

PA-AE2 1989

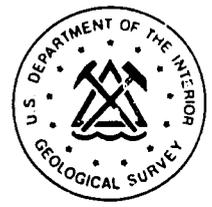
64998

Establishing the Structure of an IGADD National and Sub-Regional Early Warning System

**Recommendations to U.S. Agency
for International Development**

**EROS Data Center
National Mapping Division
U.S. Geological Survey
Sioux Falls, South Dakota USA**

December 1989



RECOMMENDATIONS
FOR FUTURE USAID ASSISTANCE TO IGADD
EARLY WARNING PROGRAMS

ESTABLISHING THE STRUCTURE OF AN
IGADD NATIONAL AND SUB-REGIONAL EARLY WARNING SYSTEM

Prepared under AID PASA No. AFR-0510-P-IC-7022-22

Submitted to:

Intergovernmental Authority for Drought and Development
IGADD Secretariat, Djibouti

and

U.S. Agency for International Development
REDSO/ESA
Nairobi, Kenya

by

EROS Data Center
National Mapping Division
U.S. Geological Survey
Sioux Falls, South Dakota

December, 1989

NOTICE

This report was sponsored by the U.S. Agency for International Development (AID), REDSO/ESA through the Famine Early Warning System Project of the AID Bureau for Africa, Office of Technical Resources. The work was funded through a Participating Agency Service Agreement with the U.S. Geological Survey - PASA Number AFR-0510-P-IC-7022-22.

The document is an internal project report and has not been edited or reviewed for conformity with U.S. Geological Survey standards or nomenclature. Any use of trade names and/or trademarks in this publication is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Notice	i
Table of Contents	ii
Forward	iii
List of Acronyms	iv
1.0 Introduction	1
2.0 Recommendations for Regional Assistance	1
2.1 Remote Sensing Training Support	2
2.1.1 Summary of RCSSMRS Situation	2
2.1.2 Project Goal	3
2.1.3 Recommended Work Statements	3
2.1.4 Implementation Approach	4
2.1.5 Course Descriptions	4
2.1.6 Anticipated Trainees	8
2.1.7 Implementation Schedule	10
2.1.8 Management Plan	11
2.1.9 Qualifications of Key Contractor Staff	12
2.1.10 Special Provisions	13
2.2 Training in Early Warning Principals and Tools	14
2.2.1 Objectives	14
2.2.2 Schedule and Recommended Courses	14
3.0 Recommendations for Bilateral Assistance	15
3.1 Djibouti	15
3.2 Ethiopia	16
3.3 Kenya	16
3.4 Somalia	17
3.5 Sudan	17
3.6 Uganda	17

FOREWORD

The Final Report on Establishing the Structure of an IGADD National and Sub-Regional Early Warning System consists of three volumes. Collectively, they provide a complete treatment of the findings, conclusions, and recommendations suggested by the USGS team. The three volumes are:

Volume 1 - Executive Summary

Contents include a brief summary of a strategic plan for an IGADD sub-regional early warning system (EWS). Topics include 1) a suggested EWS model, 2) IGADD's role in early warning, 3) priorities and actions, and 4) critical issues.

Volume 2 - Main Report

This volume provides a detailed discussion of the overall findings, conclusions and recommendations for an IGADD sub-regional EWS.

Volume 3 - Country Reports

Contents include country reports detailing the status and needs for early warning systems in the six IGADD member states. The country reports are the working documents prepared by the USGS team to develop the overall conclusions and recommendations.

LIST OF ACRONYMS

<u>Acronym</u>	<u>Definition</u>
A.I.D.	Agency for International Development
ACMAD	African Center for Meteorological Applications for Development
ADP	Automatic Data Processing
AGRHYMET	Agriculture, Hydrology, Meteorology
AISC	Assessment and Information Services Center, NOAA
AMCEN	American Ministerial Council
ARC	AGRHYMET Regional Center
ARTEMIS	Africa Real Time Environmental Monitoring Using Imaging Satellites
AVHRR	Advanced Very High Resolution Radiometer (NOAA)
BPI	Bits Per Inch
CAC	Climate Analysis Center, NOAA
CAC	Coordinating and Advisory Committee of AGRHYMET
CBS	Central Bureau of Statistics
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CLICOM	Climate Computing System
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CRTO	Regional Remote Sensing Center of Ouagadougou
DCP	Data Collection Platform
DIANA	Data in Africa Now Available
DLCO	Desert Locust Control Organization
DRSRS	Department of Resource Surveys and Remote Sensing
ECA	Economic Commission for Africa
EEC	European Economic Community
EGA	Extended Graphics Adapter
EOSAT	Earth Observation Satellite Company (LANDSAT)
ERDAS	Earth Resources Display and Analysis System
EROS	Earth Resources Observation Systems
ESA	European Space Agency
EFWIS	Early Warning Food Information System
EWS	Early Warning System
FAO	Food and Agriculture Organization (U.N.)
FAX	Facsimile Transmission
FCCAD	Foreign Crop Conditions Assessment Division
FEWS	Famine Early Warning System (USAID)
FEWS	Food Early Warning System (Somalia)
GAC	Global Area Coverage (AVHRR)
GEMS	Global Environmental Monitoring System
GIIEWS	FAO Global Information and Early Warning System
GIS	Geographic Information System
GMS	Global Monitoring System
GNS	Global Navigation System
GOES	Geostationary Operational Environmental Satellite
GOS	Government of Sudan

<u>Acronym</u>	<u>Definition</u>
GOU	Government of Uganda
GPS	Global Positioning System
GRID	Global Resources Information Database (UNEP)
GSFC	Goddard Space Flight Center (NASA)
GTS	Global Telecommunications System
HRPT	High Resolution Picture Transmitter
IBM	International Business Machines
IDA	Image Display and Analysis
IGADD	Intergovernmental Authority for Drought and Development
IPS	Image Processing System
IPS	Inches Per Second
ITCZ	Intertropical Convergence Zone
KBPS	Kilobits Per Second
KMD	Kenya Meteorological Department
LAC	Local Area Coverage (AVHRR)
LANDSAT	Land Satellite of NASA, NOAA, EOSAT
LAS	Land Analysis System
METEOSAT	Meteorological Geostationary Observation Satellite (ESA)
MOA	Ministry of Agriculture
MOH	Ministry of Health
MSS	Multispectral Scanner (LANDSAT)
NAC	National AGRHYMET Centers
NASA	National Aeronautics and Space Administration
NDVI	Normalized Difference Vegetation Index
NESDIS	National Environmental Satellite Data and Information Service (NOAA)
NEWS	National Early Warning System
NGO	Non-governmental Organization
NOAA	National Oceanic and Atmospheric Administration
NRMS	Natural Resources Management Systems
OAU	Organization for African Unity
OECD	Organization for Economic Cooperation and Development
PDUS	Primary Data Users Station
PTT	Post and Telecommunications Office
PVO	Private Voluntary Organization
RAFC	Regional Area Forecasting Center
RAM	Random Access Memory
RCSSMRS	Regional Center for Services in Surveying, Mapping, and Remote Sensing
RDMC	Regional Drought Monitoring Center
RNA	Requirements Needs Analysis
RRC	Relief and Rehabilitation Commission
SADCC	South African Development Coordination Conference
SAP	Systeme d'Alerte Precoce
SDUS	Secondary Data Users Station
SERISS	Sudan Emergency and Recovery Information and Surveillance System

<u>Acronym</u>	<u>Definition</u>
SHARE	Software Help in Applications Research and Education
SPOT	Systeme Probatoire d'Observation de la Terre
SWD&M	Sahel Water Data and Management Project
TAMSAT	Tropical Agricultural Meteorology Using Satellites
TIROS	Operational Orbiting Weather Satellite (NOAA)
TM	Thematic Mapper (LANDSAT)
UK	United Kingdom
UN	United Nations
UNDP	United Nations Development Program
UNEOS	United Nations Emergency Office for Sudan
UNEP	United Nations Environment Program
UNITAR	United Nations Institute for Training and Research
UNSO	United Nations Sahelian Office
UPS	Uninterruptible Power Supply
USAID	United States Agency for International Development (Bilateral Missions)
USDA	United States Department of Agriculture
USG	United States Government
USGS	United States Geological Survey
VGA	Video Graphics Array
WFP	World Food Program
WHARF	World Hunger Alleviation Through Response Farming
WHO	World Health Organization
WMO	World Meteorological Organization

Recommendations for Future A.I.D. Assistance to IGADD Early Warning Programs

1.0 Introduction

The U.S. Agency for International Development (AID) intends to provide assistance to IGADD's early warning initiative. As part of this study, A.I.D. required the preparation of "Recommendations for Future A.I.D. Assistance to IGADD" (Reporting Requirements, Section E - PASA AFR-0510-P-IC-7022-22). The recommendations are for consideration as options for future assistance.

A.I.D. has existing programs in Africa that have obvious linkages to this early effort. The Famine Early Warning System (FEWS), currently active in Sudan and Ethiopia, is a project that should have an important relationship with IGADD's early warning program. IGADD already has cooperated and benefited from FEWS since this study was authorized as a FEWS buy-in activity.

The Africa Energy Strategy, the Plan for Strengthening Agricultural Research in Africa, and the Plan for Natural Resources Management Systems in Africa (NRMS), all recent products of the Technical Resources Office in the Africa Bureau in A.I.D., share the need for data common to the early warning effort. The natural resource inventory data base that is being developed under NRMS is relevant especially to the physical data needs of the IGADD/NEWS effort. AID's field efforts in all of these areas should be coordinated.

The remaining sections offer specific recommendations to A.I.D. for both regional and bilateral assistance. They are recommendations based on the experiences of the U.S. Geological Survey field study team and do not represent approved commitments by A.I.D.

2.0 Recommendations for Regional Assistance

Two projects, both emphasizing training, are suggested for A.I.D. regional assistance. Both potential projects have been reviewed by A.I.D. and IGADD. While there was general agreement that IGADD must undertake both projects if it is to achieve a functional early warning program, the first project dealing with the use of remote sensing for early warning was considered to be the most appropriate for A.I.D. support.

Section 2.1 contains a detailed plan for implementing remote sensing support through A.I.D. funding. Section 2.2 provides a brief outline for A.I.D. supported early warning training.

2.1 Remote Sensing Training Support

One of the most significant and immediate contributions IGADD can offer national early warning systems are 1) remote sensing products, and 2) training in their use. The need is universal throughout the sub-region.

The IGADD/RCSSMRS remote sensing project funded by the Japanese Trust Fund through FAO has started to meet training support needs by distributing remote sensing products generated by FAO/ARTEMIS. AID/REDSO, through a grant to the IGADD/RCSSMRS project (project number 623-0002), is funding equipment and technical assistance to establish improved vegetation index products based on higher resolution (1-km) AVHRR data collected by the Kenya Meteorological Department. As part of the A.I.D. grant, funds are available to offer workshops in the use of remote sensing for early warning applications. The A.I.D. grant expires in September, 1990.

The A.I.D. Famine Early Warning System (FEWS) has pioneered the use of AVHRR data for food security assessments. It has developed procedures that are used operationally throughout Sub-Saharan Africa. The experiences of FEWS are relevant and needed in the IGADD Sub-Region. The transfer of FEWS expertise in the use of remote sensing for early warning would be of significant benefit to IGADD.

Assistance is needed to help the IGADD/RCSSMRS project develop the capacity to use AVHRR products at the national level, and develop training materials to use in remote sensing workshops. This will allow the IGADD/RCSSMRS team to devote additional effort to the implementation of improved early warning products. The project will permit continuation of the training program beyond the end of the A.I.D. grant, and provide insurance that AID's initial investment is successful.

2.1.1 Summary of RCSSMRS Situation

The RCSSMRS Department of Remote Sensing has staff with expertise in remote sensing applications and training. It has a complete photographic laboratory for the processing and reproduction of imagery, and a microcomputer-based image processing system. Through the REDSO/ESA early warning grant to RCSSMRS (Project number 623-0002), additional computer hardware and software are being purchased to generate early warning products and develop applications. The equipment will include one SUN microcomputer (UNIX operating system). Software to support user applications also has been purchased (DBASE, Lotus, Word Perfect, Surfer, Atlas*Graphics, etc.). This equipment will be used by RCSSMRS staff and the IGADD/RCSSMRS project for early warning programs.

2.1.2 Project Goal

The goal of the project is to provide training in the use of remote sensing (especially METEOSAT and AVHRR) for early warning and development programs, and assist IGADD/RCSSMRS establish appropriate products for vegetation and rainfall monitoring.

The project will train at least 16 people from each country in methods to monitor and assess cropland and pasture conditions, and evaluate rainfall patterns. Based on the training and IGADD/RCSSMRS project, each country will have a basic capability to monitor drought.

The trainees should represent national early warning units, and ministries that actively monitor vegetation conditions related to national food security. The training will allow these agencies to use remote sensing products, supplied through the IGADD/RCSSMRS project, to operationally monitor vegetation during the growing season, and determine how vegetation conditions affects crop production and grazing patterns.

The project also will provide training materials (lecture notes, exercises, visual materials) that can be used in IGADD early warning training. Staff capabilities at RCSSMRS will be developed to allow independent instruction in these courses.

2.1.3. Recommended Work Statements

1. Assist IGADD/RCSSMRS to develop training modules covering critical aspects of the application of remote sensing to early warning and development problems. Emphasis will be on the use of vegetation index data from AVHRR.
2. Organize and provide instruction in applications-oriented training courses covering the application of remote sensing for early warning.
 - a. Courses will be offered both at RCSSMRS and in IGADD member countries.
 - b. During the period that the A.I.D. grant to IGADD/RCSSMRS is in effect (FY89), the contractor will assist in course and materials development, and serve as co-instructors.
 - c. Beyond FY90, the contractor will provide all services, including logistics, instructors, materials, and participant expenses.

- d. Progressively specific training will be designed to meet the evolving needs of IGADD member states.
3. Assist IGADD/RCSSMRS to develop strategies and implementation plans to meet the remote sensing needs of the IGADD early warning units. Emphasis will be on use of AVHRR products derived from data collected at the Kenya Meteorological Department.
4. Provide limited technical assistance to RCSSMRS in the development of analytic capabilities required to meet IGADD needs.
5. Provide limited technical advice on early warning topics (primarily evaluation and planning services) as-needed.
6. Within three months following the start of the project, develop a life-of-project work plan in cooperation with IGADD and RCSSMRS. The plan should be evaluated and revised each year. The work plan also must determine training plans, technical assistance needs, responsibilities of cooperators, and required resources.
7. Establish needed capabilities and trained staff in the applications of AVHRR products both at RCSSMRS and in national early warning units.
8. Recommend operational procedures for an operational product distribution system.

2.1.4 Implementation Approach

1. USAID will establish contract to provide services for course development, instruction, course logistics, and payment of participant training expenses for workshops on the use of remote sensing for early warning applications.
2. IGADD and RCSSMRS will be asked to provide RCSSMRS staff to participate in course planning and assist with instruction.

2.1.5 Course Descriptions

The following three courses will provide a progressively detailed understanding of the use of satellite imagery to monitor vegetation conditions and rainfall patterns. The specific topics of each course may vary according to the specific training needs of IGADD national EWS staff.

1. Title: "Basic Applications of METEOSAT and AVHRR for Early Warning"

- a. Course Description: A three-week introduction to the basic characteristics of METEOSAT and AVHRR data and methods for their use in early warning programs. Included will be an introduction to both cold-cloud duration and rain-days transformations from METEOSAT, and vegetation index transformations from NOAA AVHRR data. Emphasis will be placed on interpretation of current vegetation conditions and rainfall patterns, and the comparison of current to historical conditions (see attached tentative course outline).
- b. Site: RCSSMRS/Nairobi
- c. Training Format: Instruction primarily will be in a classroom setting and use a combination of lecture and hands-on exercises. A short field exercise also will be included.
- d. Trainees: Each course will include 2 representatives per country. One delegate should represent the designated National EWS. The second should represent a ministry actively involved in vegetation and monitoring directly related to food security.
- e. Trainers: The following instructors are anticipated:
 - 1) IGADD/RCSSMRS Project Leader
 - 2) IGADD/RCSSMRS Counterpart
 - 3) IGADD/RCSSMRS expert funded by USAID grant
 - 4) FAO METEOSAT expert
 - 5) AVHRR expert from USGS project
 - 6) RCSSMRS Staff
- f. Recommended agenda
 - Day 1 - Review of Remote Sensing Principles
Review of Map Reading Principles
 - Day 2 - Introduction to METEOSAT System
 - Day 3 - Interpretation of Cold-Cloud Duration
 - Day 4 - Interpretation of Rain-Days
 - Day 5 - Country Interpretation Exercise
 - Day 6 - Introduction to AVHRR System
 - Day 7 - Vegetation Index Transformations
Transformation Methods
Relationship to Biomass and Rainfall
 - Day 8 - Interpretation of Real Time Vegetation Index
Data

- Day 9 - Procedures for Interpretation of Vegetation Change
- Day 10 - Local Field Trip
- Day 11 - Time Series Analysis
- Day 12 - Creation of Monitoring Units
- Day 13 - Integrated Interpretation of AVHRR/METEOSAT Data
- Day 14 - Country Practicum
- Day 15 - Country Practicum

2. Title: "Cropland and Pasture Condition Assessments using Remote Sensing I"

- a. Description: A two-week course addressing methods to conduct crop and pasture condition assessments. Topics will include procedures to integrate rainfall statistics with vegetation index data and METEOSAT variables (cold-cloud duration and rain-days) to (1) determine the spatial pattern of rainfall, (2) determine spatial patterns of relative crop production, and (3) determine relative biomass in rangelands (see attached tentative course outline).
- b. Site: RCSSMRS/Nairobi
- c. Training Format: Instruction primarily will be in a classroom setting and use a combination of lecture and hands-on exercises. A short field exercise also will be included.
- d. Trainees: Each course will include 2 representatives per country. One delegate should represent the designated National EWS. The second should represent a ministry actively involved in vegetation and monitoring directly related to food security.
- e. Trainers: The following instructors are anticipated:
 - 1) IGADD/RCSSMRS Project Leader
 - 2) IGADD/RCSSMRS Counterpart with METEOSAT expertise
 - 3) AVHRR expert from USGS project
 - 4) RCSSMRS Staff
- f. Recommended Agenda (note that a country specific version of this agenda also will be used for the Cropland and Pasture Condition Assessments using Remote Sensing II training course).

- Day 1 - Review of Remote Sensing Principles
Review of Map Reading Principles

- Day 2 - Vegetation Index Transformations
Calculation of Precipitation Variables with METEOSAT
- Day 3 - Interpretation of Rainfall Patterns using METEOSAT
- Day 4 - Interpretation of Rainfall Patterns using AVHRR
- Day 5 - Vegetation Condition Stratification
- Day 6 - Correlation of Rainfall Patterns and Vegetation Conditions
- Day 7 - Interpretation Exercise
- Day 8 - Local Field Trip
- Day 9 - Definition of Crop Conditions and Relationships to Production
- Day 10 - Determination of Relative Biomass Amounts in Rangelands
- Day 11 - Preparation of Strategies for Monitoring Food Security using Remote Sensing
- Day 12 - Country Practicum
- Day 13 - Country Practicum
- Day 14 - Country Practicum
- Day 15 - Review of Practicum Results

3. Title: "Cropland and Pasture Condition Assessments using Remote Sensing II"

- a. Description: A two week course held in-country addressing methods to conduct crop and pasture condition assessments. The course will be developed to deal specifically with national problems and data. Topics will include procedures to integrate field data and rainfall statistics with vegetation index data and METEOSAT variables (cloud- cloud duration and rain-days) to (1) determine the spatial pattern of rainfall, (2) determine spatial patterns of relative crop production, and (3) determine relative biomass in rangelands. (See attached tentative course outline. Note that a one day managers workshop will be held in advance of the longer technical session).
- b. Site: Djibouti, Kenya, Somalia, Uganda
- c. Training Format: Instruction will involve both a classroom setting based on lecture, hands-on exercises, and field exercises.
- d. Trainees: Each course will include 6-10 representatives from national early warning units, and ministries actively involved in vegetation monitoring directly related to food security.

- e. Trainers: The following instructors are anticipated:
 - 1) Two AVHRR experts from USGS project
 - 2) RCSSMRS Staff
 - 3) METEOSAT expert
- f. Recommended Agenda - see previous section.

2.1.6 Anticipated Trainees

Based on experiences gained during the REDSO/ESA funded study on IGADD sub-regional early warning requirements, the following staff in the respective countries are the anticipated trainees:

1. Djibouti - A national early warning unit has not been designated. However, staff from the following agencies are likely candidates to represent Djibouti (listed in order of priority):
 - a. Ministry of Agriculture and Rural Development
 - b. Meteorology Department, Ministry of Commerce, Transportation, and Tourism
 - c. Climatology Department, Ministry of Commerce, Transportation, and Tourism
2. Kenya - Like Djibouti, a national early warning unit has not been designated in Kenya. However, staff from the following agencies are likely candidates to represent Kenya (listed in order of priority):
 - a. Department of Resource Surveys and Remote Sensing, Ministry of Planning
 - b. Crops Division, Ministry of Agriculture
 - c. National Cereals and Produce Board
 - d. Central Bureau of Statistics
 - e. Meteorology Department, Ministry of Transportation and Communications
3. Somalia - Staff from the Food Early Warning Department in the Ministry of Agriculture comprise the key audience in Somalia. A prioritized list of likely participants include:
 - a. Food Early Warning Department, Ministry of Agriculture
 - b. National Range Agency, Ministry of Livestock
 - c. Department of Research, Ministry of Agriculture
4. Uganda - The Ministry of Agriculture (MOA) is expected to host the planned Uganda Early Warning and Food Information System, making MOA the key ministry for training in Uganda. A prioritized list of key participants include:

- a. Food Office, Ministry of Agriculture
 - b. Data Base and Research Division, Ministry of Environment Protection
 - c. Department of Meteorology, Ministry of Environment Protection
 - d. Forestry Department, Ministry of Environment Protection
5. Ethiopia (note that funding for Ethiopian participation cannot be provided through this project, but may be arranged under separate funding from IGADD or other sources). The key candidates in Ethiopia consist of:
- a. Ethiopia Early Warning System, Relief and Rehabilitation Commission
 - b. Forecast Division, Ministry of Agriculture
 - c. National Meteorological Services Authority
 - d. Central Statistics Authority
6. Sudan (note that funding for Sudanese participation cannot be provided through this project, but may be arranged under separate funding from IGADD or other sources). The key candidates in Sudan consist of:
- a. Sudan Early Warning System, Relief and Rehabilitation Commission
 - b. Agricultural Statistics Division, Ministry of Agriculture
 - c. Crop Protection Division, Ministry of Agriculture
 - d. Sudan Meteorological Department

The selection of trainees should consider the following qualifications:

1. Job Requirements

- a. Candidates must be directly involved in monitoring seasonal agricultural conditions related to food security. This includes staff involved in vegetation monitoring directly for early warning purposes, assessment of production potential, pasture conditions, pest impacts on food production, or crop statistics estimates.
- b. Longer duration workshops will be given to technicians rather than managers, since the training will emphasize operational procedures for monitoring.
- c. Short-duration (1-2 day workshops will be given to managers to ensure their commitment to the use of these technical tools by technicians under their supervision).

2. Technical Requirements - Preference should be given to staff with:
 - a. College-level degrees in natural resources.
 - b. Basic field understanding of vegetation and natural resources.
 - c. Basic understanding of computer operations.
 - d. Basic skills in map reading and photo interpretation.

2.1.7 Implementation Schedule

The following schedule is a tentative calendar of project activities. The schedule is provided for illustrative purposes and will be modified to reflect mutually agreeable timetables.

1. Year One

- a. Month 1-2: Develop cooperative work plan in cooperation with RCSSMRS, IGADD, and REDSO/ESA.
- b. Month 1-12: Develop training modules.
- c. Month 1-12: Provide technical assistance to RCSSMRS and IGADD when requested.
- d. Month 3: Assist in workshop on "Basic Applications of METEOSAT and AVHRR for Early Warning".
- e. Month 6: Assist in workshop on "Basic Applications of METEOSAT and AVHRR for Early Warning".
- f. Month 6: Prepare semi-annual report.
- g. Month 7: Trip to Djibouti, Kenya, Somalia, and Uganda to arrange logistics for future workshops.
- h. Month 9-10: Offer workshop on "Basic Applications of METEOSAT and AVHRR for Early Warning" in Djibouti, Kenya, Somalia, and Uganda.
- i. Month 12: Prepare annual report.

2. Year Two

- a. Month 1-2: Update work plan in cooperation with RCSSMRS, IGADD, and REDSO/ESA.
- b. Month 2: Trip to RCSSMRS to plan courses.
- c. Month 1-12: Develop training modules.
- d. Month 1-12: Provide technical assistance to RCSSMRS and IGADD when requested.
- e. Month 3: Offer workshop on "Cropland and Pasture Condition Assessment using Remote Sensing".
- f. Month 6: Prepare semi-annual report.
- g. Month 7: Offer workshop on "Cropland and Pasture Condition Assessment using Remote Sensing".
- h. Month 11: Offer workshop on "Cropland and Pasture Condition Assessment using Remote Sensing".
- i. Month 12: Prepare annual report.

3. Year Three

- a. Month 1-2: Update work plan in cooperation with RCSSMRS, IGADD, and REDSO/ESA.
- b. Month 1-12: Develop training modules.
- c. Month 1-12: Provide technical assistance to RCSSMRS and IGADD when requested.
- d. Month 3: USGS trip to Djibouti, Kenya, Somalia, and Uganda to arrange logistics for future workshops.
- e. Month 6: Prepare semi-annual report.
- f. Month 6-7: Offer workshop on "Cropland and Pasture Condition Assessment using Remote Sensing" in Djibouti, Kenya, Somalia, and Uganda.
- g. Month 10-11: Offer workshop on "Cropland and Pasture Condition Assessment using Remote Sensing" in Djibouti, Kenya, Somalia, and Uganda.
- h. Month 12: Prepare final report.

2.1.8 Management Plan

The contractor implementing the project will report directly to REDSO/ESA, but will work closely with the IGADD Secretariat, RCSSMRS Director of Remote Sensing, and IGADD/RCSSMRS Project Leader and his counterpart. Determination of annual objectives will be defined through consultation of all four parties, with final approval of work plans given by REDSO/ESA. The following are the specific responsibilities of the cooperating agencies:

1. REDSO/ESA: The REDSO/ESA Project Development Officer will provide administrative approval of vouchers and final approval of work plans and final reports.
2. Contractor: The contractor will be responsible for:
 - a. Supplying all manpower and materials needed to develop training modules, instruction, or technical assistance.
 - b. Arrangement and payment of training facilities rental, and travel and per diem expenses for trainees (sub-contracting may be used to arrange course logistics).
 - c. Preparation of annual work-plans and final report, insuring that they are reviewed by the cooperating organizations. The work-plans and final report will be submitted along with comments of the reviewing organizations to REDSO/ESA for final approval.
 - d. Completion of course evaluations based on questionnaires that include student comments.

- e. Preparation and submission of semi-annual financial and progress reports.
3. IGADD Secretariat: The IGADD Secretariat will be responsible for coordination within the member states. In addition, it will be responsible for:
- a. Announcing training based on contractor inputs, screening and notification of accepted candidates, and notifying contractor of trainee names.
 - b. Investigating sources of funding to cover trainee travel and per diem expenses for representatives of countries in which USAID funds cannot be used (currently Sudan and Ethiopia).
 - c. Participating in annual work-planning and reviews, consolidating comments from other IGADD contractors (i.e., FAO early warning team) and insuring that the training is compatible with IGADD early warning objectives.
 - d. Providing in-country resource persons at no cost to A.I.D., who is responsible for logistical coordination.
4. RCSSMRS: RCSSMRS will provide:
- a. One staff member from the region to work with contractor on course planning and development, and to serve as co-instructors in the training programs.
 - b. Facilities for Nairobi-based training (payment for use of RCSSMRS facilities will be covered by the contractor).
 - c. Assistance to arrange course logistics (if an agreement can be reached with contractor from project funds).
 - d. Review of annual work-plans and recommendations for new activities.

2.1.9 Qualifications of Key Contractor Staff

1. Project Leader

- a. Understanding of early warning requirements in IGADD sub-region.

- b. Technical understanding of image processing, AVHRR data, and remote sensing applications in early warning and food security problems.
- c. At least three years of experience working with food early warning systems in developing countries.
- d. Experience in management of large projects in developing countries.
- e. Minimum of graduate degree in agriculture, natural resource, or food security-related discipline.

2. Senior Trainer

- a. Strong technical understanding of applications of remote sensing (especially AVHRR data) for vegetation monitoring and early warning.
- b. At least three years of experience in remote sensing applications projects in developing countries.
- c. Extensive experience as a remote sensing instructor in developing country training courses.
- d. Minimum of graduate degree in agriculture, natural resource, or food security-related discipline.

3. Other Staff - The home office also must have staff with early warning system experience available to provide short-term consultation in the following areas:

- a. Image processing
- b. Computer hardware and software operations
- c. Computer systems design
- d. Remote sensing applications
- e. Project planning and evaluation

2.1.10 Special Provisions

- 1. Resumes of key staff involved in the project will be submitted to REDSO/ESA for concurrence. In addition, continuity of project staff throughout the life-of-project is desired unless extenuating circumstances exist.

2. Language requirements: Home office backstopping and trainers for courses held in Djibouti must qualify at a minimum of FSI French S3/R3.

2.2 Training in Early Warning Principals and Tools

To reach a baseline level of capabilities, tailored instruction must be provided to each national EWS in areas where strengthening is needed. The following outline summarizes a training program that would provide a basic understanding of the principals and tools used for food early warning.

2.2.1 Objectives

A training program is needed to provide in-country instruction on early warning topics appropriate to the specific national situation. Topics addressed will be those required to raise national EWS staff to a basic level of capabilities. Because of A.I.D. funding restrictions, the project only would cover Djibouti, Kenya, Somalia, and Uganda.

The project would establish services for development, instruction, and payment of participant training expenses. IGADD Secretariat staff would assist in planning and instruction.

2.2.2 Schedule and Recommended Courses

A three-year schedule of courses is recommended. The suggested annual activities are:

- | | |
|-------------------|--|
| <u>Year One</u> | Offer first-year training courses. |
| <u>Year Two</u> | Evaluate year one training program and develop years 2-3 work-plans with IGADD and FAO early warning team. Offer second-year training courses. |
| <u>Year Three</u> | Offer third-year courses. |

The recommended training courses for the four countries are:

Djibouti

- | | |
|--------------|--|
| Year One - | Early Warning Principals and Tools |
| Year Two - | Interpretation of Nutrition Indicators |
| Year Three - | Climate Data Base Development |

Kenya

- Year One - Role of Early Warning for National Food Security and Development (managers seminar)
- Year Two - Vulnerability Assessment Procedures
- Year Three - Methods for At-Risk Monitoring

Somalia

- Year One - Data Base Development
- Year Two - Vulnerability Assessment Procedures
- Year Three - Methods for At-Risk Monitoring

Uganda

- Year One - Early Warning Principals and Tools (managers seminar)
- Year Two - Early Warning Principals and Tools (technical seminar)
- Year Three - Data Base Development

3.0 Recommendations for Bilateral Assistance

The following sections identify several areas for bilateral cooperation. An elaboration of the recommendations and needs can be found in Volume 3 - Country Reports.

3.1 Djibouti

The need for early warning assistance is low in Djibouti. Thus, the possibilities for bilateral projects also is low.

Because of the regional relevance of Djibouti's climate data, assistance is needed to salvage historical climate data held by the Climatology Department. The records are deteriorating because of pest damage - and eventually may be lost. Training to establish a computerized climate data base would be useful, providing software could be included as part of the training package. CLICOM training would be appropriate.

If the Djiboutian Government wishes to purchase computers and software from U.S. sources, the costs could be charged to AID's Non-Project Assistance cash transfers (603-1022).

Djiboutians should be included in REDSO/ESA-supported training in remote sensing and early warning through the IGADD/RCSSMRS initiatives.

3.2 Ethiopia

Regarding Ethiopia, future A.I.D. involvement will depend on the further development of bilateral relations between it and the U.S. and upon the removal of legal restrictions for financing A.I.D. development activities. Given the appropriate policy and legal changes, or approval for the use of A.I.D. disaster assistance funds, A.I.D. could play a role to strengthen the existing early warning apparatus in Ethiopia. Three areas appear to be appropriate:

1. Strengthen in-country data processing and data analysis capabilities, both at the national and regional (provincial) level through the provision of microcomputers and software needed for early warning.
2. Arrange appropriate technical assistance and training needed to improve the reporting capability of the Relief and Rehabilitation Commission (RRC). This could include training in the use of computer methods (including GIS), report presentation, and graphics.
3. Sponsor a detailed vulnerability assessment geared to resource-based monitoring and famine early warning.

In addition, increased participation in A.I.D. FEWS is desirable since FEWS and the RRC share purpose and base conclusions on similar methods and data.

3.3 Kenya

Kenya's needs are relatively modest compared to other countries in the sub-region. They consist chiefly of:

1. Additional microcomputer equipment, software, and training for Ministry of Agriculture staff.
2. Additional technical support and software for the Kenya Meteorological Department (KMD) and Department of Resource Surveys and Remote Sensing (DRSRS) in the use of AVHRR data.

The USAID mission in Kenya already is contemplating some support to DRSRS. Its future support to the Regional Center for Services in Surveying, Mapping, and Remote Sensing (RCSSMRS) will be decided following an evaluation to be completed by the end of 1989. It would be appropriate for A.I.D. to support training, equipment, and technical assistance inputs to RCSSMRS in the area of AVHRR technology. This would benefit not only Kenya and RCSSMRS, but also IGADD's early warning program.

3.4 Somalia

The USAID/Somalia country development strategy currently does not include a role in early warning. Thus, under current mission priorities, USAID/Somalia is not likely to become involved in EWS support. However, if priorities change, there are several areas where assistance could be granted, including:

1. Improve in-country communications by both increasing the number of SSB radios, and by establishing a maintenance program for existing radios.
2. Provide staff training in data base development and computer analysis methods.
3. Establish nutrition and health surveillance programs in the Ministry of Health.
4. Upgrade computers by installing larger hard disks. Increased storage capacity is necessary for continued expansion of the CLICOM system.
5. Fund a generator and UPS system for the early warning system. Power outages currently are disabling the Ministry of Agriculture for long periods.
6. Sponsor a detailed vulnerability assessment geared to resource-based monitoring and famine early warning.

3.5 Sudan

AID has made significant contributions to early warning in Sudan. FEWS, SERISS/agricultural statistics and nutrition surveillance projects, and the market price statistics project are all vital to early warning.

However, future assistance by A.I.D. is unlikely under the funding restrictions caused by recent political events. The current A.I.D. policy calls for a phase-out of most Sudan projects by early-1990.

3.6 Uganda

USAID/Uganda can play a significant role to guide the development of a Government of Uganda (GOU) early warning system. However, the A.I.D. strategy in Uganda wisely may leave the specific EWS development efforts to the proposed FAO effort. Instead, it may concentrate on a broader scope that involves developing a national resource information system with links to both food security early warning and economic development.

In many ways, Uganda is starting from scratch. With the need to reestablish data gathering systems in most sectors, USAID/Uganda can provide leadership to develop sound resource inventory and data collection programs. In addition, it can promote and lead the development of an integrated resource information system that will improve the structure, integrity, security, and access to Uganda's resource information. The NRMS project can serve as the vehicle to establish a resource information system that can benefit natural resource management programs and satisfy the IGADD/GOU initiative for an EWS.