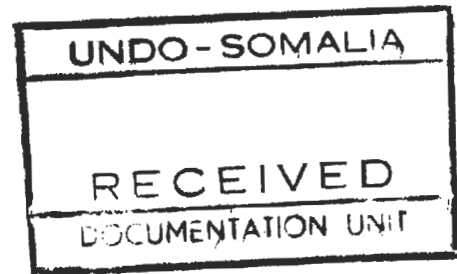




# Jubba Environmental and Socioeconomic Studies

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## VOLUME IV: BIBLIOGRAPHY

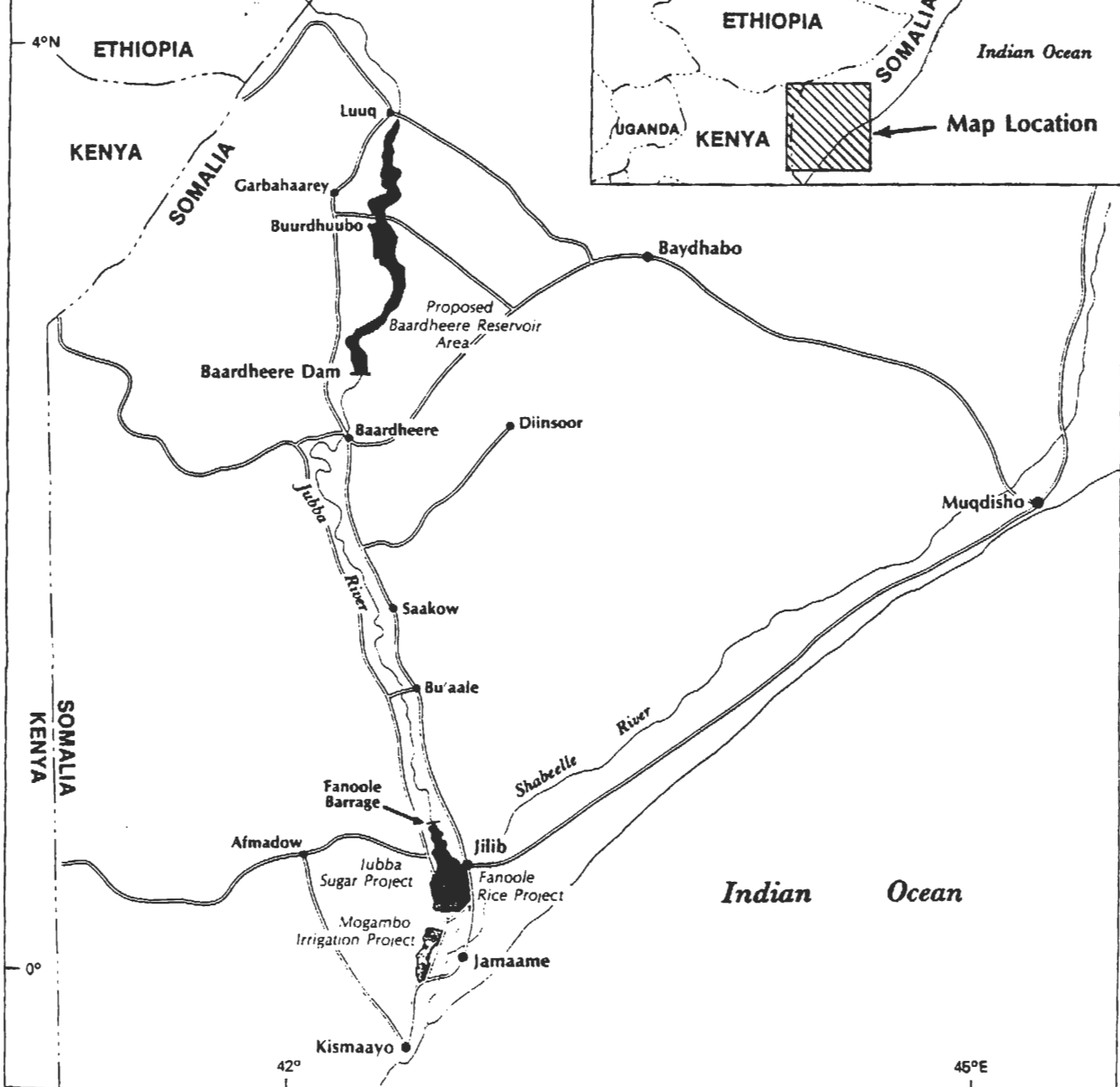
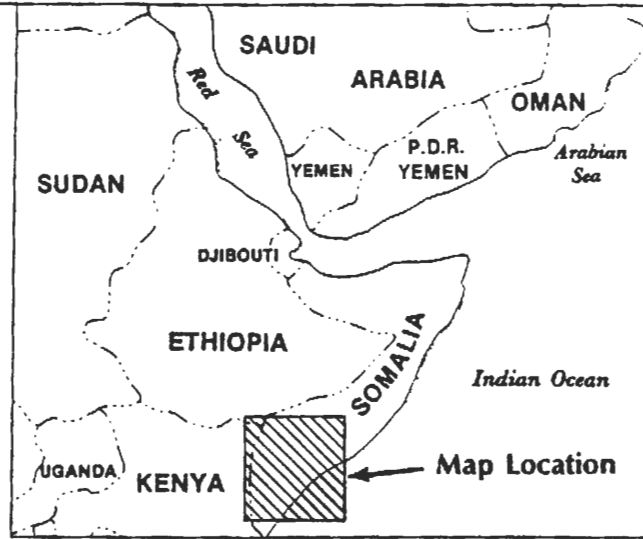
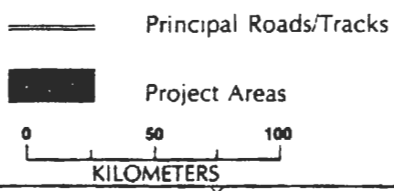


**JESS** *Jubba Environmental and  
Socioeconomic Studies*  
*Daraasaadka Dooxada Jubba*

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*A project of • Ministry of National Planning and Jubba Valley Development •  
United States Agency for International Development • Associates in Rural Development, Inc.*

**FIGURE 1**  
**AREA OF THE BAARDHEERE DAM PROJECT**  
**AND JUBBA VALLEY DEVELOPMENT**



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Jubba Environmental and Socioeconomic Studies (JESS) were part of the Jubba Development Analytical Studies Project (JuDAS), implemented in southern Somalia by the U.S. Agency for International Development (USAID) and Ministry of National Planning and Jubba Valley Development (MNPJVD) of the Government of the Somali Democratic Republic (GSDR). Associates in Rural Development, Inc. (ARD), of Burlington, Vermont, provided technical assistance and project management for JESS under USAID contract number AFR-0134-C-00-5047-00. The JuDAS Project also included a soils and land-use classification project, completed in 1987 by the U.S. Bureau of Reclamation (USBR), and a long-term training component administered by USAID. In addition, the Board on Science and Technology for International Development (BOSTID) of the National Academy of Sciences (NAS) provided advisory services to USAID and MNPJVD under JuDAS.

JESS began in September 1985 and ended in March 1989 with publication of this final report. It was carried out as a three-phase project to collect environmental and socioeconomic data in Somalia's Jubba Valley—the site of proposed development of a large hydroelectric dam with the following characteristics:

| <i>Specifications of Proposed<br/>Baardheere Dam and Reservoir<sup>1</sup></i> |                              |
|--|------------------------------|
| Installed generating capacity  | 105 mw                       |
| Dam height   | 75 m                         |
| Dam length   | 609 m                        |
| Elevation at dam crest   | 144 masl                     |
| <i>Reservoir water level</i>   |                              |
| min. normal operation (at penstocks)   | 128 masl                     |
| max. normal operation  | 142 masl                     |
| max. exceptional (flood) <sup>2</sup>  | 148 masl                     |
| max. normal fluctuation <sup>2</sup>   | 14 m                         |
| <i>Reservoir characteristics<sup>3</sup></i>                                   |                              |
| length   | 160 km                       |
| surface area   | 310 km <sup>2</sup>          |
| volume   | 3,400 million m <sup>3</sup> |
| <i>Discharge<sup>4</sup></i>   |                              |
| annual monthly mean  | 152 cumecs                   |
| max. operation   | 203 cumecs                   |
| design flood   | 750 cumecs                   |
| Average residence time for   |                              |
| inflows during max. normal operation   | 191 days                     |

1. Values are approximate, based on preliminary design (ELC 1985).

2. Drawdown in typical year is 7 m. 3. Approximate for 142 masl.

4. Information updated by AHT (personal communications, 1988).

Complementary to construction of the dam, various plans are being prepared for subsequent development of irrigated agriculture in the middle and lower Jubba Valley. Numerous environmental and socioeconomic changes will occur with dam construction, filling of the reservoir, infrastructural enhancement, and intensification of agriculture.

The JuDAS Project had two major purposes:

- to gather necessary information on soils/land use and socioeconomic and environmental factors to be incorporated into a master planning process for Jubba Valley development; and
- to provide MNPJVD with technical support and training.

As one of its objectives was to assist Jubba Valley development, JESS continuously supplied results from its socioeconomic and environmental studies to a master planning team assigned to MNPJVD. The team was financed by the German Agency for Technical Cooperation (GTZ) and staffed through Agrar- und HydroTechnik, GmbH (AHT). JESS also provided practical, informal training for its Somali counterparts and served in an advisory capacity to USAID and MNPJVD on long-term training. The three phases of JESS are described below.

Phase I was a six-month period from September 1985 to March 1986 that was used to review and assemble data from existing literature, studies, and ongoing programs in the project area. Based on information gaps and an overview of the area, JESS prepared a work plan to conduct appropriate baseline and problem-specific studies concerning environmental and socioeconomic conditions in the Valley.

Phase II lasted for 24 months, from April 1986 to March 1988, and focused on intensive field data collection, including two longer-term baseline studies (on socioeconomics and terrestrial ecology) and various separate short-term investigations on a variety of environmental and socioeconomic factors relevant to Jubba Valley development.

Phase III, from April 1988 to March 1989, consisted of data analysis, synthesis, interpretation of research results and report writing. This phase culminated in the present comprehensive final report

which presents pertinent research findings, and recommendations for enhancing the positive effects and avoiding or mitigating negative impacts of dam construction and operation, as well as development of the Jubba Valley.

The main vehicle for NAS/BOSTID's interaction with the JESS team, USAID and MNPJVD, was a series of workshops/technical advisory meetings. The first workshop, which was held in Somalia at the end of January 1986 and included a field trip to the Jubba Valley, was organized to give direct input to the design of JESS Phase II studies. This workshop was followed up with a two-day meeting in April at ARD's offices in Burlington, Vermont with the panel reviewing the JESS draft Phase II work plan. Beginning in late September 1986, a one-week workshop was held in Kenya to visit water development projects in the Athi and Tana River basins, to review and discuss lessons learned and avoid problems which could occur in similar developments in the Jubba Valley. A final workshop was held in Coolfont, West Virginia in May 1987, and was used to review progress of JESS research, after more than a year of field activities. In late 1988 and early 1989, panel members also reviewed earlier drafts of final reports on longer-term research included in these volumes. During implementation of JESS, the following scientists participated on NAS's Jubba Valley Advisory Panel:

*Thaver Scudder*, Ph.D. (Chairman), Director, Institute for Development and Anthropology, California Institute of Technology

*Claudia Carr*, Ph.D., Professor, Department of Conservation and Resource Studies, University of California

*Lee Cassanelli*, Ph.D., Associate Professor of History, University of Pennsylvania

*Charles W. Howe*, Ph.D., Professor of Economics, University of Colorado

*John M. Hunter*, Ph.D., Professor of Community Health Sciences & Professor of Geography, Michigan State University

*Walter J. Lusigi*, Ph.D., United Nations Educational, Scientific and Cultural Organization, Nairobi

*Peter Rogers*, Ph.D., Professor, Division of Applied Sciences, Harvard University

*Berekat H. Selassi*, Ph.D., Professor, Howard University & Georgetown University

*Michael Dow*, Ph.D., Associate Director, BOSTID

*Jeffrey A. Gritzner*, Ph.D., Senior Program Officer, BOSTID

*Susan M. Piarulli*, Program Assistant, BOSTID

The environmental studies proposed in the Phase II work plan were oriented around a longer-term effort, *Terrestrial Ecology Baseline Studies* (TEBS), due to a shift in focus to the study of vegetation and land-use changes in riverine and floodplain areas associated with the Jubba River. JESS' tropical ecologist led the TEBS effort with support from various consultants in forestry, botany, wildlife management, and remote sensing.

The longer-term *Socioeconomic Baseline Studies* (SEBS) were planned around a comprehensive household/family survey of randomly selected villages and towns in the Jubba Valley. The survey covered many aspects, such as a demographic profile, family resources management and allocation, health and nutrition, social services, land tenure, and resources-use rights. SEBS later had an additional special emphasis through a *Women's Baseline Study* (WBS), used to assess issues related to the role of women in development. A separate initiative was also undertaken for a brief survey to assess marketing and price structures for agricultural commodities. These studies were directed by JESS anthropologists and the JESS socioeconomicist.

Thirty short-term environmental and socioeconomic investigations were also carried out during Phase II to fill gaps in the technical information for scientifically narrow areas. Reports emanating from these studies and project-management reporting are listed on the following page. It should be understood that JESS short-term consultants worked, in most cases, in isolation from each other and produced certain findings and recommendations that were not comparable. While JESS has reproduced the findings and recommendations of each of these scientists as reported, Volume I (*Executive Report*) and reports based on JESS longer-term studies (TEBS and SEBS) represent the most comprehensive assessment of the overall JESS effort; these reports consider and, in most cases, summarize the findings of other investigations.

With the final design and specifications of the proposed Baardheere Dam and development projects for the Jubba Valley still undergoing study and revision, the need for JESS environmental and socioeconomic assessments was more generic. The flexibility and responsiveness of USAID project management and ARD's field team permitted various studies to be revised or rescheduled based on the realities of an evolving development project.

### Complete List of JESS Reports.

- Phase I Review and Phase II Work Plan for the JESS Project.* July 1986. Report No. 1.
- Bibliography for the JESS Project.* July 1986. Report No. 2.
- JESS Manpower and Training Assessment.* Richard Z. Donovan; July 1986. Report No. 3.
- Jubba Environmental and Socioeconomic Studies First Annual Report.* November 1986. Report No. 4.
- JESS Interim Report on Health Impacts of Design Alternatives for Proposed Baardheere Dam.* William R. Jobin; November 1986. Report No. 5.
- JESS Interim Report on Health Consequences of Design Criteria for Water Supply and Sanitation in New and Resettled Communities.* William R. Jobin; November 1986. Report No. 6.
- JESS Consultancy Report on Water Quality and Public Health Engineering.* William R. Jobin; November 1986. Report No. 7.
- JESS Interim Report on Cultural Heritage Sites in Proposed Baardheere Reservoir Area.* Steven A. Brandt; November 1986. Report No. 8.
- Interim Report on Vegetation Survey of the Jubba Valley.* Christopher F. Hemming; October 1986 Report No. 9.
- JESS Phase I Design Studies.* William R. Jobin, Peter A. Bloch, James C. Riddell, Curt R. Schneider and James F. Ruff; July 1986 Report No. 10.
- JESS Second Consultancy Report on Water Quality and Public Health Engineering.* William R. Jobin; January 1987. Report No. 11.
- JESS Fisheries Consultancy I Report.* Earl K. Meredith; June 1987. Report No. 12.
- JESS Interim Report on Aerial Photography Interpretation.* Eric Trump; June 1987. Report No. 13.
- JESS Preliminary Report on Aerial Survey of the Jubba River.* R. Murray Watson; June 1987 Report No. 14.
- JESS Third Consultancy Report on Water Quality and Public Health Engineering.* William R. Jobin; July 1987. Report No. 15.
- JESS Working Paper: Pre-construction Concerns with the Baardheere Dam.* R. E. Tillman; November 1987. Report No. 16.
- JESS Interim Report: Riverine Forests of the Jubba Valley. Issues and Recommendations for Conservation.* Ian Deshmukh; November 1987. Report No. 17.
- JESS Interim Report: Mapping Jess Research Results.* Paul Dulin; October 1987. Report No. 18.
- JESS Interim Report: Survey of Palearctic Migrant Birds in Somalia's Middle and Lower Jubba Valley.* David Pearson; October 1987. Report No. 19.
- JESS Interim Report: Long-term Environmental and Socioeconomic Monitoring.* Paul Dulin; October 1987. Report No. 20.
- JESS Report on Water Balance and Sediment Transport in the Jubba River Watershed.* Donald Alford; August 1987. Report No. 21.
- JESS Interim Report: Data Management and Analysis.* Leonard A. Malczynski; November 1987. Report No. 22.
- JESS Interim Report: Vegetation Survey of Baardheere Reservoir Zone.* Christopher F. Hemming; August 1987. Report No. 23.
- Jubba Environmental and Socioeconomic Studies: Second Annual Report.* December 1987. Report No. 24.
- JESS Interim Report: Second Survey of Palearctic Migrant Birds in Somalia's Middle and Lower Jubba Valley.* David Pearson; December 1987. Report No. 25.
- JESS Report on Cultural Heritage Survey of the Proposed Baardheere Reservoir.* Steven A. Brandt and Thomas H. Gresham, with contributions from Robert Benson, Nanny Carder, and James Ellison; June 1988. Report No. 26.
- JESS Report on Forestry in the Jubba Valley.* T. J. Synnott; March 1988. Report No. 27.
- JESS Report on Biological Limnology of the Jubba River.* Steven G. Njuguna and Francis M. Muthuri; March 1988. Report No. 28.
- JESS Report on Malaria Endemicity in the Lower Jubba Region.* Marian Warsame Yusuf; April 1988. Report No. 29.
- Phase II Report and Phase III Work Plan.* March 1988. Report No. 30.
- JESS Report on Land Tenure Dynamics in the Jubba Valley.* James C. Riddell; May 1988. Report No. 31.
- JESS Report on Fisheries.* Earl K. Meredith; June 1988. Report No. 32.
- JESS Report on Pastoral Economy and Seasonal Livestock Movements in the Jubba Valley.* Jorg Janzen; August 1988 Report No. 33.
- JESS Report on Land Tenure in the Middle Jubba Valley: Issues and Policy Recommendations.* Catherine Besteman and Michael Roth; August 1988. Report No. 34.
- JESS Report on Economic History of the Lower Jubba: Implications for Development Planning.* Ken Menkhous; August 1988. Report No. 35.
- JESS Summary Report on Bilharzia and Distribution of Bulinus Abyssinicus in the Jubba Valley.* Ralph Klumpp; August 1988. Report No. 36. (Included in JESS Report No. 39.)
- JESS Report On Aerial Resource and Land-use Surveys in the Jubba Valley.* Murray Watson and Jennifer Nimmo; May 1988. Report No. 37.
- JESS Report on Upper Jubba Watershed Performance.* Tom Hart; August 1988. Report No. 38.
- JESS Report on Water Quality and Public Health Aspects.* William Jobin; August 1988. Report No. 39.

Throughout the life of the project, JESS cooperated with other projects and ministries, often exchanging data at informal and formal levels. Such exchanges always took place with full knowledge of MPNJVD and USAID. The following descriptions illustrate the wide range of contacts established during the project.

**Land Tenure Center (LTC) of the University of Wisconsin** — From the outset, JESS encouraged a close working relationship with two LTC researchers engaged in land tenure assessments in middle Jubba Valley. JESS assisted with logistics, personnel, and advice, and received considerable support in terms of data collection. LTC researchers routinely visited JESS team members and participated in some team meetings to exchange information whenever they returned to Muqdisho from their fieldwork. The JESS team made attempts to visit LTC field sites in the Jubba Valley whenever their activities were in proximity to those sites. As a result of this close liaison, LTC produced a report on land-tenure issues in the Jubba Valley for JESS.

**Settlement and Resource Systems Analysis (SARSA)** — JESS established close working relationships with the SARSA team. This one-year project studied rural-urban linkages within an approximate 100 km around Kismaayo. Several joint team meetings were held, data were freely exchanged, and both teams made an effort to coordinate their work and standardize data collection to avoid overlapping efforts.

**Livestock Marketing and Health (LMH) Project** — While it was not necessary to hold joint team meetings, JESS and LMH freely exchanged data on livestock practices in the Jubba Valley. Members of both teams routinely attended consultant debriefings of common interest.

**Central Rangelands Development Project (CRDP)** — While JESS and CRDP had different geographic venues of interest, information on numerous shared sectoral and technical activities was commonly exchanged between them. Terrestrial ecologists from both teams pooled their resources at times for taxonomic assistance, and the social scientists compared survey techniques. To a limited degree, the projects provided each other with assistance in logistics.

**British Forestry Project** — The JESS ecologist had numerous meetings with members of the British

Forestry Project concerning vegetation and land-use mapping.

**World Concern** — JESS had two unique experiences with World Concern. During the floods in May 1987, World Concern asked JESS to assist with rescue operations near Luuq. Refugee fields had been severely flooded, and many irrigation pumps were underwater. JESS responded with a loan of a boat and two boat pilots, which enabled World Concern to rescue a majority of refugee irrigation pumps before they rusted beyond repair. In a second instance, World Concern volunteered to perform an anemia survey in Jilib after JESS was forced to cancel a similar study with the Refugee Health Unit (RHU) of the National Refugee Commission. Under this agreement, JESS loaned World Concern hemoglobin spectrophotometers that had been purchased for the RHU study in exchange for the data collected between March and September 1988.

**Halcrow-Fox Associates (HFA)** — HFA conducted a study for MNPJVD concerning resettlement of the population currently situated in the area of the proposed reservoir. JESS was HFA's first contact in Somalia concerning information and logistic support. During 1987 and early 1988, a very close working relationship developed between the two groups. Incoming HFA consultants were routinely briefed by the team before the onset of their fieldwork. With the permission of MPNJVD, HFA relied heavily on JESS equipment for its fieldwork.

**World Bank** — One of the principal objectives of JESS is to make its research results available to potential donors in order to meet requirements for financial and development plans. JESS provided considerable assistance to a World Bank preappraisal mission for the Baardheere Dam regarding environmental and resettlement issues, organized and implemented a field trip to the reservoir area for the World Bank team and provided liaison between MNPJVD and the bank in terms of archaeology studies. Copies of all JESS reports have been continuously supplied to the Bank during all phases of the project.

**United Nations High Commissioner for Refugees (UNHCR)** — JESS held several meetings with resettlement teams from UNHCR. Reports and field notes were made available to these teams as well as remote sensing products developed during JESS.



**Somali Academy of Science (SOMAC)** — In its studies on archaeology and land tenure, JESS worked with counterparts in an attempt to encourage wider participation of Somali scientists.

**National University of Somalia (NUS)** — JESS utilized expertise from the faculties of medicine and chemistry to conduct studies in epidemiology, water quality, limnology, and land tenure. JESS was instrumental in arranging the turnover of a USBR atomic-absorption spectrophotometer and other laboratory equipment to NUS before the end of the JuDAS project.

**Ministry of Health (MOH)** — JESS worked closely with MOH in planning and implementing epidemiology surveys in the lower Jubba Valley. MOH supervisors and technicians conducted this study with JESS financing, logistics, and technical assistance.

**World Health Organization (WHO)** — JESS also worked closely with WHO officials in planning and implementing the epidemiology surveys. Based on this liaison, surveys were conducted under standards endorsed by WHO. Reports on study results were presented to WHO at an individual debriefing.

**Ministry of Fish and Marine Resources (MFMR)** — JESS maintained a close relationship with MFMR throughout its studies in Phase II. Personnel from this ministry used JESS boats and equipment to conduct freshwater fisheries research in two Somali rivers and assist fishery cooperatives, one on each river.

**Baardheere Dam Technical Committee** — The JESS team leader was a member of this committee at the invitation of the Baardheere Dam Project.

**Agrar- und HydroTechnik** — According to USAID's JuDAS project paper and the scope of work in ARD's technical assistance contract, the purpose of JESS was to generate environmental and socioeconomic information necessary for the creation of a master plan for Jubba Valley development. MNPJVD has overall authority for coordination of the master plan, while GTZ is financing technical assistance through the AHT master planning team. JESS and master planning efforts were to be coordinated in a timely manner by MNPJVD. However, JESS and master plan schedules were *not* in synchronization. Because these projects were funded, negotiated, designed, and planned by different donors, their schedules were not coordinated.

JESS' Phase II began in April 1986 and ended in March 1988. Outputs of that phase were to be used by master planners for preparation of *Master Plan Volume 1: Present Stage of Development*, but this volume was released in December 1987.

AHT's *Master Plan Volume 2 Regional Development Strategy* was released in July 1988. It briefly defines a series of alternative development projects for the Jubba Valley. While AHT took advantage of JESS' Phase II baseline information, analyses of baseline studies data were not completed until the end of Phase III, with the release of the preliminary drafts of the JESS final report in August 1988. AHT's *Master Plan Volume 3: Jubba Valley Development Investment Program* was originally scheduled for release in December 1988, before the planned presentation of the JESS final report.

With these timing and scheduling constraints, JESS staff had to open informal channels of information exchange with the AHT master planning team. Throughout Phase II, USAID, MNPJVD, AHT, and a wide audience of reviewers were kept informed of JESS activities and research results through the release of timely interim reports prepared by consultants and long-term JESS staff. In addition, 28 monthly reports, prepared during the implementation of Phases I and II, were widely distributed in Somalia and elsewhere. SEBS data bases and other research materials, including aerial photographs, water-quality sampling data, field-trip notes, vegetation maps and the results of aerial censuses, were turned over to the master planning team as a matter of course. Various debriefings were presented by JESS consultants after completing their short-term investigations. JESS/AHT inter-team meetings, and informal one-on-one collaboration between JESS staff and AHT consultants were mutually beneficial to both teams' efforts in data collection.

As intended in the design of JESS, information collected during Phase II was processed and analyzed during Phase III. Full reports were prepared for both of the longer-term baseline studies (SEBS and TEBS). These, in combination with the group of short-term, intermittent investigation reports, complete JESS' contribution of environmental and socioeconomic studies relative to proposed development in Jubba Valley development. Recommendations are included for enhancement of the beneficial aspects and mitigation and/or avoidance of negative impacts associated with

proposed developments, while guidelines for environmental and socioeconomic monitoring take into account the inherent limitations of Somalia's sociopolitical and economic constraints.

This final report was prepared from direct analyses of JESS research and reviews of other data and literature relevant to Jubba Valley development. The *Executive Report (Volume I)* synthesizes available information concerning the environmental and socioeconomic implications of construction of the Baardheere Dam and subsequent development of the Jubba Valley. All other JESS reports on long-term baseline studies and short-term investigations are annexed to the *Executive Report: Volume II (Environmental Studies)*, *Volume III (Socioeconomic Studies)*, and *Volume IV (Bibliography)*.

Copies of research materials, including principal data bases and code books, tabular data, field maps, site descriptions, photographic slides, and aerial photographs, were prepared and transferred to the five *JESS Data Repositories*—MNPJVD, USAID/Somalia, USAID/REDSO/ESA, USAID/Washington, and ARD/Burlington. A list of repository materials is included in Volume IV.

As of 31 March 1989, the JESS technical assistance team included:

*Robert "Gus" Tillman*, Ph.D.—team leader,  
environmental assessment;

*Kathryn Craven*, Ph.D.—socioeconomics;

*Ian Deshmukh*, Ph.D.—ecology, vegetation, and  
wildlife;

*James Merryman*, Ph.D.—anthropology;

*Nancy Merryman*, Ph.D.—women's issues,  
administrative coordination;

*Marie Tillman*—data center coordination,  
bibliographer; and

*Robert Ondrusek*—information management.

Two personnel changes occurred during the three and one-half years of the project. Dr. E. Drannon Buskirk served as team leader from November 1985 until February 1987, when Dr. Tillman assumed this role. Mr. Richard Donovan was ARD's home-office project manager from the inception of the project until May 1987. Mr. Paul Dulin then managed JESS until completion of the contract and coordinated the preparation of the final report.

Throughout the life of the project, ARD home-office staff participated in various aspects of project management, administration, technical assistance and logistics. Dr. George Burrill, ARD's president,

maintained overall management responsibility for the contract. Mr. Richard Hart, the firm's business manager, provided administrative coordination. Mr. Kevin Fitzcharles assisted with project management, hiring consultants, and handling logistics. Mr. Ross Bryant and Mr. Ted O'Shaughnessy supervised procurement. Dr. Alfred Waldstein provided intermittent technical assistance in the preparation of the SEBS final report. Star Albright and Clair Dunn were responsible for editorial production of the final report.

For USAID/Somalia, Sally Patton was project manager from the inception of JuDAS until July 1987. Weston Fisher then managed the project until its completion. Both gave generously of their time and were instrumental in the implementation of this complex project.

|          |          |  |
|----------|----------|--|
| <b>A</b> | A.A.P.G. | American Association of Petroleum Geologists   |
|          | ACMRR    | Advisory Committee of Experts on Marine Resources Research                                 |
|          | ADC      | Agricultural Development Corporation   |
|          | AETFAT   | Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale                       |
|          | AFIS     | Amministrazione Fiduciaria Italiana della Somalia  |
|          | AHT      | Agrar-und HydroTechnik, GmbH   |
|          | AID      | U.S. Agency for International Development  |
|          | AIDS     | acquired immune deficiency syndrome  |
|          | AIRD     | Associates for International Resources and Development                                     |
|          | ARD      | Associates in Rural Development, Inc.  |
|          | ARIS     | Aerial Resource Inventory System   |
|          | ARTEMIS  | African Real-Time Environmental Monitoring using Imaging Satellites                        |
|          | ASCE     | American Society of Civil Engineers  |
|          | ASD      | Air Survey and Development, Inc.   |
|          | ASEAN    | Association of Southeast Asian Nations   |
|          | ASGA     | Association des Services Geologiques Africains   |
|          | AVHRR    | Advanced Very High Resolution Radiometer   |
| <b>B</b> | B.P.     | before present (present being 1952, when radiocarbon dating became commercially available) |
|          | BDP      | Baardheere Dam Project   |
|          | BFPS     | British Forestry Project, Somalia  |
|          | BMZ      | Bundesministerium fuer Wirtschaftliche Zusammenarbeit                                      |
|          | BNA      | Blue Nile Associates   |
|          | BOSTID   | Board on Science and Technology for International Development                              |
| <b>C</b> | ca.      | <i>circa</i> (approximately)   |
|          | CAS      | catch assessment survey  |
|          | CDA      | Cooperation for Development in Africa  |
|          | CEC      | Commission of the European Communities   |
|          | CIFA     | Committee for Inland Fisheries of Africa   |
|          | CILSS    | Comite Permanent Interetats de Lutte contre la Secheresse dans le Sahel                    |
|          | CISP     | Comitato Internazionale per lo Sviluppo dei Popolo   |
|          | CITES    | Convention on International Trade in Endangered Species                                    |
|          | CPCA     | Comite des Peches Continentales pour l'Afrique (FAO)                                       |
|          | CPUE     | catch per unit of (fishing) effort   |
|          | CRDP     | Central Rangelands Development Project   |
|          | cumecs   | cubic meters per second  |
|          | CV       | coefficient of variation   |
|          | CWS      | Church World Services  |

|          |          |   |
|----------|----------|---|
| <b>D</b> | D.V.W.K. | German Association for Water Resources and Land Improvement   |
|          | DAP      | disodium ammonium phosphate   |
|          | DC       | district commissioner   |
|          | DLWR     | Department of Land and Water Resources  |
| <b>E</b> | EC       | electrical conductivity   |
|          | EC25     | electrical conductivity at 25°C.  |
|          | EEC      | European Economic Community   |
|          | EIFAC    | European Inland Fisheries Advisory Commission   |
|          | ELC      | Electroconsult  |
|          | EMRO     | Eastern Mediterranean Regional Office (WHO)   |
|          | ENC      | Ente Nazionale Commercio  |
|          | ERDAS    | Earth Resources Data Analysis Systems, Inc.   |
|          | ERP      | European Recovery Programme   |
|          | ERS      | Economic Research Service   |
| <b>F</b> | FAO      | Food and Agriculture Organization of the United Nations   |
|          | FBS      | fish biology sampling   |
|          | FEWSD    | Food Early Warning System Department  |
|          | FR       | Forest Reserve  |
|          | FSP      | fish sampling program   |
| <b>G</b> | GDP      | Gross Domestic Product  |
|          | GJV      | Greater Jubba Valley  |
|          | gm       | gram  |
|          | gn       | gill net  |
|          | GNP      | gross national product  |
|          | GOE      | Government of Ethiopia  |
|          | GSDR     | Government of the Somali Democratic Republic  |
|          | GTZ      | German Agency for Technical Cooperation   |
| <b>H</b> | ha       | hectare   |
|          | hl       | hook line   |
|          | HMSO     | Her Majesty's Stationery Office   |
|          | hn       | hoop net  |
| <b>I</b> | IBRD     | International Bank for Reconstruction and Development (World Bank)  |
|          | ICA      | International Center for Aquaculture  |
|          | ICE      | Istituto Nazionale per Il Commercio Estero  |
|          | ICOLD    | International Commission on Large Dams  |
|          | ICRAF    | International Council for Research in Agroforestry  |
|          | ICTA     | Instituto Ciencia y Tecnología Agrícolas (Guatemala)<br>(Institute of Agricultural Science and Technology ) |
|          | IDC      | International Development Corporation   |
|          | IFAD     | International Fund for Agricultural Development   |

|                |   |
|----------------|---|
| IFO            | Institut fuer Wirtschaftsforschung  |
| IIASA          | International Institute for Applied Systems Analysis  |
| IIED           | International Institute for Environment and Development   |
| IIIC           | International Irrigation Information Centre   |
| ILCA           | International Livestock Center for Africa   |
| ILO            | International Labour Office   |
| IMF            | International Monetary Fund   |
| IPAL           | Integrated Project on Arid Lands  |
| IPM            | Integrated Pest Management  |
| ISNAR          | International Service for National Agricultural Research  |
| ITC            | International Institute for Aerial Survey and Earth Sciences                                      |
| ITE            | Institute of Terrestrial Ecology  |
| IUCN           | International Union for Conservation of Nature and Natural Resources                              |
| IWR            | Institute for Water Resources   |
| <b>J</b> JASPA | Jobs and Skills Programme for Africa  |
| JESS           | Jubba Environmental and Socioeconomic Studies   |
| JSP            | Juba Sugar Project  |
| JuDAS          | Jubba Development Analytical Studies  |
| <b>K</b> KFW   | Kreditanstalt fur Wiederaufbau, German Aid Funding Organization                                   |
| kph            | knots per hour  |
| KREMU          | Kenya Rangeland Ecological Monitoring Unit  |
| <b>L</b> LDC   | less developed countries  |
| ln             | natural logarithm   |
| LRDC           | Land Resources Development Centre<br>(now part of TDRI, Tropical Resources Development Institute) |
| LSA            | Later Stone Age   |
| LSU            | Land System Units   |
| LWR            | Department of Land and Water Resources, Ministry of Agriculture                                   |
| <b>M</b> MAB   | Man and the Biosphere Programme   |
| MARC           | Monitoring and Assessment Research Centre   |
| MARS           | Market Study  |
| masl           | meters above sea level  |
| maxcpue        | maximum catch per unit of effort  |
| MCC            | Mennonite Central Committee   |
| mcm            | million cubic meters  |
| mcpe           | mean catch per unit of effort   |
| MEI            | morphoredaphic index  |
| MFMR           | Ministry of Fisheries and Marine Resources  |
| mincpue        | minimum catch per unit of effort  |
| MIP            | Mogambo Irrigation Project  |

|                |   |
|----------------|---|
| MJVD           | Ministry of Jubba Valley Development  |
| MMP            | Sir Malcolm MacDonald and Partners, Ltd.  |
| MNPJVD         | Ministry of National Planning and Jubba Valley Development (formerly MJVD)                |
| MOA            | Minister of Agriculture   |
| MOH            | Ministry of Health  |
| MSA            | Middle Stone Age  |
| MSY            | maximum sustainable yield   |
| <b>N</b> n.d.  | no date   |
| NAS            | National Academy of Sciences  |
| NASA           | National Aeronautics and Space Administration   |
| NERC           | Natural Environment Research Council  |
| NES            | National Environment Secretariat  |
| NESDIS         | National Environmental, Satellite, Data and Information Service                           |
| NHWL           | Normal High Water Level in Reservoir  |
| NLITH          | number of lithics found in a density sample   |
| NOAA AVHRR     | National Oceanic and Atmospheric Administration, Advanced Very High Resolution Radiometry |
| NRA            | National Range Agency   |
| NTTCP          | National Tsetse and <i>Trypanosomiasis</i> Control Project                                |
| NUS            | National University of Somalia  |
| <b>O</b> OAS   | Organization of American States   |
| ODA            | Overseas Development Administration   |
| ODI            | Overseas Development Institute  |
| ODU            | Overseas Development Unit   |
| OECD           | Organization for Economic Cooperation   |
| OEF            | Overseas Education Fund   |
| OMVG           | Organization pour la Mise en Valeur du Fleuve Gambie                                      |
| ORS            | oral rehydration salts  |
| ORT            | oral rehydration therapy  |
| <b>P</b> PA 18 | Piper 18 (Super Cub) airplane   |
| pET            | potential evapotranspiration  |
| PHC            | Primary Health Care   |
| PPC            | Bureau for Program and Policy Coordination  |
| ppm            | parts per million   |
| PVO            | Private and Voluntary Organizations   |
| <b>R</b> $r^2$ | coefficient of determination in regression analysis                                       |
| RAO            | Regional Agricultural Officer   |
| REDSO          | Regional Economic Development Services Offices  |
| RGS            | river gauging stations  |
| RMR            | Resource Management and Research, Ltd.  |

|          |         |   |
|----------|---------|---|
| <b>S</b> | SAIS    | Studio Architetti Ingegneri Specializzati                         |
|          | SAREC   | Swedish Agency for Research Cooperation with Developing Countries |
|          | SCOPE   | Scientific Committee on Problems of the Environment               |
|          | SDR     | Somali Democratic Republic  |
|          | SEBS    | Socioeconomic Baseline Studies (of JESS)                          |
|          | SES     | Somali Ecological Society   |
|          | SG      | specific gravity  |
|          | SIATSA  | Tropical Agricultural Research Services                           |
|          | SIDA    | Swedish International Development Agency                          |
|          | SLR     | single lens reflex camera   |
|          | SMP     | Somali Marine Projects  |
|          | SOGREAH | Societe Grenobloise d'Etudes et d'Applications Hydroliques        |
|          | SOMAC   | Somalia Academy of Arts and Sciences                              |
|          | SRC     | Synergic Resources Corporation                                    |
|          | SRCS    | Somali Red Crescent Society                                       |
|          | SRP     | Somalia Research Project (University College of London)           |
|          | SRS     | Southern Rangelands Survey  |
|          | SSh     | Somali shillings  |
|          | SWDO    | Somali Women's Democratic Organization                            |
| <b>T</b> | t       | metric ton, metric tonne  |
|          | TAMS    | Tippetts-Abbott-McCarthy-Stratton                                 |
|          | TARDA   | Tana and Athi River Development Authority                         |
|          | TDS     | total dissolved solids  |
|          | TEBS    | Terrestrial Ecology Baseline Studies (of JESS)                    |
|          | TLU     | Tropical Livestock Unit   |
|          | TSS     | total suspended sediment  |
|          | TVA     | Tennessee Valley Authority  |
| <b>U</b> | UN      | United Nations  |
|          | UNCTAD  | United Nations Conference on Trade and Development                |
|          | UNDP    | United Nations Development Programme                              |
|          | UNEP    | United Nations Environment Programme                              |
|          | UNESCO  | United Nations Educational, Scientific, and Cultural Organization |
|          | UNHCR   | United Nations High Commission for Refugees                       |
|          | UNICEF  | United Nations Children's Fund                                    |
|          | UNIDO   | United Nations Industrial Development Organization                |
|          | USAID   | U.S. Agency for International Development                         |
|          | USBR    | U.S. Bureau of Reclamation  |
|          | USDA    | U.S. Department of Agriculture                                    |
|          | USEPA   | U.S. Environmental Protection Agency                              |
|          | USGPO   | U.S. Government Printing Office                                   |

|   |      |   |
|---|------|---|
| V | VITA | Volunteers for International Technical Assistance, Inc.   |
| W | WASH | Water and Sanitation for Health Project                   |
|   | WBS  | Women's Baseline Study                                    |
|   | WDA  | Water Development Agency                                  |
|   | WHO  | World Health Organization                                 |
|   | WWF  | World Wide Fund for Nature (formerly World Wildlife Fund) |
| Y | YMCA | Young Men's Christian Association                         |

Throughout this report scientific units follow standard international practice. For example,  $\text{kg km}^{-2} \text{ year}^{-1}$  means kilograms per square kilometer per year.

The International Monetary Fund calculated the average official exchange rate for 1987 at 105.6 SSh to the U.S. dollar. The purchasing power parity during the same period, however, was just over 166 SSh to the U.S. dollar.



The following glossary of standard Somali place names and terms used in JESS reports represents a close approximation to Somali pronunciation and orthography. Words in *parentheses* are alternate spellings that are commonly seen, but which JESS feels are non-standard. The spelling of "Jubba" is an obvious example—by far, the most commonly encountered spelling of the river has only one "b," but based on the most common Somali pronunciation of this word, the double "b" spelling is considered standard. Words appearing in *square brackets* indicate another, different Somali or foreign name for the same place. For example, the most common Somali name for the capital is not Muqdisho, Mogadishu, or Mogadiscio, but Xamar (pronounced "hamar").

### Place Names

- Afgooye  
Afmadow  
Arbay Cabdi  
Baardheere (Bardera, Bardere, Bardhere)  
Badhaadhe  
Banta  
Baraawe (Brava, Barawe)  
Baydhabo (Baidoa)  
Beledul Kariim  
Bidi  
Birbiriso  
Bu'aale [mistakenly identified  
on some maps as Dujuuma]  
Buulo Maamow  
Buur Fuule  
Buurdhuubo (Burdubo)  
Cabdulle Kakane  
Canjeel  
Cusbooley  
Deex — grazing area between  
lower Jubba River and the coast  
Demo  
Dhacar — grazing area  
in lower Jubba, west of the river  
Dhesheeg Radiile  
Dhoobey — grazing area  
east of lower Middle Jubba  
Dhesheeg Waamo (Deshek Uamo)
- Dujuuma  
Faafxadhuun  
Fanoole  
Fuuma  
Gaduudey  
Garbahaarey  
Golweyn  
Gomeeni Yare  
Goob Weyn  
Gurmeyso  
Hakaka  
Haraawe  
Hiloshiid  
Hombooy  
Honqorre  
Hurufle  
Iskandariya [Alessandria]  
Jabbi  
Jamaame [Margherita]  
Jilib (Gelib)  
Jowarri — grazing area  
east of upper Middle Jubba and bay  
Kalaanje  
Kaytooy  
Kismaayo (Kismayo, Chisimaio, Kismayu)  
Kumbareera  
Kumtiire  
Kuudka  
Libaanga  
Libooye  
Luuq  
(Luq, Luk, Lugh, Lugh Ferrandi, Lugh Gananc)  
Madiina  
Mana Moofa  
Manaane  
Mardha  
Mareerey  
Maykoreebe  
Mogambo  
Mokomane  
Moofa  
Muqdisho  
(Mogadishu, Mogadisho, Mogadiscio) [Xamar]  
Nafta Quur

Nasiib Buundo  
Nyiireey  
Qalaaliyo  
Qoraxey  
Saakow (Saacow, Sakow)  
Sarenley  
Sarsaar  
Shabeelle  
Shangaani  
Tansaaniya  
Turdho  
Wandiid — grazing area east  
of Saakow; east of Banaada  
Webi Jubba  
(Uebi Juba) [Ganaane] — Jubba River  
Xagar Buulo  
Yontooy

### **Houses**

aqal - portable nomad hut  
baraako - rectangular with tin roof  
cariish - rectangular wattle or mud and wattle  
hoori - portable nomad hut  
mundul - round wattle or mud and wattle  
sar - cement or cement-brick house

### **Measures and Storage**

boosto — about 1/24 of a hectare  
darab — about 1/4 of a hectare  
kintaal — quintal or about 100 kilograms  
shood — 1/4 of a suus or .62 to .75 kilograms  
suus — 2.5 to 3.0 kilograms  
teneg — large ghee tin

### **Physical Features**

bakool — white soils  
ceel — well  
degaan — “home areas” of pastoralists  
dhesheeg  
(deshek, desheek, dhasheeg) — depression  
dhoobey — dark/black clay soils  
doonk — inland rainfed soil  
dooy — red clay soil  
gosha — of the forest  
haro — lake  
hilo — watering place  
jiimo — riverbank  
shiid — stone

og, togga (tug, toog) — seasonal stream  
war — manmade pond  
webi — river

### **Politics**

beel — subdistrict  
guddi — committee  
guddoomiye — chairman  
madaxweyne — president  
nabadoon — peacemaker  
sheikh — Islamic religious leader  
tuulo — village  
xaafad — neighborhood

### **Seasons**

gu' — big rains (April to June)  
xagaa — dry season (June to September)  
deyr — small rains (October to November).  
jiilaal — very dry season (December to February)

## **Bibliography**

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This report updates and expands on that published as "Bibliography for the JESS Project." *JESS Report No. 2*, July 1986.

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# Introduction

The Jubba Environmental and Socioeconomic Study (JESS) project (number 649-0134) is jointly funded by the Government of the Somali Democratic Republic (GSDR) and U.S. Agency for International Development (USAID). JESS is part of a larger project funded by USAID and the GSDR, the Jubba Development Analytical Studies (JuDAS) project. Technical assistance and JESS project management are being provided to the Ministry of National Planning and Jubba Valley Development (MNPJVD) by Associates in Rural Development, Inc. (ARD) of Burlington, Vermont, under AID contract number AFR-0134-C-00-5047-00.

This bibliography is a revised version of the JESS bibliography that was published in 1986, relating specifically to social and environmental systems in Somalia as well as river basin assessment and planning, in general. Many new references have been added and the bibliography has been organized into 22 different sections, corresponding to the subject codes (BIBCODE) being used by the JESS team in Somalia. In each section, citations are listed alphabetically by author or issuing body, and citations dealing specifically with Somalia have been separated from other references within the same section. Each citation is listed only once even if it is multidisciplinary and since it was impossible to secure copies of all references cited, many are simply classified according to the information contained in the title.

The bibliography includes selected monographs, conference papers, journal articles, book chapters, reports, JESS studies and dissertations. Regrettably, some citations do not have complete bibliographic information, as such information was not available from the secondary sources they were taken from or they were merely referred to as unpublished studies and reports. Users should recognize that the bibliography is neither definitive nor comprehensive, and that an inclusion of a particular reference does not imply that its scientific merit has been substantiated.

## Jess Data Repositories

During the more than two-and-one-half years of field research in Somalia and in the preparation of the JESS Final Report, JESS project staff and con-

sultants generated abundant data in various formats and at a variety of analytical levels. Because of the sheer bulk of this raw data and the expense involved in their wide-scale reproduction and distribution, it was decided that JESS establish five *data repositories* in strategic locations, where future investigators and those involved with long-term environmental and socioeconomic monitoring of Jubba Valley development activities, could access the most relevant research products. Consequently, the following JESS data repositories were established:

- *Ministry of National Planning and Jubba Valley Development, Muqdisho, Somalia (MNPJVD)*
- *U.S. Agency for International Development, Agricultural Development Office, Muqdisho, Somalia (USAID/Somalia)*
- *U.S. Agency for International Development, Regional Economic Development and Support Office/East and Southern Africa, Nairobi, Kenya (REDSO/ESA)*
- *U.S. Agency for International Development, Center for Development Information and Evaluation, Washington, DC (CDIE)*
- *Associates in Rural Development, Inc., Burlington, Vermont (ARD)*

Products of JESS field research are varied in size, shape, format, and, in some cases represent original or manuscript items which have not been copied for publication. These products include:

- field maps and charts
- aerial photographs (oblique and vertical)
- completed survey questionnaires
- field notes and observations
- data bases, customized software programs, and codebooks
- photographic slides
- detailed methodological descriptions

For reasons of logistics and reproduction costs, not all products are included in each of the five repositories. As complete as possible, sets of data products, including most original and manuscript items, are deposited in the repository at

USAID/Somalia although, additionally, certain photographic products are deposited at REDSO/ESA to permit access to reproduction equipment. MNPJVD, CDIE, and ARD repositories contain copies of those data products determined to be most relevant to future users in those locations.

Most of the data products were generated by JESS full-time staff and consultants during two longer-term studies: *Terrestrial Ecology Baseline Studies* (TEBS) and *Socioeconomic Baseline Studies* (SEBS). For this reason, the following descriptions of data products are categorized by TEBS and SEBS. A third category, "Other Data Products", contains brief descriptions of products generated by the overall JESS effort; these are placed in repositories for convenience. After the description of each principal data product, acronyms in brackets are presented which correspond to the data repositories where this product is housed.

## **TEBS Data Products**

### **1. Databases and Access Guide for Ground Vegetation Monitoring Sites.**

These are comprised of program and data diskettes in Borland's Reflex software. Also included is a copy of *Using Reflex*, a guide to the use of this program. Databases include site descriptions and detail accounts of woody vegetation, herbaceous vegetation, plant taxonomy, and ethnobotany. Also on disk is the descriptive analysis of aerial photographs of monitoring sites, which goes with product 4, below. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

### **2. Photographic Slides of Ground Monitoring Sites**

Four boxes of 35mm slides in numerical order by sites which were taken from ground positions recorded in TEBS Ground Monitoring Sites Directory. (Product 3). [USAID/Somalia, REDSO/ESA]

### **3. TEBS Ground Monitoring Sites Directory**

A volume giving directions to, markers for, and descriptions of, ground monitoring sites. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

### **4. Aerial Photographs of Monitoring Sites (Prints)**

Two boxes of 9 x 9 inch vertical aerial photographic prints, scale 1:1,000. Negatives are retained by Resource Management and Research, Ltd (RMR)

for future reproduction (16B West Central Street, London WC 1). [USAID/Somalia]

### **5. Aerial Census Data Tables**

Six volumes of tables giving land use, livestock numbers, wildlife numbers, and other rural features estimated during aerial strip censuses of TEBS study area. A guide to use of the tables is included [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

### **6. Aerial Census Data Disks**

These disks record the unanalysed counts of features along each flight line for each aerial census. Position of each subsection of each flight line is marked on map products 7 and 9c, below. [USAID/Somalia, REDSO/ESA, ARD]

### **7. Maps of Aerial Census Results**

Map sheets showing floodplain strata for aerial censuses and diagrammatic summaries of land-use and livestock densities (7 sheets; 1:100,000). [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

### **8. Photographic slides from Aerial Censuses**

Two groups of slides: one set shows features from riverine censuses; the second set shows livestock herds, for use in analysis of species composition (including key to labels). [USAID/Somalia]

### **9. Manuscript Maps**

a) Interpretation of JESS 1:10,000 aerial photography of riverine strip for land use and vegetation (20 sheets; 1:50,000). [USAID/Somalia]

b) Interpretation of vegetation and land use from 1960 aerial photomosaics at approximately 1:60,000. (Photomosaics examined at Tropical Resources Development Institute, London). [USAID/Somalia]

c) Somalia topographic maps at 1:100,000 used in aerial censuses, showing position of flight lines for census and position location of aerial photographs taken of monitoring sites (Product No. 4). These sheets cover floodplain and river-dependent zone for the area north of Baardheere Dam site. South of the dam site, these sheets cover only the river-dependent zone. [USAID/Somalia]

### **10. Stereoscopic Aerial Photography at 1:10,000**

This photography, commissioned by JESS in 1987, covers the riverine strip to a width of approximately two km each side of the river. Negatives are retained

by Resource Management and Research, in their London office. [MNPJVD, USAID/Somalia]

#### **11. Aerial Survey of Jubba Reservoir Zone**

Survey by RMR of all rural structures in the inundation area which comprises:

a) Watson, R.M. (1988) Occupation and land use of the Jubba Valley Destined for Inundation. Internal Report to JESS by RMR. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

b) Manuscript maps of location of rural structures in the inundation area (drawn on photomosaics). [USAID/Somalia]

c) Photographic slides of rural structures in inundation area (including key to labels). [USAID/Somalia]

#### **12. Aerial Survey of Coastal Zone**

The results of this survey are contained in two items:

a) Map set of coastal zone likely to be affected by changes in Jubba River flows showing position of features of interest (e.g., reefs, mangrove swamps, and location of product b). [USAID/Somalia]

b) Set of 35 mm color photographic slides of coastal features of interest relating to map series. [USAID/Somalia]

### **SEBS Data Products**

#### **1. Data Bases and Access Guide for SEBS and Women's Baseline Study (WBS)**

These comprise program and data diskettes in dBASE III Plus and ASCII formats. A detailed access guide is provided detailing what to find in each section and how data organized (by Socio-ecological Sector, Region and Whole Valley). A user's guide for dBASE III plus is included, as well as a copy of: Malczynski, L., 1987, *Data Management and Analysis*, JESS Report No. 22.

This report describes the operation of the data entry program. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

#### **2. Data Bases and Access Guide for Marketing Survey (MARS)**

Includes data and program diskettes in Lotus 1-2-3 format. A user's guide for four market survey sites: Jilib, Baardheere, Buurdhuubo, and Kismaayo. Fields of data collection include: milk and meat, grains, vegetables, fruits, live animals, fish, and wood/thatch/fodder. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

#### **3. Questionnaires for SEBS, WBS, MARS**

Completed questionnaires were microfilmed at CDIE in Washington, DC and copies may be obtained through USAID/Somalia. [USAID/Somalia, CDIE]

### **Other Data Products**

#### **1. JESS Final Report Maps**

Copies of all maps presented in JESS Final Report: Volumes I, II, and III. These maps are to be used for general reference. [MNPJVD, USAID/Somalia, REDSO/ESA, CDIE, ARD]

#### **2. Photographic Slide Show**

A group of 40 slides showing the evolution of JESS. The "slide show" is accompanied by an annotated guide. [MNPJVD, USAID/Somalia, REDSO/ESA, ARD]

#### **3. Miscellaneous Photographic Slides and Prints**

Various photographic slides and prints accumulated during field research in Somalia by JESS full-time staff and consultants. These products are grouped and labeled. [USAID/Somalia]

#### **4. Aerial Photographs**

One set of stereoscopic aerial photographs at 1:30,000 scale, taken by Air Survey and Development GmbH between 1983 and 1984. [USAID/Somalia]



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