energy use, efficiencies of conversion, matching of fuel to end-use, and environmental and social costs of energy use patterns. Development agencies should assist developing countries in exploring for fossil fuels and in developing hydroelectric and solar facilities. In devising an urban energy assistance program, the authors recommend that emphasis be placed on: (1) collecting data specific to the target area and disseminating those data to proper local officials; (2) improving local energy capabilities by institution building, training, and increasing public awareness; and (3) financing urban energy activities.

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931000300

Paper copy \$24.83

Microfiche \$3.24

**134**

**PN-AAJ-209**

## **AFRICA ENERGY SURVEY METHODOLOGY; VOLUME 1**

Donovan, Hamester, & Rattien, Inc.  
1979, 117 p.

*Volume 2, Appendix II, Data Base, published separately:  
PN-AAJ-210, 139 p.*

With the availability of energy a major determinant in Africa for economic growth and the equitable distribution of its benefits, most African energy planners are constantly on the look-out for new and more efficient energy use systems. This report provides a methodology to be used by African energy planners in assessing energy resources, uses, and suitable conversion technologies based on the specific needs of individual African nations. The critical issues addressed include: (1) assessing the purpose for collecting and analyzing energy-related data (three major planning considerations are covered—national energy accounts and environmental considerations, allocation and use of resources, and project analysis and choice of techniques); (2) determining what specific data are required (a wide range of possible data elements is outlined by category and class to support information needs); (3) deciding how to collect chosen data (this section addresses the crucial elements of proper research design and helps determine specific survey requirements, including the use of local technical and social research expertise); and (4) finding ways to use data. Four analytical processes for using the data are described, including two techniques for establishing overall country future energy resource requirements: (1) a Reference Energy System composed of energy source, process, and end-use; and (2) Linear Projection for forecasting future demand. Two other

techniques address methods for selecting candidate energy conversion techniques appropriate to specific development programs. The first, the Socio-Cultural-Feasibility Study, is a qualitative assessment of local conditions affecting various techniques. The second, the Cost/Benefit Analysis, is a quantitative measure of the financial and economic feasibility of each technique. Application of the latter two techniques is demonstrated in a lengthy, appended case study of a potential fish drying project in a maritime artisanal fishing village in Senegal. A number of suitable technologies for the project are subjected to both types of analysis and it is concluded that the solar cabinet dryer should be field tested. A total of 20 references (1967–79) are appended and a case study of fish drying in Senegal is included.

AID/SOD/PDC-C-0147

698013500

Paper copy \$15.24

Microfiche \$2.16

**135**

**PN-AAJ-210**

## **AFRICA ENERGY SURVEY METHODOLOGY; VOLUME 2: APPENDIX II, DATA BASE**

Donovan, Hamester, & Rattien, Inc.  
1979, 139 p.

*Volume 1, Main Report, published separately: PN-AAJ-209,  
117 p.*

Appended to a separately published report outlining a methodology for surveying Africa's energy needs and suitable energy technologies, this volume, divided into eight sections, provides a structure for obtaining an energy data base. Each section is divided into a general or background series of questions followed by a set of questions suitable for macroanalysis; both multiple-response and narrative-response formats are used. Section one, "To Measure Household and Village Demographic, Economic, Climatic, and Political Indicators," includes household size; age and sex distribution; and economic, religious, and ethnic information. Questions about villages cover size, location, geography, economics, education, and trends. The second section, "To Identify and Quantify Household Energy Consumption Patterns (Rural and Urban)," covers energy consumption patterns relating to cooking and water heating, lighting, cooling, water transportation and lifting, food grinding, and household appliance fuels and use patterns. The third section, "To Identify and Quantify Village Energy Resources," covers factors such as commercial energy sources, ownership, distribution, location, development plans, prices, and trends. Fuels considered range from dung and firewood to electricity and petroleum products. The fourth section, "To Measure Energy Consumption in Industry," includes the following elements: labor input, manufacturing processes and production, and the type of fuel consumed. The fifth section, "To Measure Energy Consumption in Agriculture," covers crops and crop patterns, labor and equipment requirements, fertilizers, irrigation, and crop processing. Elements covered in the sixth section, "To Measure Energy Consumption in Agriculture," include private and public vehicles and facilities; travel and



transportation requirements and variables; and road, rail, water, and air resources. The seventh section, "To Measure Energy Consumption in Commercial and Government Buildings and Vehicles," treats commercial (retail, hotel, etc.) and government requirements and practices. The final section, "To Identify Social and Cultural Relationships Associated with Energy Consumption/Supply Patterns," deals with the division of labor, time requirements, responsibilities, consumer preferences, and perceived needs.

AID/SOD/PDC-C-0147

6980135000

Paper copy \$18.07

Microfiche \$2.16

**136**

**PN-AAJ-566**

## **PYROLYSIS OF RICE HUSKS IN INDONESIA: INTERIM REPORT**

Tatom, J.W.; Wellborn, H.W.  
Development Technology Center.  
1980, 60 p.

Because developing countries are in desperate need of renewable, low-cost energy, efforts have recently been undertaken to develop labor-intensive means of converting biomass into synthetic fuels. This report describes an ongoing USAID/Indonesia project to develop economical pyrolysis technology and design the equipment needed to utilize pyrolytic outputs and byproducts to meet the energy needs of rural Indonesia. The report includes a description of the convertor's basic design, an extensive review of previous and current work, an economic analysis of the convertor, an evaluation of program objectives and strategy in light of experience to date, and a list of future activities. The pyrolytic convertor being designed is capable each day of transforming one ton of dry, pulverized feed (rice husks in the Indonesian case) into char through extensive heat application and oxidation. Based on previous U.S. and industrial world experience, the convertor's design is currently being modified to avoid particulate accumulation in the off-gas, to maintain proper material flow within the convertor to avoid bridging problems, and to maintain a fixed bed depth to ensure uniform off-gas temperature. Since, in addition to the char, conversion byproducts such as carbon monoxide and oil vapor can be harnessed for both onsite and offsite use, a charcoal briquetting system, an off-gas burner for crop drying, and oil utilization equipment have been developed. Economic analysis of the project reveals that return on investment is sufficiently attractive to warrant widespread adoption of rice convertors for fuel production. Based on preliminary reviews, the authors recommend a revised strategy focusing on char utilization for domestic fuel purposes, onsite gas utilization to power diesel engines; using oils as wood preservatives or industrial bunker fuels; and slightly increasing mechanization of the overall pyrolysis system for greater efficiency. Future project endeavors include upgrading convertor throughput, improving briquet production techniques, perfecting the use of off-gases for diesel and spark ignition engine operation, investigating alternative uses for oils, and beginning design work on further

system mechanization. An 11-item bibliography (1976-80) is appended.

AID/497-79-100.33-T

497026800

Paper copy \$7.80

Microfiche \$1.08

**137**

**PN-AAJ-629**

## **THE POTENTIAL FOR RENEWABLE ENERGY TECHNOLOGIES IN THE RURAL POSTHARVEST FOOD SYSTEM IN DEVELOPING COUNTRIES**

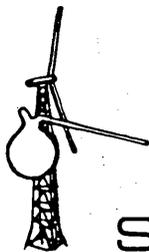
Lindblad, C.J.  
1981, 98 p.

The finite supply and escalating price of oil make the development and promotion of renewable energy technologies a priority for developing countries. This report examines energy demand and potential renewable energy technologies for postharvest food processing with particular emphasis on technologies related to grain. Postharvest activities (harvesting, drying, threshing, winnowing, shelling, hulling, grinding, storage, refrigeration, canning, cooking) and the techniques used in these activities are explored. Possible renewable sources include fuelwood, charcoal, solar cookers, ovens, and crop dryers, photovoltaics, animal draft, pedal power, wind power, hydropower, biogas, and alcohol fuels; some of these, it is noted, also have potential applicability beyond postharvest activities. The report recommends that: (1) implementation trials be conducted to gauge user receptivity to new technologies and assess the practicality of the new technologies in terms of local priorities, customs, and resources; (2) development and promotion programs be established for those technologies with the greatest near-term potential—fuelwood production, efficient cookstoves, small-scale water resources, and wind resources exploited for mechanical and electrical power; (3) low-cost technologies be developed and made available at affordable prices to farm families; (4) attempts be made to assure that women's incomes and role in postharvest activities do not erode in the face of technical advances; and (5) national renewable energy research and development centers be established to provide energy surveys, locally adapted technologies, training, local language manuals, and technical assistance in the design and implementation of technology promotion efforts. The report concludes that even though the acceptance of such promising new technologies as solar crop drying, animal power, pedal power, biogas digesters, and organic insect control will take time and that the short-term effect of renewable energy technologies will probably not be great, these technologies can still have a significant long-term impact. A 116-item bibliography (1960-81) is appended.

AID/otr-147-80-108

Paper copy \$12.74

Microfiche \$1.08



138

PN-AAJ-771

## WOOD FUEL USE IN PAPUA NEW GUINEA; AN ASSESSMENT OF INDUSTRIAL COMBUSTION EQUIPMENT

Mendis, M.S.  
Mitre Corporation.  
1980, 242 p.

*Sponsored by A.I.D. and the U.S. Department of Energy, Pittsburgh Energy Technology Center*

In Papua New Guinea (PNG), where 75% of industrial energy needs are supplied by petroleum and fossil fuel reserves are unknown, the rapidly rising price of petroleum imports threatens industrial growth. To aid government efforts to encourage use of wood products, this report assesses the engineering and economic feasibility of new and retrofit wood fuel industrial combustion equipment. Existing combustion equipment in PNG is relatively small-size, generally oversized, and not fully efficient. By comparing such existing equipment and its use with commercially available, state-of-the-art industrial wood fuel systems, the following technologies were selected as most promising for local use: pyrolytic oil and oil-petroleum mixture combustion, lump/crushed charcoal combustion, hogged/chipped wood combustion or gasification, crushed charcoal gasification, and pulverized charcoal-oil mixture combustion. All these technologies are compatible with equipment currently existing in PNG and make centralized use of raw wood and wood wastes through direct combustion or gas conversion. In 11 case studies representing a cross-section of PNG industrial fuel systems, each technology was analyzed in terms of its net present value (NPV) savings over the existing petroleum-fueled system. The report concludes that industrial wood fuel use, especially using a pyrolytic oil system, is attractive for high-use industries and generally has a positive NPV over petroleum-fueled systems. The report recommends that the PNG government: (1) encourage use of wood, pyrolytic oils, and charcoal as industrial fuels when purchasing new equipment, and promote wood and pyrolytic retrofits for existing, heavily used, and well-maintained equipment; (2) establish guidelines for standardizing new wood fuel technologies; (3) offer financial or tax assistance to aid small industry in implementing the new technologies; (4) assist in making existing equipment more fuel-efficient; and (5) encourage development of wind, solar, and other alternative renewable energy technologies. Appended are a 19-item bibliography (1973-80), a discussion of wood conversion technologies, a list of equipment suppliers and manufacturers, and the NPV equations and FORTRAN program.

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PN-AAJ-807

## ENERGY IN THE FOOD SYSTEM; DOMINICAN REPUBLIC

Daines, S; LeBaron, A.; Posner, L.; Hancock, K.; Buttars, R.; McGranahan, G.; Mitchell, G.; Mubayi, V.; Stern, R.  
Practical Concepts, Inc.; Brookhaven National Laboratory.  
1980, 235 p.

This intensive study of fossil energy use in the Dominican Republic's (DR) food system reveals that the system's energy bill for non-sugarcane products can be reduced as much as 4% by the year 2000. After reviewing DR food system components, the authors estimate energy use and its efficiency at each food-chain link (production, processing, marketing, storage, and transportation) for traditional DR agricultural products; make a series of short-and medium-term energy use projections; and explore policy alternatives for product, technology, and energy use adjustments. Sugar cane production and processing is the greatest and most inefficient energy user, employing high technology to consume nearly 75% of all DR fossil fuel energy at the farm level, while contributing only 23% of the total value of agricultural production. Because sugarcane requires separate treatment, however, no energy-saving options are presented in its regard. Other agricultural products also absorb relatively large amounts of fossil fuel energy, but these have a good domestic (beef) or foreign (tobacco, coffee) market that would be difficult to curtail. Only a limited number of products, outside of sugarcane, offer potential for reducing fossil fuel energy consumption. The most likely of these are banana, plantain, poultry, cocoa, and especially rice, the only one of these products currently using a relatively high technology and energy use level. Policy options to reduce energy use in the food system or increase its efficiency within income constraints or nutritional requirements fall into three categories: (1) change the mix of products produced or consumed; (2) alter cultivation techniques; and (3) alter food processing and handling technology. Cocoa, poultry, and unprocessed pork are good crop substitutes because, as potential export products which employ minimal amounts of fossil fuel energy, they could earn foreign exchange and save imported fossil fuel energy. Shifting production of rice, milk/beef, and peanuts to geographical zones where simpler technologies are used, could save 10-13% of fossil fuel energy. Appendices include a 97-item bibliography (1960-80) in English and Spanish.

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PN-AAJ-489

### BIOMASS FOR ENERGY IN ECUADOR: AN ASSESSMENT

Beinhart, G.; Henry, J.F.

United States Department of Agriculture, Forest Service/  
Science and Education Administration Bioresources Team.  
1981, 99 p.

Burgeoning population growth in Ecuador contributes to increased use of fuelwood and the consequent over-exploitation and degradation of Ecuadorian forests and ecosystems. This paper surveys the country's existing biomass resources and considers new approaches to its production and use. The Instituto Nacional de Energia (INE) needs to encourage greater wood production (woodlots, multipurpose forests) and improve fuelwood efficiency through the introduction of more efficient wood burning stoves. Although alternative fuel sources are plentiful in Ecuador, their feasibility will depend upon relative costs (monetary, convenience, and effectiveness). Crop residues of bagasse, rice, cocoa hulls, and other residues available at agroindustry plants may be compressed through direct combustion, gasification, pyrolysis, or fermentation and converted into energy. Excess bagasse alone could satisfy the solid fuel needs of about 20,000 people yearly, indicating the importance of investigating this economical alternative. Although the use of crops for energy without reducing food production is possible in Ecuador, it is not economically feasible in the immediate future. Total costs of production, harvesting, processing, and transporting, are higher than the market value of crude biomass as a solid fuel. Other long-term options for the INE are municipal wastes that can be processed into refuse-derived fuel (RDF) or burned to produce steam and electricity for industrial and municipal applications. RDF pellets, a solid fuel, would be half the price of fuelwood and would also be competitive in a gaseous form for oil-fueled boiler systems. Biogas production from animal manure and municipal sewage can be used for fuel in rural homes and small industries. The INE is operating seven demonstration biogas generators in different areas to investigate the reliability and economic feasibility of biogas for rural families. The study recommends that continued surveys be undertaken by INE and A.I.D. on the use of fuel wood substitutes and the probable future of biogas. Nine appendices on contacts, trips, and energy consumption and a list of 25 references (1974-80) are included.

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PN-AAH-729

### FIELD REPORT: AN ASSESSMENT OF TRANSPORT INFRASTRUCTURE RELATIVE TO ZAMBIAN COASTAL LINKAGE

Moeller, P.W.  
1980, 226 p.

The major constraint to Zambia's economic development—its inadequate transport system—is rooted in the politically unsta-

ble atmosphere surrounding this landlocked nation and in the poor condition of the transport infrastructure itself. This field report reviews Zambia's transport system in terms of Zambia's import/export traffic through the southern African nations on which Zambia depends. An overview of foreign railway systems connected to those of Zambia reveals poor track conditions and a shortage of high-powered locomotives, equipment, and manpower, as well as problems resulting from the closure of the Rhodesian border between 1971-79 and of ports due to guerilla activities. Regarding cargo transport by road, it is found that although trucks can easily respond to demands for heavier loads, haulage by truck is more costly than by railway and depends upon imported petrol. Assessments of major roads and port facilities reveal that primary roads, extensively damaged by heavy rains in the 1970's have been adequately restored (although the same cannot be said of secondary roads); and that port facilities are deficient in warehouse and handling equipment. Also discussed are Zambia's deficit in maize supplies, due to road and bridge destruction, and the amount of imported maize needed to cover this deficit; constraints to its transport; and strategies to remove the latter. The impact on Zambia's transport system from the reopening of Rhodesia's border would mean a return to a client-state status between the two countries which, in spite of the constant threat of political instability, would significantly increase the flow of commodities to Zambia. Recommendations for A.I.D. assistance to Zambia include identifying key problems—specifically, maximization of existing infrastructure, with emphasis on inputs of cargo and grain storage equipment and of maintenance and management skills—and providing a framework for solving these problems. Priority targets for A.I.D. assistance are specified. Concluding the report are a 12-item bibliography (1977-79) and appendices on other donor activity, bridge and port status and field trip reports, and Zambia/Mozambique route options.

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PN-AAJ-415

### SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT, VOLUME I: EXECUTIVE SUMMARY

Louis Berger International, Inc.; Tippetts-Abbott-McCarthy-Stratton.  
1981, 59 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Syria has in place or is constructing all the infrastructure needed for an adequately functioning transport sector until the year 2000. So concludes this executive summary, the first of a seven-volume study of the Syrian transport sector. The report recommends actions to the Government of Syria (GOS) in each of the key sectors discussed in this series. In regard to transportation management, the GOS should reorganize the



Ministry of Transport to clarify its responsibilities and those of its subordinate agencies and should solicit external advisory services to improve operations and develop training programs. Road transport recommendations include recentralizing responsibility for road planning, construction, and maintenance in the Ministry of Communications; reducing the rate of road construction; developing new road design standards and pavement design testing methods; and initiating a plan of pavement widening and resurfacing during the present 5-year plan. Among the rail transport recommendations are developing a major 2-year technical assistance program with a consulting subsidiary of a railway operating on European UIC standards and reorganizing the rail management board to include representatives of all pertinent ministries and interests involved in transportation. Regarding ports, the GOS should enforce unitized cargoes as much as possible and immediately acquire 45,000 wooden pallets. To improve aviation, the GOS is advised to purchase new, more efficient aircraft to replace aging or obsolete models. Other transport sectors covered in the assessment are pipelines, storage facilities, and transportation personnel training. A final section presents preliminary investment recommendations based on a strictly economic comparison of alternative scenarios projecting the transport sector's requirements from 1980 to 2000.

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**PN-AAJ-416**

## **SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT, VOLUME II: TRANSPORT DEMAND**

Louis Berger International, Inc.; Tippetts-Abbett-McCarthy-Stratton.  
1981, 190 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Despite the strains on the Syrian transportation network caused by an increasing population and an often forbidding topography, this report predicts that Syria's aggregate demand for transport will not outstrip supply through the year 2000. This report, the second of a seven volume study on the Syrian transport sector, analyzes, against a background of demographic and economic data, demands placed on the Syrian transport system by domestic freight, transit, passenger, and tourist traffic. Domestic freight traffic was disaggregated into 51 commodity groups and then combined into three categories of similar per ton-kilometer cost characteristics to predict increases in freight flows on the major transport corridors. Shipped freight tonnage will thus increase 2.5% per year from 1979 to 1985 and 4.4% annually from 1986 to 2000. These low growth rates are primarily due to stagnant pipeline transport of crude oil. Anticipating future transit traffic (goods shipped through Syria to another country) is difficult because political changes in the Mideast make the use of Syrian intermediate transit uncertain, but assuming that economic factors prevail

and that Syria's geographic position is exploited by those shipping goods to and from Europe, and excluding the pipeline sector, annual tonnage growth rates of 9% for 1979 to 1985 and 5% for 1986 to 2000 may be expected. Domestic demand for passenger traffic is met almost entirely by automobiles, buses, and other transport exclusive of air and rail due to the former's high price and the latter's restricted availability. In fact, rail accounts for only 3.1% of the total passenger-kilometers travelled and air for only 0.4% as of 1979. To ease the expected 53% increase in passenger demand by 1985, the rail system will increase its share of passenger-kilometers to 12% by 1985. To help reduce burgeoning passenger traffic demand (expected to be three times its 1979 level by the year 2000) Syria should adopt a cost-effective, non-subsidized pricing policy for mass transit. Finally, although Syria seeks to expand its tourist traffic by increasing the number of transit beds from 18,500 to 35,000, the Central Bureau of Statistics' practice of designating all visitors to Syria as tourists may make these plans overly optimistic.

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**PN-AAJ-417**

## **SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY; FINAL REPORT, VOLUME III: RAILWAYS**

Louis Berger International, Inc.; Tippetts-Abbett-McCarthy-Stratton.  
1979, 226 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Syria has embarked upon an ambitious expansion of its rail system which, by 1985, will adequately meet national rail transport demand through the year 2000. So concludes this, the third of a seven-volume study on the Syrian transport sector. The study analyzes both of Syria's rail lines, the Chemin-de-fer Syrien (CFS) and the Chemin-de-fer Hijaz (CFH). The CFS, a standard gauge (1,435 mm) railway serving both north-south and east-west traffic, is the largest and most important railway in Syria. By 1985, CFS will have achieved annual increases of 6 million passengers and 5 million tons of freight. Although new lines will go from Mhine to Damascus and from Deir Ez to Albu Kamal, CFS will have to anticipate capacity problems requiring doubletracking on the Damascus-Homs line in the 1990's. Further, to run the newly expanded CFS network efficiently, a major personnel training and assistance program should be initiated and managerial positions created to deal with finance, law, administration, planning, marketing, engineering, and liaison with ports. Existing rolling stock should be better utilized, but even with total utilization, equipment will need to be supplemented with an additional 184 main line locomotives, 65 shunting locomotives, 843 coaches, and 7,540 freight wagons by the year 2000. Passenger tariffs are presently well below the marginal cost of running the CFS efficiently and should be raised to meet operating costs. The CFH is Syria's narrow



gauge (1,050 mm) rail network which in the past depended for its livelihood on the transport of passengers and freight from east to west. When its last access to the Mediterranean was cut off at the Lebanese border in 1976, CFH suffered an irreversible depression. Despite dieselization and added rolling stock, CFH is generally not competitive with other forms of overland traffic and a closure of its Damascus-Dera'a line appears inevitable. More importantly, Syria is conducting a feasibility study to determine the utility of replacing CFH with a standard gauge line. Thus, the above recommendations are of an interim nature and mostly concern maintaining the line until its final disposition is determined.

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**SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT, VOLUME IV: ROADS AND ROAD TRANSPORT**

Louis Berger International Inc.; Tippetts-Abbett-McCarthy-Stratton.  
1981, 333 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Syria's roads are unlikely to accommodate traffic increases projected to the year 2000 without significant modifications. So concludes this study of Syria's road system, the fourth of a seven-volume study of Syria's transport sector. The current road system is a mixture of deficiency and overdevelopment. Notable portions of both paved and unpaved rural roads are of a quality either too high or too low for their current traffic, and road conditions are deteriorating on 83% and 95.5% of these roads respectively. Based on the least-cost alternative system of investment evaluation, the study concludes that the proposed highway betterment program will yield high economic benefits—even though the rail system is more efficient than the road system—and that a marginal cost pricing policy for passenger transport would substantially reduce total system costs by 2000. Also provided are a list of investment priorities under the 1981–85 development plan (including the purchase of 90,000 new or replacement vehicles), additional priorities for the period 1986–2000, and an estimate of income from road user charges. In other areas, it is recommended that the feasibility of returning to a crushed granular aggregate base course in road design be studied; that the rules governing road inspection be clarified to end violations of Syrian construction standards; and that maintenance be improved by establishing a Mohafaza-level model road maintenance/production unit and by increasing national government administrative and technical support. The vehicle scrapping rate should also be established to determine the actual number and age of the cars in use, and statistics collected on cars (domestic and imported) and on vehicle operating costs. A method for determining the latter is provided. Decentralizing the responsibilities formerly concen-

trated in the Ministry of Communications (MOC) has created serious gaps and conflicts in road construction, maintenance, and budgeting. To address these problems and ensure proper technical guidance is provided to primary and local road units, the study recommends recentralizing all road responsibilities under the MOC with the Mohafazas and the Ministry of Local Administration participating in the budget and planning processes.

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**PN-AAJ-419**

**SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT, VOLUME V: PORTS AND SHIPPING**

Louis Berger International Inc.; Tippetts-Abbett-McCarthy-Stratton.  
1981, 274 p.

*Study includes volumes 1-7; PN-AAJ-415 through PN-AAJ-421*

Syria's planned expansion of the ports of Tartous and Lattakia will provide the nation with sufficient port capacity through the year 2000. So concludes this report on ports and shipping, the fifth of a seven-volume study of Syria's transport sector. However, the report's underlying assumption of an average one-shift per day loading rate is only possible if at both ports Syria: (1) implements a new, graduated tariff regime; (2) institutes unitized cargo handling; (3) improves coordination of road and rail transport to and from the ports; (4) improves the use of storage facilities and customs clearance procedures; and (5) develops a manpower training program. While Lattakia and Tartous share common problems, differences in the age and size of the ports require separate analyses. Although Lattakia's physical plant is basically sound, port efficiency is directly impeded by inadequate equipment to repair cargo handling machinery; the unavailability of spare parts due to their foreign origin or the obsolescence of port machinery; operational slowdowns caused by rapid changes in cargo handling requirements; and the unavailability and poor coordination of land transport to and from the port. To expedite cargo handling, Lattakia should acquire 25,000 new pallets as soon as possible and anticipate rail and road congestion in its expansion plans. The port at Tartous is new and in good condition, enjoys wide aprons between ships and transit sheds, and has equipment that is adequate and in good working order. The port's rapid growth has, however, led to interruptions in cargo handling due to dirt from construction which irritates workers and necessitates frequent machinery repairs, and haphazard storage of building materials and enforcement of safety requirements. Immediate recommendations are to contain dust from the phosphate conveyor and ship loading systems, acquire road cleaning machinery, and purchase 20,000 pallets as soon as possible for expeditious cargo movement. To rejuvenate its 40-ship merchant fleet, which is at the end of its economic life, Syria



# TRANSPORTATION

should build 35 new ships by the year 2000 and initiate a merchant marine training program.

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## **SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT, VOLUME VI: OTHER MODES AND RELATED INDUSTRIES**

Louis Berger International, Inc.; Tippetts-Abbett-McCarthy-Stratton.

1981, 292 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Syria's efforts to meet its transport needs through the year 2000 are succeeding even in such disparate subsectors as aviation, pipelines, construction, and storage. So concludes this fifth of a seven-volume report on Syria's transport sector. Syria easily meets current air travel demand with four domestic airports and an international airport at Damascus, with a second planned for Aleppo. The most urgent requirement in civil aviation is to revise the master plans of all these airports to eliminate obsolete or inefficient physical plants. Also needed are improved training programs for paraprofessional and lower-level personnel from Syrianair and the Directorate General for Civil Aviation. Syria should modernize its air navigation system by establishing a regional traffic control center in concert with its Arab neighbors and by straightening out flight routes wherever possible. Syrianair should also refurbish its fleet with 727's and F-27's for use on international and domestic routes, respectively. Three public corporations are responsible for Syria's internal and external oil pipeline system and for domestic storage and marketing. All pipelines have ample capacity and maintenance is adequate. Feasibility studies should be conducted for pipelines between Homs, Al Raqqa, and Aleppo, and for new distribution centers at Damascus and Dera'a. Although Syria's construction sector cannot be analyzed fully due to the government's reluctance to provide vital industry statistics, available information indicates this sector will grow by an average of 7% per year from 1979 to 2000 and is capable of undertaking all building programs currently envisioned. Competitive bidding would make this sector healthier and more viable by equitably dividing contracts between the dominant public companies and private ones. Existing and planned storage capacity will be adequate, since present facilities can increase storage efficiency up to 100% by improving record-keeping systems needed for forecasting and by better managing present capacity.

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**PN-AAJ-421**

## **SYRIAN ARAB REPUBLIC COMPREHENSIVE TRANSPORT STUDY: FINAL REPORT; VOLUME VII: TRANSPORT SECTOR PLANS**

Louis Berger International, Inc.; Tippetts-Abbett-McCarthy-Stratton.

1981, 224 p.

*Study includes volumes 1-7: PN-AAJ-415 through PN-AAJ-421*

Using the Syrian Transport Analysis System (SYRTRANS), a computerized management information system, this report, the last of a seven-volume study on the Syrian transportation sector, assesses prospects and plans for the sector as a whole. Because data on Syria's transport sector have gaps, are inconsistent, and are poorly managed, the consultants developed SYRTRANS for the Government of Syria (GOS). SYRTRANS' structure (including individual data banks) and methods are described along with its major uses—predicting the quantity and type of traffic each subsector can accommodate, seeking ways to reduce costs and optimize facility use, and analyzing modal split (i.e., the use of one transit mode over another equally accessible mode). Assuming that market conditions regulate modal split, from 1979 to 1985 the most striking movement will be the increased use of the expanding rail system. From 1985–2000, rail will carry the majority of bulk freight (cereals, phosphates, cement) while road transport will accommodate more perishable and expensive goods such as food, fertilizer, and capital equipment. The most notable modal shift will occur within the road subsector where passenger cars will double by the year 2000, reducing the importance of pickup trucks and where increased bus service will supplant the importance of intercity taxis. Regardless of modal split, however, marginal cost pricing of tariffs is recommended since it will cause no distortion of economic or social activities due to artificial prices. Organizationally, the GOS should reserve all intermodal planning to the Supreme Planning Council, clarify the responsibilities of the Ministry of Transport, and initiate a manpower study to identify personnel needs to end labor shortages throughout the sector. Regarding the current 5-year plan (1981–85), the consultants recommend the following order of investment priorities: committed projects (accounting for 73% of expenditures); equipment needed to utilize existing and committed transport facilities; air navigation equipment; two new primary road links (Lattakia-Ariha and Hama-Saraqeb); the road betterment program; new secondary and tertiary roads; and lastly, domestic air service.

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PN-AAJ-434

**ECONOMIC AND TECHNICAL FEASIBILITY STUDY,  
BUKOMBE-ISAKA ROAD LINK, TANZANIA; FINAL  
REPORT**

Louis Berger International, Inc.  
1981, 208 p.

Rwanda, Burundi, and parts of eastern Zaire are now dependent on two transportation routes to the Indian Ocean—a "northern" route through Uganda and Kenya to the port of Mombasa, and a "southern" route across Lake Tanganyika and Tanzania to the port of Dar es Salaam. These routes have become unsatisfactory due to considerable difficulties and delays caused by deteriorating roads, slow rail and port services, and the unstable political situation in Uganda. An alternative "middle" route which crosses Tanzania by road from Rusomo to Isaka and then by rail to Dar es Salaam has thus been proposed. This report examines the economic and technical feasibility of this "middle" route with particular emphasis on the Bukombe to Isaka segment of the proposed Rusomo to Isaka road. The present road from Bukombe to Isaka is 5.5 meters wide and 117.5 km long. It has generally good horizontal alignment, but the vertical alignment is less satisfactory, primarily because long sections of the road tend to flood in the rainy season. Road maintenance is inadequate and bridges and culverts, although in fair to good condition, are narrower than the graded road. Two types of improved road—a new gravel road and a new paved road, both 6.5 m wide, 112.5 km long, and on new alignment—are considered, and economic analyses are conducted assuming both 5% and 7% traffic growth rates. The Economic Internal Rate of Return (EIRR) is relatively attractive (16.0–18.1%) for the paved road, but lower (5.0–8.9%) for a new gravel road since the vehicle operating cost savings from transferring to a new gravel road would be considerably less. A more favorable EIRR for a new gravel road might be obtained if the possibility of upgrading and using some sections of the existing road is considered. This approach may merit further study. Road maintenance improvements, improved rail services, reduction of transshipment time at Dar es Salaam, and provision of an efficient rail/road transfer facility at Isaka will also be necessary if the "middle" route is to provide satisfactory service, and several programs are now underway to accomplish these objectives. Numerous illustrative tables are included, and an appendix provides data on traffic growth and EIRR.

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**TRANSPORTATION TECHNOLOGY SUPPORT FOR  
DEVELOPING COUNTRIES. SYNTHESIS 3: LABOR-  
BASED CONSTRUCTION AND MAINTENANCE OF  
LOW-VOLUME ROADS.**

National Research Council, Transportation Research Board.  
1981, 74 p.

One major deficiency in many developing countries' transport systems is the lack of low-volume roads that generally carry only 5–10 vehicles a day but provide some rural areas with their only link to markets and public service facilities. This report, available in English, French, and Spanish, is part of an AID-funded project to improve developing country access to existing information on the planning, design, construction, and maintenance of low-volume roads. This report's specific purpose is to synthesize—mainly for policymakers in the transportation ministry, planners of road programs and chief engineers in the road authority—existing literature on the meaning, concerns, and use of labor-based technologies in low-volume road construction and maintenance in the context of development. A wide range of labor- and equipment-based construction tools and methods (from hoes, picks, crowbars, and wheelbarrows to bulldozers and mechanized excavators and loaders) are discussed because no construction technology is entirely labor-based but instead spans a full spectrum of human, animal, and mechanical resource combinations. A general evaluation framework is presented to assist policymakers in choosing an appropriate mix of construction technologies which is technically, financially, socially, and economically feasible. An implementation framework is also included which traces the major considerations in implementing low-volume construction projects at both the national (program conception, development, organization, operation and financing) and local (scheduling, supervision, management, monitoring and training) levels. The authors state that the potential for increased use of labor in lower-standard roads is most promising despite the high incidence of capital-intensive technologies throughout the construction industry. Labor-based technology for construction and maintenance of low-volume roads is most favorable when there is a call for projects that are small in scale, geographically dispersed, and technically uncomplicated and when a country's capital reserves are inadequate to purchase construction machinery. Appended is a 29-item bibliography (1963–79).

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The above bring to 25 the number of IRRI research papers announced in Vol. 9, Nos. 1-4 of *ARDA*.

Other institutional achievements in rice research announced in this issue are those of The Agricultural Development Council in three reports on Nepal dealing with rice production (082), adoption of modern rice varieties (080), and changes in income distribution following introduction of modern rice varieties (081).

A final paper, item 136, by the Institute of Technology at Bandung, Indonesia, describes pyrolytic conversion of rice husks into fuels, the conversion design, and the economic returns anticipated for investment in converters.

Substantive achievements by research institutions require a long-term institutional commitment as well as the donor backing, such as A.I.D. has provided and continues to provide, which makes this commitment possible. Both the commitment and the support spring from the devotion of research institutions and donors alike to the ultimate goal of development—improving the quality of human life—which is their common *raison d'être*. The Report of the Presidential Commission on World Hunger and A.I.D.'s response to it through the TPCA are sober reminders, that for nearly two-thirds of all developing world people, the attainment of this grand goal must begin with the fulfillment of basic human needs, especially the most basic need of all, the need for food.

### The Gift of Food.



**PHOTO CREDITS:** A.I.D. photos, pp. 31, 43, 50, Inside Back Cover. International Center for Living and Aquatic Resources Management photos, pp. 8-9. Earth Satellite Corporation photo, p. 23. American Public Health Association photo, p. 45. World Health Organization photo, p. 51. Central Salt and Marine Chemicals Research Institute photo, p. 59.

AGENCY FOR INTERNATIONAL DEVELOPMENT

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