

BIBLIOGRAPHIC DATA SHEET1. CONTROL NUMBER
PN-AAH-6872. SUBJECT CLASSIFICATION (698)
NA00-0000-G146

3. TITLE AND SUBTITLE (240)

The Sahel epidemiological and environmental assessments project, v. 3, part E, section I: health considerations in the development of traditional sector agriculture

4. PERSONAL AUTHORS (100)

Lennox, R. W.

5. CORPORATE AUTHORS (101)

Am. Public Health Assn.

6. DOCUMENT DATE (110)

1977

7. NUMBER OF PAGES (120)

62p.

8. ARC NUMBER (170)

AFR614.5.M571

9. REFERENCE ORGANIZATION (150)

APHA

10. SUPPLEMENTARY NOTES (500)

(Additional volumes: v.1, 321p.:PN-AAH-679; v. 2, 414p.:PN-AAH-680; Assessment Team rpts.: PN-AAH-681 - PN-AAH-691)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Sudan	Environmental health
Rural health	Health services
Health delivery	Diseases
Disease vectors	Potable water
Agriculture	Waste disposal

13. PROJECT NUMBER (150)

698013500

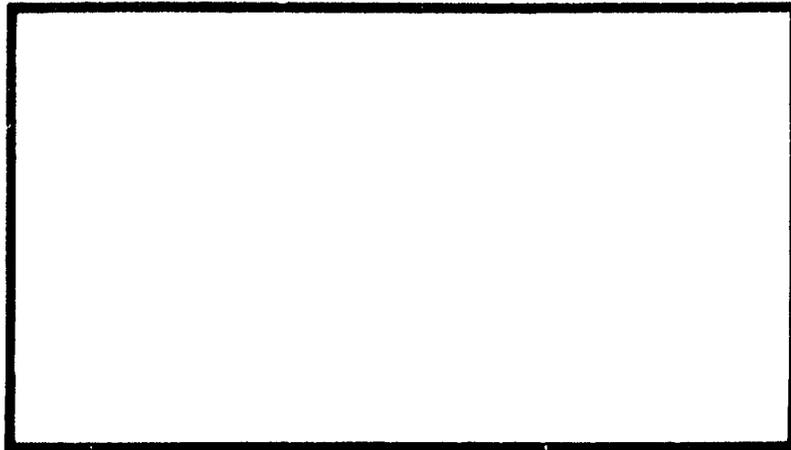
14. CONTRACT NO.(140)

AID/afr-G-1253

15. CONTRACT TYPE (140)

16. TYPE OF DOCUMENT (160)

16



AMERICAN PUBLIC HEALTH ASSOCIATION

International Health Programs

1015 Eighteenth Street, N.W.

Washington, D.C. 20036

THE SAHEL EPIDEMIOLOGICAL
and
ENVIRONMENTAL ASSESSMENT PROJECT

Section I Part E
VOLUME THREE

Health Considerations in the
Development of Traditional
Sector Agriculture

Health Considerations in the Development
of
Traditional Sector Agriculture

The Democratic Republic of The Sudan

Studies & Report by: Robert W. Lennox, Sc.D.
Epidemiologist
International Health Programs Staff
American Public Health Association

During the Period: March 20, 1977 to May 1, 1977

Conducted & Published by: International Health Programs Staff
American Public Health Association

At the Request of: Health/Nutrition Division
Office of Development Resources
Bureau for for Africa
U.S. Agency for International Development

Authorized Under Contract No. AID/Afr-C-1253
Sahel Epidemiological & Environmental
Assessments Project
May 1977

HEALTH CONSIDERATIONS IN THE
DEVELOPMENT OF TRADITIONAL SECTOR
AGRICULTURE IN THE SUDAN

VISIT FOR AMERICAN PUBLIC HEALTH ASSOCIATION
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
20 MARCH - 1 MAY, 1977

Robert W. Lennox, Sc.D.
Epidemiologist - APHA
Sahel Epidemiological and Environmental
Assessment Project

CONTENTS

Trip Report	I
Request for Services	II
Scope of Work	III
PIO/T for Team	IV
Itinerary	XI

Report-Annex Health Considerations In The Development of Traditional Sector Agriculture In The Sudan

Introduction	1
Health Profiles	5
Southern Darfur	10
Lakes	14
Blue Nile	18
Summary and Recommendations	22
Lakes Province	22
Blue Nile Province	26
Northern Kordofan Province	30
Map of Sites Visited and Location of Health Profiles	34
Useful Contacts	35

TRIP REPORT

In response to a letter of request from the office of Dr. Cross (enclosed) the services of Dr. Lennox of APHA staff were secured to participate as Environmental Health Specialist as a member of a 5 person team to develop a strategy and several project documents pertaining to possible AID assistance to Traditional sector agriculture in the Sudan. The scope of work of the Environmental Health Specialist and the team PIO/T are included.

The team traveled extensively in Sudan during their 6 week stay (see itinerary). The Health member's contribution is in the form of an annex to the traditional agriculture report and as such can be found with the document submitted by the American Technical Assistance Corporation (ATAC).

In this report, only the Health Report (annex) has been included. Details of the strategy and project documents referred to the annex must be obtained from Anilee Rollins, AID Sudan desk officer.

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

3660

March 3, 1977

Dr. Malcolm Merrill
American Public Health Assoc.
1015 18th St. N.W.
Washington, D.C.

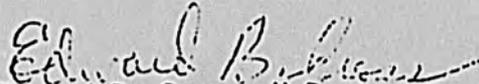
Dear Dr. Merrill:

This is to confirm phone conversation between members of our respective staff relative to the possibility of APHA providing an Environmental Health Specialist for a design team going to Sudan. This consultant will be a member of a five person team to assist in the preparation of project documentation required to develop a program in traditional sector agriculture in Sudan.

I have attached copies of the PIO/T describing the team's objective plus a specific scope of work for the health member. The entire team will be assembled by American Technical Assistance Corporation (ATAC) to meet in Washington, hopefully, no later than March 14, 1977. You may wish to contact Mr. S. Brown, telephone 893-5900, for further details.

In view of the limited time remaining until March 14th, I would appreciate written notification confirming whether or not APHA will be able to undertake this assignment as soon as possible.

Sincerely yours,


Edward B. Cross, M.D.
Principal Health Advisor
Africa Bureau

ATTACHMENT: a/s

Environmental Health Specialist

The environmental health specialist will assess the potential effects of any proposed project, both positive and negative, on the health status of the population living in the target area. This will include an analysis of the health problems caused by major endemic diseases already prevalent in the vicinity or that may be activated by planned agricultural interventions, i.e., fertilizers, pesticides, irrigation, land clearing, etc. Specifically, the specialist will:

- a) Collect and analyze pre-project implementation baseline data with particular reference to major endemic diseases.
- b) Conduct epidemiological studies as to incidence and prevalence of major diseases in the area.
- c) Assess constraints imposed by endemic diseases on plans for socio-economic development of the area.
- d) Assess what preventive measures (i.e. environmental health, engineering, hydrological, chemical etc.) may be undertaken to either prevent worsening of the disease problems or ameliorate the health hazards in the project area.
- e) Assess what control and/or disease eradication measures may be available or needed to complement developmental efforts and improve the quality of life of the area population.
- f) Assess the role water supply and environmental sanitation could play in control of the major endemic diseases.
- g) Assess GOS's capabilities current and planned to carry out control program activities for the major endemic diseases (i.e. Health Structures/Facilities, Services. Accessibility, Staffing, etc.).
- h) Make appropriate recommendations for pragmatic solutions to the environmental health problems.

PID/T

Project/Activity No. and Title 698-0135

Program Development and Support (Sudan: Traditional Sector Agriculture)

SCOPE OF WORK

17. Scope of Technical Services

A. Objective for which the Technical Services are to be Used To assist in the preparation of project documentation required to develop a program in traditional sector agriculture in Sudan.

B. Description

The Contractor will provide a five person team with the skills indicated in Block 19.C (1) of this document for the purpose of preparing project documentation (i.e., a Project Identification Document--PID and a Project Review Paper--PRP) for a project in traditional sector agriculture in Sudan.

In developing the project documentation, the design team will be guided by the following criteria:

(1) The content and format of the documentation will be according to official AID guidelines.

(2) The program proposal must be consistent with Congressional guidelines, Agency policy and program priorities. (Continued on p. 6)

C. Technicians

(1) (a) Number	(b) Specialized Field	(c) Grade and/or Salary	(d) Duration of Assignment (non-months)
1	Regional/Rural Administrator (Team Leader)	152	2
1	Agricultural Specialist	152	2
1	Environmental Health Specialist	152	2
1	Social Scientist	152	2
1	Environmental Specialist	275	2

(e) Duty Post and Duration of Technicians' Services
Khartoum, Sudan - 6 weeks
AID/W - 2 weeks

(f) Language requirements
None

(g) Access to Classified Information
None

(5) Dependents

 Will Will Not

Be Permitted to Accompany Technician

PIO/T

Project/Activity Div. and Title **698-0135**
Program Development and Support (Sudan:
Traditional Sector Agriculture)

Equipment and Supplies (Related to the services described in Block 19 and to be procured outside the Cooperating Country by the supplier of those services)

A. (1) Quantity	(2) Description	(3) Estimated Cost	(4) Special Instructions
None			

2. Financing of Equipment and Supplies

(1) By AID - \$

(2) By Cooperating Country -

21. Special Provisions

- A. This PIO/T is subject to AID (contracting) (PASA implementation) regulations.
- B. Except as specifically authorized by AID, or when local hire is authorized under the terms of a contract with a U.S. Supplier, services authorized under this PIO/T must be obtained from U.S. sources.
- C. Except as specifically authorized by AID/N, the purchase of commodities authorized under this PIO/T will be limited to the U.S. under Geographic Code 000.
- D. Other (specify): Six-day work week authorized.
Premium pay is not authorized.

PIO/T

Cooperating Country
Sudan
Project/Activity No. and Title 695-135
Program Development and Support (Sudan:
Traditional Sector Agriculture)

23. Reports by Contractor or Participating Agency (Indicate type, content and format of reports required, including language to be used if other than English, frequency or timing of reports, and any special requirements)

Each contract technician will provide his/her specific contribution to the preparation of the required AID project design documents. The content and format of the project documents will be determined by the appropriate guidelines outlined in AID Handbook 3, Project Assistance, which will be provided by AID/W during pre-departure orientation. Five copies of the document should be submitted to Mr. McDaniel, AFR/DR/ESAP by May 31, 1977

24. Background Information (Additional information useful to Authorized Agent and Prospective Contractors or Participating Agency; if necessary cross reference Block 19.C(4) above.)

All required information will be provided by AID/W during pre-departure orientation and the AID Affairs Officer in Khartoum.

24. Relationship of Contractor or Participating Agency to Cooperating Country and to AID

A. Relationships and Responsibilities Contract personnel will be responsible to the Director, AFR/DR, or his designee.

E. Cooperating Country Liaison Official To be designated by the AID Affairs Officer in Khartoum.

AID Liaison Officials Anilee Rollins, AID Sudan Desk Officer
Morris McDaniel, AFR/DR/ESAP Project Officer

LOGISTIC SUPPORT

Provisions for Logistic Support

A. Specific Items (Insert "X" in applicable column at right. If entry needs qualification, insert asterisk and explain below in C. "Comments")

	IN KIND SUPPLIED BY		FROM LOCAL CURRENCY SUPPLIED BY		TO BE PROVIDED OR ARRANGED BY SUPPLIER
	AID	COOPERATING COUNTRY	AID	COOPERATING COUNTRY	
(1) Office Space					X
(2) Office Equipment					X
(3) Housing and Utilities					
(4) Furniture					
(5) Household Equipment (Stoves, Refrig., etc.)					X
(6) Transportation in Cooperating Country					X
(7) Transportation To and From Country					X
(8) Interpreter Services/Secretarial					
(9) Medical Facilities					X
(10) Vehicle (official)					X
(11) Travel Arrangements/Tickets					
Other (Specify)					
(12)					
(13)					
(14)					
(15)					

B. Additional Facilities Available From Other Sources

APO

PX

COMMISSARY

OTHER (Specify, e.g., duty free entry, tax exemption)

C. Comments

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 6 OF 10 PAGES

1. Cooperating Country
Africa Regional

2. Code No.
698-135-3-6177045

2.b. Effective Date

2.c.
 Original OR Amendment
No. _____

3. Project Activity No. and Title 698-0135
Program Development and Support (Sudan:
Traditional Sector Agriculture)

TITLE OF FORM

Indicate block
numbers.

Use this form to complete the information required in any block of a PIO or PA/PR form.

(3) The activity will focus on traditional agriculture developme systems.

(4) It must incorporate or relate to locally based agricultural systems.

(5) Special concern in design must be given to how the system works at the delivery end and what difference it makes on the lives of the majority of the people in the zone of influence of the proposed project activity.

(6) If field level farmer education systems such as extension or "rural development centers" are identified as the focus or component of the project activity, they must be looked at in relationship to an overall agriculture knowledge generation and delivery system.

(7) Recognition will be given and AID support considered for national backstopping to locally based systems through national level agencies or a university.

(8) The design must take into account the economic, political, social, ecological and environmental health characteristics and development potential of the particular agriculture zones in which the proposed project activity will operate.

(9) Recognition in design must be given to the characteristics of specific rural populations and the relevance of services offered to their true interests and motivations.

(10) Recognition must also be given to demographic considerations in the area where the proposed project will operate.

(11) Finally, project design must recognize the presence or absence of complementary development factors or services and how the AID-financed activity (or Sudan Government system) is related to these.

Specific contributions to be made by each contract technician to preparation of the required documentation are as follows: The Team Leader will be responsible for assuring that the documentation is consistent with AID requirements, establishing work schedules and priorities, coordinating and supervising the work and input of other members of the design team, and maintaining regular contact with the AID Affairs Officer, the Embassy and GOS officials as appropriate.

The Agricultural Specialist will be required to review and make recommendations with regard to the broad spectrum of factors which may affect the productivity of small farmers in the areas chosen for project coverage. These factors may include but not be necessarily limited to

CONTINUATION SHEET
M 374-10L

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Invoice

PAGE 7 OF 10 PAGES

TITLE OF FORM

1. Cooperating Country
Africa Regional

2. Case No.
098-135-3-6177045

2.b. Effective Date

2.c.
 Original OR Amendment
No.

3. Project Activity No. and Title 098-0135
Program Development and Support (Sudan:
Traditional Sector Agriculture)

Use this form to complete the information required in any block of a PIO or PA/PR form.

cropping patterns, capacity of soils, moisture patterns, suitability of and requirements for inputs, marketing mechanisms, infrastructure, transportation, and institutional and cultural constraints relating to resource use. The general overview undertaken by the contractor specialist will be supplemented by Government of Sudan technicians with specialized skills in those subjects considered particularly relevant to the project area.

The Environmental Health Specialist will assess the potential effects of any proposed project, both positive and negative, on the health status of the population living in the target area. This will include an analysis of the health problems caused by major endemic diseases already prevalent in the vicinity or that may be activated by planned agricultural interventions, i.e., fertilizers, pesticides, irrigation, land clearing, etc.

The Social Scientist, working in close cooperation with other members of the team, will undertake a human resource inventory, analysis and evaluation in specified geographical areas. The Social Scientist will be responsible for identifying, evaluating and quantifying the major human and social developable resources and development constraints.

The Environmental Specialist will assess the environmental impact of the proposed activities within the areas being considered for project coverage, examine the relationships of the proposed actions to plans for land and resource use, policies and controls for the affected areas and sectoral or national development plans; provide reasonable alternatives to proposed project actions; and identify any irreversible commitments of national or cultural resources that would be involved in the proposed action should it be implemented.

Within the time available, the team will also prepare PID documents on other project opportunities in the traditional sector identified during the visit.

Duration of the assignment will be eight weeks beginning on or about March 7, 1977. One week will be set aside for AID/W pre-departure orientation and briefings and one week for debriefing upon return. During the debriefing period, team members will participate in the AID/W project committee review of the PRP document. Pre-departure orientation may include consultations with the British Ministry of Overseas Development in London concerning British Government sponsored programs in traditional sector agriculture in Sudan as well as a visit to the World Bank's East Africa Regional Office in Nairobi. The work of the team will require field visits outside Khartoum, particularly to the poor western and southern regions which offer best prospects for meaningful AID project involvement.

CONTINUATION SHEET

DEPARTMENT OF STATE
AGENCY FOR
INTERNATIONAL DEVELOPMENT

Worksheet Issuance

PAGE 8 OF 11 PAGES

1. Concerning County
Africa Regional

2. File No.
698-135-3-000045

2.b. Effective Date

2.c.
 Original OR Amendment

3. Project/Activity No. and Title 698-0135
Program Development and Support (Sudan:
Traditional Sector Agriculture)

TITLE OF FORM

Indicate block numbers.

Use this form to complete the information required in any block of a PID or PA/PR form.

RED50/EA is expected to furnish a design officer to work with the team. The group will be accompanied by a senior AID/W officer who will take the lead in discussions with Government of Sudan officials and give overall AID policy guidance and direction. Responsibility for the final documents, however, rests with the Contractor. The team will work under the direction of the AID Affairs Officer of the U.S. Embassy staff in Khartoum.

Due to limited office space, secretarial support and transportation facilities available at the Embassy in Khartoum, funds are being provided the Contractor to procure these services through private sources.

ITINERARY

Sunday , 20 March

Left Baltimore	AL 360	15:00
Arrived New York		15:40
Left New York	PA 002	19:00
Arrived London		07:00

Monday, 21 March

Made appointments to see:

Professor Nelson, Christopher Draper, London School of Tropical Medicine and Dr. Hunter-Jones and Dr. Dafalla of C.O.P.R

Tuesday, 22 March

Kept appointments (Above)

Nelson - About Sahel Documentation
Draper - Marburg virus in Sudan
Hunter-Jones - Vector Control in Sudan
Dafalla - Bilharziasis in Sudan

Left London BA 19:35

Wednesday, 23 March

Arrived Khartoum 08:35

Visited Ministry of Health

Attended Planning session with other team members and Sudanese Counterparts at Ministry of Agriculture.

Thursday, 24 March

With Team members visited various Agriculture Officials.

Discussed long range plans with Sadik Rasheed - Institute for Development.

Picked up maps at Survey Department.

Friday, 25 March

Met with Team members to develop Itinerary and Scope of Work.

Saturday, 26 March

Left Khartoum 10:15
Arrived El Obied 11:20

Met with Agricultural Staff of Northern Kordofan Province to discuss area problems and plan itinerary.

Visited 2 villages North of El Obied in Goz Sand area - interviewed villagers.

Sunday, 27 March

Traveled to Om Ramad Village on Clay Soils South of El Obied, inspected facilities and interviewed villagers.

Monday, 28 March

Met with staff of Provincial Hospital El Obied.

Inspected markets and local water supply.

Traveled to reservoir to observe construction and inspect for snails.

Tuesday, 29 March

Traveled by road from El Obied to Kadugli (Provincial Capitol of Southern Kordofan)

Visited the market at Dilling.

Met with Agriculture Officials of Southern Kordofan at Kadugli

Wednesday, 30 March

Met with Commissioner of Agriculture and his staff to discuss program.

Traveled to Abu Sonoon village in Nuba Mountains to see cotton scheme.

Visited veterinary inoculation center at Lake Kalack:

Thursday, 31 March

Interviewed Dr. Osman Bashir, Director of Provincial Hospital at Kadugli.
Meeting with Minister of Veterinary Services.

Friday, 1 April

Traveled by air taxi to Nyala, Provincial-Headquarters of Southern Darfur.
Meeting with Deputy Commissioner and staff to plan program.

Saturday, 2 April

Traveled to Gedid Ras El Fil (an oasis in the Making) discussed health problems with villagers.

Sunday, 3 April

Traveled to Kaz and Neyertete, interviewed village and Rural Council members-
Jebel Marra Area.

Monday, 4 April

Traveled to 2 small villages in Jebel Marra, Golo and Guildo, interviewed
farmers and health officials.

Tuesday, 5 April

Visited experimental farm at Neyertete, returned to Nyala.
Discussed proposals with Commissioner of Agriculture.

Wednesday, 6 April

Traveled by air taxi to Khartoum.

Thursday, 7 April

Left Khartoum 12:05
Arrived Juba 13:30

Meeting with Agriculture staff for Southern Region to plan program.
Met with Alan Williams of IVS

Friday 8 April

Visited Provincial Hospital and interviewed Personnel

Visited Experimental Farm in Juba Area

Saturday 9 April

Traveled by car to Paloteki Experimental extension farm

Sunday 10 April

Traveled by air taxi to experimental farm at Bor

Returned to Juba Via Sud

Monday 11 April

Traveled by air taxi to Rumbek interviewed Health Personnel at A.C.R.O.S.S.

Traveled by air taxi to Maridi

Interviewed Health Inspector at Hospital

Traveled by air taxi to N'Zara
Toured coffee Plantation and oil palm scheme

Tuesday 12 April

Toured Processing Plants (coffee oil and cotton) at N'Zara

Traveled by air taxi to Amadi and interviewed A.C.R.O.S.S. personnel

Traveled by air taxi to Juba met with agriculture officials concerning
6 yrs plan

Wednesday 13 April

Meeting with Minister of Agriculture meeting with WHO officials

Thursday 14 April

Further discussions with WHO personnel left Juba, Sudan air 13:20 arrived
Khartoum 16:30

Friday 15 April

Planning Report and strategy with team

Saturday 16 April

Visited Census Office and extracted figures for use in report

Discussed 2 proposals for Health Programs in the South With Alan Williams

Sunday 17 April

Second visit to Census office

Visited Survey Office for map materials

Redso personnel arrived and had meeting with team about pids

Monday 18 April

With redso personnel planned writing schedule and discussed overall strategy paper

Tuesday 19 April

Received proposals from Alan Williams visited Dr. Idres of the Ministry of Health

Team discussed the Northern Kordofan project

Wednesday 20 April

Writing report

Thursday 21 April

Writing report

Discussion of Health Aspects of Strategy

Friday 22 April

Discussed Health Aspects of Lakes Province Proposal with Redso personnel

Report writing

Friday 8 April

Visited Provincial Hospital and interviewed Personnel

Visited Experimental Farm in Juba Area

Saturday 9 April

Traveled by car to Paloteki Experimental extension farm

Sunday 10 April

Traveled by air taxi to experimental farm at Bor

Returned to Juba Via Sud

Monday 11 April

Traveled by air taxi to Rumbek interviewed Health Personnel at A.C.R.O.S.S.

Traveled by air taxi to Maridi

Interviewed Health Inspector at Hospital

Traveled by air taxi to N'Zara

Toured coffee Plantation and oil palm scheme

Tuesday 12 April

Toured Processing Plants (coffee oil and cotton) at N'Zara

Traveled by air taxi to Amadi and interviewed A.C.R.O.S.S. personnel

Traveled by air taxi to Juba met with agriculture officials concerning 6 yrs plan

Wednesday 13 April

Meeting with Minister of Agriculture meeting with WHO officials

Thursday 14 April

Further discussions with WHO personnel left Juba, Sudan air 13:20 arrived Khartoum 16:30

Friday 15 April

Planning Report and strategy with team

Saturday 16 April

Visited Census Office and extracted figures for use in report

Discussed 2 proposals for Health Programs in the South With Alan Williams

Sunday 17 April

Second visit to Census office

Visited Survey Office for map materials

Redso personnel arrived and had meeting with team about pids

Monday 18 April

With redso personnel planned writing schedule and discussed overall strategy paper

Tuesday 19 April

Received proposals from Alan Williams visited Dr. Idres of the Ministry of Health

Team discussed the Northern Kordofan project

Wednesday 20 April

Writing report

Thursday 21 April

Writing report

Discussion of Health Aspects of Strategy

Friday 22 April

Discussed Health Aspects of Lakes Province Proposal with Redso personnel

Report writing

Saturday 23 April

Report writing

Sunday 24 April

Finished Introduction and Provincial Health Profiles

Monday 25 April

Visited M.A. Amin-Public Health Lab discussed Schistosomiasis control in Gezira

Reviewed Sudan Collection at Medical School Library

Tuesday 26 April

Finished Reviewing material at Library

Visited personnel at Dept. of Community Medicine University of Khartoum

Discussion with Dr. R. Abdulah concern, Leishmaniasis, Malaria and Filariasis in Sudan

Wednesday 27 April

Discussion with Abu Gassim Safeldin about potable water resource Develop.

Discussion with Catholic Relief services personnel about Nutrition programs in Sudan

Thursday 28 April

Visit to Nutrition personnel UNIV of Khartoum

Received draft of Blue Nile and Lakes province projects. Started writing impact statements

Friday 29 April

Discussion with WHO team members looking into sanitation in Sudan

Finished Lakes Project Impact Paper

Left Khartoum SD 118 22:30

Saturday 30 April

Arrived London 07:20

Sunday 1 May

Left London PA 101 1100, arrived New York 13:35

Left New York AL 471 16:20, arrive Baltimore 17:15

HEALTH CONSIDERATIONS IN THE DEVELOPMENT
OF TRADITIONAL SECTOR AGRICULTURE IN THE SUDAN

INTRODUCTION

Preliminary estimates by the Department of Statistics, based upon the National Census of 1973, have indicated that more than 80% of the population of the Democratic Republic of Sudan can be categorized as either rural or nomadic. The majority of these individuals, who are estimated to number more than 12 million, depend upon agriculture, pastoralism or some combination of both for their livelihood.

Diversity in the socio-cultural makeup of these people, absence of reliable all-weather transportation, lack of skilled manpower and a shortage of economic resources have inhibited the efforts of the National Government to deliver many needed services to many segments of this population. Nowhere has this disparity been more evident than in the area of health.

In its present 6 year plan the GOS has designated traditional sector agriculture as a priority area for improvement. Similarly, the Ministry of Health in its National Health Program 1977/78 1983/84 has made a major commitment to improving the health status of the country's rural population. The central mechanism for bringing about this improvement in the new Primary Health Care Program. The realization of these two objectives (improvement of traditional sector agriculture and primary health care

NOT OFFICIAL

D R A F T

FOR EDITORIAL REVIEW ONLY

for rural populations) has great potential for improving the health and nutritional status as well as the quality of life for the rural agriculturists of Sudan.

The Primary Health Care Program, developed by the Sudanese with assistance from WHO has been called the most practical, well designed and implementable plan yet proposed for a developing country. Now in its pre-implementation phase, the plan calls for delivering village oriented health care to at least 80% of the rural and nomadic populations of the Sudan by mid-1984. Since the elements of the plan as well as its objectives are consistent with AID's own policies for improving the quality of life of rural populations the writer urges successive AID teams, particularly those responsible for health to confer with Sudanese Health Officials concerning avenues of cooperative activity to assist in accomplishing this worthwhile objective.

The present USAID team organized under the title "Program and Support (Sudan: Traditional Agriculture)" has been given the task of assisting the GOS in its efforts to improve productivity and land use practices of the farmers and pastoralists engaged in what is known generically as traditional sector agriculture.

The development of any responsible strategy for assisting traditional sector agriculture must include careful consideration of its elements for their possible impacts both positive and negative upon the health of its beneficiaries. Toward that

and, each of the plans proposed by the team has been examined for such health impacts.

The team has proposed a variety of approaches to assist traditional agriculture in widely different geographical areas of the country. Each plan has a set of inputs that have been adapted to meet the needs of the geographical area in question. Similarly, each geographical area has its own set of health problems that are more or less unique. Therefore, a format for discussing health impacts has been selected that will permit separate analysis of each proposed intervention:

A health profile has been assembled for each geographical area in which the team proposes to develop a program. These profiles, based upon review of available documents, visits to the proposed project areas and interviews with area residents and health officials, have been used to assess the proposed inputs of the team's plan for potential health impacts. Each of the profiles addresses the existing conditions of the area with regard to:

- The availability of preventive and curative health services.
- The prevalence and/or incidence of endemic diseases. Particularly those associated with agricultural activities.
- The nutritional status of the population.

- The presence of vectors, or potential vectors of disease.
- The availability of potable water and existing methods of sewage disposal.

The final section is a discussion of the project inputs with regard to the health situation of each area and suggestions for minimizing potential negative impacts as well as maximizing positive ones.

HEALTH PROFILES

A. Northern Kordofan Province

1. Availability of Health Services

The Sudan Bureau of Statistics projects that by 1984 the rural populations of the province will approach 877,000 and estimates that there will be 243,000 Nomads at that time. In keeping with the objectives of the new Primary Health Care Program, 101 primary health care units will be set up to provide health services for the rural population. This is in addition to the 41 dispensaries and 84 dressing stations now in existence. Primary health care services for the nomadic segment of the population will be provided by a nomad community health worker (1 per 1500 pop.) selected by the clan for training and will move with the group. He will serve using existing health services as points of referral and drug supply.

At the present time the rural and nomadic populations are served by 41 dispensaries and 84 dressing stations located, primarily, in villages of 1000 or more that have permanent water supplies, schools and a well established community structure. Smaller, less well established communities must obtain services by traveling to the services in much the same manner that they obtain water. Nomadic populations have access to health services only when their routes carry them close to these same services. The rural health facilities contain no beds, are staffed by nurses (3 yr diploma) or medical assistants (nurse with 2 yrs of specialized training) and often

have an inadequate supply of medicines. Their function is to administer simple treatments and refer cases to the 10 health centers or 7 hospitals located in the urban areas of the Province. In many rural villages, there may be found a village-midwife (a resident of the village who has received one year of training).

The health centers (10) and hospitals (7) located entirely in urban settlements (communities of 5000 or more) have physicians, medical specialists and a total of 1,023 beds. The Provincial Hospital at El Obied is a well-staffed facility with an intern program and training programs for nurses, medical assistants and village midwives. The health centers as well as the hospitals provide pre-natal and neonatal care, immunization services, laboratory services, family planning advice (on request) and supervise the activities of the rural facilities.

2. Endemic Disease Problems

As in most sections of the country, malaria (P. falciparum) is the primary endemic disease problem. A major cause of infant mortality, malaria rates as high as 5000/100,000 population have been reported for Kordofan Province within the last 10 years. These figures reflect only reported cases and authorities estimate that the actual prevalence is much higher. While incidence is highest in the wet season. June - October, endemnicity is considered

to be perennial. No evidence of chloroquine resistance has been observed to date. The major vector in the area, Anopheles gambiae, is a vigorous species with few preferences for breeding areas. Personnel at El Obied Hospital Plan a research program on the bionomics of malaria vectors in the area.

Schistosomiasis haematobium is reported to be highly prevalent among school age children in North Kordofan. Good results are seen with Antimonials and Ambilhar but reinfection rates are high. Lacking few perennial streams, incidence is highest during the rainy season. Metrifonate has not been used by the hospital personnel.

Diarrheal diseases of all types constitute a major problem in the area. Few facilities have the technical capabilities to distinguish between etiological agents but in 1974, the Province of Kordofan (combining what are now north and South Kordofan) reported 77,982 cases of gastroenteritis in children attending all health facilities. The only province reporting a larger number of cases was Blue Nile.

Tuberculosis is considered to be a severe problem in Kordofan with 41234 reported cases in 1974. Believed to be associated with the consumption of unpasteurized milk, patients of all ages present with pulmonary, bone, glandular and miliary symptoms. Shortage of BCG is sited as the major constraint to mounting a campaign of intervention. The destruction of

tuberculous cows is not commonly practiced due to the lack of government funds with which to pay compensation to pastoralists. Brucellosis is suspected to exist but facilities for definitive diagnosis are not locally available.

Hepatitis is common in the province and suspected by local authorities to be associated with primary liver carcinoma. A study into this association is underway.

Other diseases associated directly or indirectly with agricultural or pastoral pursuits such as hookworm, filariasis, hydatid disease and trypanosomiasis are either not present or of minor concern.

3. Nutritional Status

Dietary imbalances resulting from high carbohydrate, low protein intake are common as are deficiencies in vitamins C and members of the B complex. While famine does not exist 61,541 cases of malnutrition and anemia were reported for Kordofan in 1974 and kwashiorkor and marasmus are commonly seen. Malnutrition is considered to be the leading cause of death in children less than 5 years of age.

4. Density of vectors of disease

There is little evidence of any concerted effort to control disease vectors in the rural areas of North Kordofan. The absence of permanent water, waste or otherwise limits the breeding season of most vectors to the rainy season. The perennial persistence of malaria in the area is due primarily to the resourceful breeding habits of Anopheles gambiae, the

major mosquito vector. Specimens of Bulinus truncatus recovered from the reservoir west of El Obied during the dry season were not found to be infected with schistosomes. But this water resource is strictly protected against use by humans or animals. Black flies and tsetse flies are not known in the area.

5. Potable Water and Sewage Disposal

With the exception of El Obied which has a reservoir and a pipe borne water delivery system, water for human and animal use is drawn by hand from deep hand dug wells, shallow wells dug in waddies or pumped from boreholes during the dry season. The complete absence of guinea worm in the area indicates that there is little if any dependence upon step wells. This is not the case in areas of South Kordofan where this disease is prevalent. The extremely limited number of watering points necessitates the carrying of water in tins, goat skins and donkey carts to remote areas thus creating conditions for secondary contamination and resulting in the high incidence of enteric disease, particularly during the dry season.

Where soil type permits, hafirs, or water yards have been dug to store quantities of surface water. Hafirs are traditionally protected against direct use by man and animals by fencing, the water being drawn by bucket or pump from a nearby well connected to the hafir by underground pipes.

Many unprotected, natural hafirs exist, however, that often dry up in the dry season but are the major source of schistosomiasis transmission and mosquito breeding during the rainy season. There is no tradition of using human feces ("Night Soil") as fertilizer but washing after defecation promotes the spread of fecally borne disease when the water source is a natural body of water.

B. Southern Darfur

1. Availability of Health Services

At the present time the Province of Southern Darfur has 6 hospitals (414 beds) 3 health centers, 26 dispensaries, 28 dressing stations and 7 public health offices to serve a population estimated to be in excess of 850,000 about 90% of which is either rural or nomadic. The GOS plans to have 149 additional facilities (dispensaries and primary health care units) in service by 1984. In addition, the primary health care program will train 197 nomads to be Nomad Community Health workers.

Within proposed project area, on the western slopes of Jebel Murra there are few health facilities. A 70 bed hospital at Zalingei is the only physician staffed facility within the area. The target area, within the Kongei River watershed has no health facility at all. The nearest unit is a 2-man dispensary at Guildo miles away. The largest community in the Kongei watershed is Golo Village which along

with 13 satellite villages forms the Golo Rural Council. Residents are aware that the remote location and seasonable impassible roads have been responsible for their inability to secure health as well as other services. At present no members of their community have been selected for training in the Primary Health Care Program.

2. Endemic Disease Problems

The largest single endemic disease problem is malaria due to Plasmodium falciparum. The area of Golo has been classified as holoendemic and perennial transmission is known to occur in many villages of Jebel Marra. Statistics for the whole of Darfur Province have indicated a rate of 8082 cases/100,000 population for 1974. Because of inaccurate reporting however, the actual rate is probably much higher. It is second only to Blue Nile Province (10894/100,000) in this regard.

Intestinal and urinary schistosomiasis are known to be endemic in the Jebel Marra. In a survey by Dr. Mutamad Ahmed Amin of the Faculty of Medicine University of Khartoum in 1972, infecte snails were recovered from the irrigation canals of the Farm at Nyertete. The conditions for transmission of schistosomiasis were classified as "grave" by that team. The writer recovered several specimens of Pulinus and Biomphilaria on the recent visit to Nyertete but no evidence of infection was found. The sample, however,

with 13 satellite villages forms the Golo Rural Council. Residents are aware that the remote location and seasonable impassible roads have been responsible for their inability to secure health as well as other services. At present no members of their community have been selected for training in the Primary Health Care Program.

2. Endemic Disease Problems

The largest single endemic disease problem is malaria due to Plasmodium falciparum. The area of Golo has been classified as holoendemic and perennial transmission is known to occur in many villages of Jebel Marra. Statistics for the whole of Darfur Province have indicated a rate of 8082 cases/100,000 population for 1974. Because of inaccurate reporting however, the actual rate is probably much higher. It is second only to Blue Nile Province (10894/100,000) in this regard.

Intestinal and urinary schistosomiasis are known to be endemic in the Jebel Marra. In a survey by Dr. Mutamad Ahmed Amin of the Faculty of Medicine University of Khartoum in 1972, infected snails were recovered from the irrigation canals of the Farm at Nyertete. The conditions for transmission of schistosomiasis were classified as "grave" by that team. The writer recovered several specimens of Fulinus and Biomphilaria on the recent visit to Nyertete but no evidence of infection was found. The sample, however,

was small. Reports of Schistosomiasis cases at Zalingi Hospital indicate that the urinary form (S. Haematobium) is more prevalent and constitutes about 90% of the total. Returnees from the Gezira are frequently infected and constitute a reservoir of infection to be transmitted to the local snails.

Onchocerciasis (river blindness) has been reported from the Jebel Marra area but has been considered to be on the decline by K.M. Obeiran, M.D. 1973. The reasons cited for the decline were 1) low parasite densities in the population, 2) the short life span of Simulium damnosum (the blackfly host), 3) meteorological factors and 4) the social and economic behavior of the population. The land-fall of the Jebel Area is steep and the potential for blackfly breeding seems favorable. Watson et. al. noted this in 1967 and suggested that the area has potential for Onchocerciasis transmission and should be monitored for this eventuality. Decline in the perennial stream flow may be a factor in checking the number of vectors in the area. A WHO survey of the area in 1970 by Anderson et.al. did not consider the risk of increased transmission to be great.

Chronic diseases such as tuberculosis, leprosy and leishmaniasis occur in the area but are not considered to be major problems. Occasional outbreaks of relapsing fever, typhoid and typhoid and cerebrospinal meningitis have occurred in epidemic proportions in the past.

3. Nutritional Status

In the Jebel Marra area, a wide variety of fruits and vegetables are grown including oranges, mangoes, guava, lemons, tomatoes, potatoes, and sugar cane. The staple grain is millet and cow's milk is available. It is likely that if nutritional deficiencies are present they are due to reduced consumption in bad years rather than to qualitative shortages. One notable exception is a persistent problem with endemic goiter. A survey conducted by Ali Kambal M.Sc., Univ. of Khartoum (thesis) identified the cause as simple iodine deficiency. It was noted in the recent visit, sea salt which contains iodine is not as readily available in the markets of Jebel Marra as it is in the markets of Kas of Nyalla.

4. Density of Vectors of Disease

As mentioned in an earlier section, malaria is endemic and perennial in the Jebel Marra area. The major vector is Anopheles gambiae but there are several secondary vectors present. No Tsetse have been reported. Phlebotomus clydei has been reported by Kirk & Lewis to be the vector of Leishmaniasis in the area. The low density of Simulium damnosum in Jebel Marra is somewhat mystifying considering the seemingly suitable habitat among the mountain streams. An apparent autochthonous case of bancroftian filariasis with associated elephantiasis in Zalingi in 1974 suggests that a suitable vector mosquito may be present but no survey has been conducted for this purpose (Abdalla et.al. 1974).

Snails of the genus Bulinus and Biomphalaria are present but their numbers are limited by the periodic drying up of the streams. There are no vector control programs in the area.

5. Potable Water and Sewage Disposal

In Jebel Marra, water for drinking is obtained from water courses. In areas such as Colo where streams are not perennial, hand-dug shallow wells supply these needs during the dry season. Water is stored, for family use, in earthen crocks which are subject to some degree of secondary contamination.

There is no formal method for human waste disposal and most defecation is performed in "the Bush". As in most other areas of the country cleansing with water following defecation is customary. Most individuals are aware of the risks of water borne diseases and carry water with them to the defecation site rather than to select sites for defecation close to water courses. Little control is exercised over the activities of children however.

C. Lakes Province:

1. Availability of Health Services

There is some difficulty in assembling information about Lakes Province. This is in part because the province was newly formed in 1976 along with the other subdivisions of the Southern Region. Basically, Lakes Province was created by

the subdivision of Bahr El Gazal Province. As most of the statistics for the region appear under the old designation, they will be so expressed in this report. Preliminary estimates from the 1973 census place the population of Bahr El Gazal at 1,397,000. In 1975 the whole of Bahr El Gazal had 107 health care facilities including 1 provincial hospital (at Wau), 6 District hospitals, 1 health center, 23 dispensary and 76 dressing stations. No rural hospitals are included within the province. On an area comparison and assuming the population to be evenly distributed, one could estimate the population of Lakes to be around 500,000.

The Primary Health Care Program calls for the construction of 256 primary health care units and 43 dispensaries in the whole of Bahr El Gazal approximately 1/3 of which should be within Lakes Province.

In the area of Rumbec a unit of the African Committee for the Rehabilitation of Southern Sudan (ACROSS) was visited. In addition to their educational function, they are presently operating a series of clinics in the area. Some of the services being provided by the group are distribution of medicines, vaccination when materials are available, and a mobile clinic. Working with the Regional Hospital in Rumbec this group provides valuable services to the large population of Dinka pastoralists that constitute the major inhabitants of the area.

2. Endemic Disease Problems

No information could be found concerning epidemiological surveys conducted in the Rumbec area but Ms. Erika Waser, a nurse with ACROSS, was available to provide some information.

As in other places, malignant Tertian Malaria (P. fal-
ciparum) was identified as a major problem. Of particular concern to the ACROSS group was an alarming prevalence of tuberculosis particularly among Dinka children. It is believed to be primarily of bovine origin as the Dinka consume quantities of milk from their cows which are not tested but believed to be widely infected. Brucellosis is also thought to be present. But diagnostic facilities are not available. Seasonal water shortages in the area are blamed for a high incidence of dysentery and enteric diseases of all types as well as hepatitis.

The health of children was said to be particularly bad with Otitis, Bilharzia, Pneumonia, Measles, TB, Tetanus and seasonal outbreaks of cerebrospinal Meningitis during the dry season. No guess could be made at the infant mortality rate but it was considered to be extremely high.

Human trypanosomiasis is rare in the area but onchocerciasis with attendant blindness is common as is trachoma. Guinea worm appears focally. Relapsing fever is common among the herders but it is not known locally whether it is louse or tick borne.

D. Blue Nile Province:

1. Availability of Health Service

The preliminary figures from the 1973 census place the population of Blue Nile Province at 969,474 which is about 6.5% of the total population of Sudan. About 74% of its inhabitants are classified as rural and 11% are nomads. There are presently 3 facilities (health centers or rural hospitals) which are staffed by physicians, 35 rural dispensaries (staffed by Medical Assistants or nurses) and 138 dressing stations (with nurses or dressers). It is planned by 1984 to upgrade all dispensaries to meet the specifications of the Primary Health Care Program and to supplement them with 5 new facilities. The existing 138 dressing stations will be modified, upgraded and staffed as primary health care units. A building program will be launched to bring the total number of PHCU's to 200.

During the recent visit to Sudan, the writer did not travel to Blue Nile Province and therefore cannot offer any firsthand information about the current status of the existing health facilities.

2. Endemic Disease Problems

The National Health Program 1977/78 - 1983/84 in reviewing the statistics for the last 10 years with regard to the prevalence of endemic diseases, lists Blue Nile first for malaria gastroenteritis and tuberculosis. It should be noted however that until 1974 the highly mechanized agricultural area known as Gezira was part of the Province. The vicinity of

Abu Genai, where the team concentrated its efforts is an area of high malaria endemicity, as well as for Schistosomiasis Haematobium and Schistosomiasis Mansoni. While considerable uncertainty surrounds the exact mode of transmission, the area has experienced several severe outbreaks of visceral leishmaniasis.

Intense transmission of Onchocerciasis is known to occur in the upper Blue Nile with attendant nodules and blindness. In an area just to the south of Abu Genai is one of 3 known foci of Bancroftian filariasis in Sudan.

3. Nutritional Status

It is on the subject of nutrition, that the writer feels most disadvantaged in providing information about the Blue Nile Project area.

The area in question, while located near the river, depends primarily on rain-fed agriculture. The traditional farmers are engaged in the cultivation of sorghum which constitutes their staple diet.

Supplementary protein from fish taken from the Nile has potential, at least, for raising their intake above most comparable rain-fed agricultural communities in the Western region. Some vegetables are grown locally but the exact nutritional status of the residents will be known only after a comprehensive survey has been conducted.

4. Density of Vectors of Disease

Anopheles gambiae and A. funestus have been identified as the two major malaria vectors in Blue Nile. Several species of Aedes mosquitoes occur locally and were associated with a particularly severe outbreak of yellow fever in 1959. South of Damazin, Culex pipiens has been associated with the transmission of Bancroftian filarias with concomitant elephantiasis.

Fast flowing waters below the Roseires Dam provide an excellent breeding ground for Simulium damnosum. This focus has been studied by WHO and has been recommended as a site for a control program.

Both Eulinus and Blomphalaria snails abound in the Nile and its tributaries and are responsible for a high transmission of intestinal and urinary schistosomiasis.

Several species of Phlebotomus occur in the area and Kala Azar occurs in sporadic outbreaks. The vector-host relationship has not been

confirmed however and many authorities believe that the natural mode of infection may be by mechanical transmission from biting flies such as Stomoxys and Tabanus.

5. Potable Water and Sewage Disposal

Much of the water consumed in the area is carried directly from the Nile. The vessels used to transport and store drinking water are vulnerable to contamination and are often breeding sites for mosquitoes.

Some Hafirs have been constructed in the area to collect surface water. While many of the Hafirs are protected from animals and human contamination by fences, there are many in which the fences are in a poor state of repair and are probably subject to a large risk of contamination.

There is no evidence of any sewage disposal system or any formal method for discarding or using human waste.

SUMMARY AND RECOMMENDATIONS

The AID traditional agriculture team has, at present, developed project proposals for three of the four provinces reviewed in the preceding section. The proposals are quite different in their design and reflect the team's professional judgement with regard to each area's special problems. This Annex will not attempt to review or summarize the proposals. The reader is referred to the proposals themselves for details. Within each proposal, however, several actions or inputs appear that have potential for producing health-related impacts, both positive and negative.

In this final section, each project has been discussed with reference to these possibilities and insofar as possible, suggestions have been made for each activity identified as to ways in which positive impacts may be maximized and negative impacts reduced to a minimum. Activities that have been considered as having little or no impact upon health directly have not been included.

Conversely, where a possible impact has been identified that is not directly related to the project design or proposed activities but to some area-specific health need or hazard, it has been addressed as a complementary proposal. No attempt has been made to quantify these proposals in terms of relative risk, personnel required or financial expenditures. They are simply suggestions of a qualitative nature for consideration during the planning process.

A. Lakes Province

This proposal calls for the establishment of an Agricultural Training Center in which rural agriculturists and pastoralists will be brought together to receive training, services and commodities for improving

their productivity and standard of living.

An implicit outcome that hopefully will be realized is an overall improvement in nutritional status. It is recognized that all of the program's inputs are intended to promote that objective so no positive impacts that are direct objectives of the program have been included.

1. Immigration of Trainees

The program calls for bringing traditional farmers and/or pastoralists together at the training center for largely field-oriented training. Within the area that these potential trainees presently reside there are many endemic diseases. The assembling of people together under new and unfamiliar conditions carries a risk of transmission of communicable diseases such as tuberculosis, influenza and enteric infections.

Risks of promoting outbreaks of infections of this type may be reduced by selecting persons from the same area and having the same lifestyle for participation at any one point in time. This will reduce the possibility that susceptible, non-immune individuals will be brought into contact with a disease with which they have had no experience. An alternative approach is to have each trainee examined by the local health authorities to insure that they are not infected with a communicable disease. These authorities would then undertake treatment or referral of that person as provided for in the guidelines established by the Ministry of Health.

2. Housing of Trainees

If the trainees are to remain at the center in residence, it is contingent on the program to provide for acceptable quarters or accommodations that will include: spraying of the living area to insure absence of insect vectors; provision of a water seal latrine; showers; safe

drinking water; and clothes washing facilities.

3. Provision of Vehicles

It is recognized that the introduction of trucks, bicycles and motorcycles carries a risk of accidents if proper instruction is not undertaken in their use.

A less obvious possibility of a positive nature would be to provide supplies and evacuation services for the local health facility, perhaps, in return for the health screening and treatment inputs suggested under item one.

4. Provision of Grain Mills and Flour Milling Services

In addition to providing a source of flour processing for improved nutrition, such a facility could be developed as a nidus for many community and health related activities such as maternal and child health, education and immunization programs. This is particularly attractive in light of the fact that women are traditionally responsible for producing the flour. The female segment of the population is often difficult to reach by more conventional means.

The introduction of enteric disease problems by unsanitary operation of the mill is a possible negative outcome which can be obviated by providing proper housing for the mill and monitoring of the operation and maintenance of the equipment.

5. Sale and Distribution of Improved Seed

This activity is aimed at improved production primarily of sorghum. As such, its impact should be positive provided: the seed has been tested in the area it will be used, and if the product is consumed and not sold completely. If seed for non-consumable cash crops are made available, it must not be at the expense of subsistence crops. The same responsibility

applies to providing markets for crops. People must not be encouraged by an attractive market prospect to ignore subsistence crops. Even if cash profits are increased, the difficulties of transport in the province might reduce the possibilities of buying food at any cost.

6. Improved Utilization of Shea Nut Oil

This is viewed primarily as a likely positive impact due to the nutritional energy represented by increased availability of a now reduced vegetable oil. The nutritional value of shea nut oil relative to other alternatives (ground nut, cotton seed) are not known to the writer. If this is a question in the minds of others, the biochemists at the University of Khartoum might be willing to undertake a study to resolve the question.

7. Anthropological Survey

This would seem a likely vehicle with which to learn more about the diets, food preferences, drinking water sources, health related habits and alternative sources of medical care of the beneficiaries. It would seem appropriate to expand this survey to include nutrition, sanitation and disease.

8. Inspection of Land

This activity is to be undertaken with regard to site selection for the center. It would be advisable to include the advice of an authority on vector biology to insure that the site is not placed in the vicinity of a hazardous area, i.e., a black fly breeding site or schistosomiasis infested stream.

9. Educational Program for Improved Livestock Management

Since area residents are not particularly interested in selling cattle for slaughter, it must be assumed that the major thrust will be

toward improved milk production. The Health Profile for Lakes Province has touched on Bovine Tuberculosis as a serious source of human disease. The program should include warnings concerning this hazard and seek ways to introduce acceptable methods of simple pasturization or sterilization techniques for milk.

Additionally, the herders should be introduced to appropriate control methods for cattle pests, i.e., Stomoxys/Callitroga and ticks not only for husbandry reasons but for control of Zoonotic infection.

10. Complimentary Programs

One of the most pressing problems of area residents is the lack of potable water. The center would be a likely place to attempt to develop appropriate and replicable methods for storage of water and/or water harvesting.

The Ministry of Health and its supporting institutions have considerable capability in performing human health and nutrition surveys. It would be quite useful to find some avenue of collaboration with them, perhaps using the center as a base, to fill in our understanding of the current status of this much neglected area.

The USAID Health Team scheduled to visit Sudan later in the year would be well advised to address this issue.

B. Blue Nile Province

The project planned for Blue Nile Province emphasized providing mechanized farming equipment, marketing services, information extension and a credit system to improve the production and quality of life for traditional farmers in the Southern District of the Province. The major inputs will be directed toward the production of food crops such as

sorghum, which is the staple grain of the population as opposed to non-food cash crops. One must assure that the farmer's own needs for food will be met first before consideration will be given to marketing. Providing this assumption is true, the program will have potential for improving the nutritional status of the population. Very little information exists regarding the present nutritional status of people in this area. This question will be dealt with at the end of this section under complimentary programs.

With regard to the health related impacts of the proposed projects inputs, a few possibilities can be discussed.

1. Land Clearing

This activity would be undertaken in the initial stages of the project and would be essential to an agricultural program involving mechanization. The destruction of obstacles on the land would potentially be beneficial for any vector control project where spraying is involved. This is true not only for agricultural pests but for vectors of human disease.

As stated in the Health Profile, this area has a large problem with onchocerciasis and malaria, periodic epidemics of Leishmaniasis and a significant problem with Bancroftian filariasis. Clearing of brush and obstructions would increase the effectiveness of controlling adult black flies, mosquitoes and sand flies, particularly if aerial spraying was employed.

The reservoir of Leishmaniasis is believed to be a rodent in this area. While this suspicion has not been confirmed, some risk would be involved if rodent habitats were disturbed during the clearing process particularly if the population of sand flies was high at the time. It

would seem prudent to undertake a spraying program just prior to the land clearing operation. Secondary benefits would result in the elimination of pests that could feed on the persons engaged in the clearing activity, i.e., black flies, ticks and cattle flies. (It has been suspected by some investigators that cattle flies such as Stomoxys and Tabanus may mechanically transmit visceral Leishmaniasis in the Sudan.)

2. Introduction of Tractors and Farm Machinery

This input is considered to be crucial to the success of the project and if it results in improved production of food crops its health benefits are obvious. One, less obvious, positive impact would be to provide a means of transporting potable water to the more remote areas of the project. Water from the Nile and Hafirs is presently used for this purpose, but the means of transporting it (goat skins, petroltins) offer many opportunities for secondary contamination and no doubt contribute significantly to this large amount of diarrheal disease in Blue Nile Province. If water wagons were provided, the tractors could be used to transport water to the areas of need. There is no need for an elaborate special purpose container but it must be assured that the vessels employed are marked to be used for potable water only. Considerable risk would result from using drums alternately for petrol and insecticides. The positive impact of this input could be maximized by developing suitable enclosed water storage facilities in the areas of use. (It would be advisable to consider complimentary installation of water seal latrines and showers at the sites selected for these proposed water storage units.)

Possible negative aspects of introducing modern farm machinery into this area would include increased risk of serious traumatic injury. Some residents of the Abu Gemal area claim to be experienced tractor operators

having received training in the mechanized schemes of the Gezira. This claim should not be allowed to influence the program director to any extent. Properly supervised training courses including safety should be given to all participants at all levels.

It is doubtful if the local health care facilities have ever seen, let alone been prepared to deal with, traumatic injuries of the magnitude that can be caused by a disc harrow or other machinery. It is essential that the local medical personnel be given special training (not simply alerted) to deal with these eventualities.

3. Upgrading of Local Dry Weather Road

The only health implications of this activity appear to be positive ones. They would include access to health care, facilitated transport out in the event of medical evacuation, possible route for introduction of supplementary foods, drugs, and water.

3. Building of Windbreaks

Although the proposed purpose of this activity is to prevent erosion, it would seem advisable to consider using fruit trees for this purpose. While it has not been established that a fruit deficit exists in this area, it would not be counter-productive to consider this possibility.

4. Complimentary Programs

Conversations with nutrition authorities in Khartoum indicate that there is a considerable lack of information about the nutritional status of the residents of the southern section of Blue Nile Province. While this is certainly true about many other areas of the Sudan, it seems that the possibility of using nutritional status as an indirect indicator of improvement of the well being of a population engaged in

subsistence agriculture should be explored. The Ministry of Health and other agencies within their sphere have had considerable experience in conducting nutritional surveys in Khartoum, Upper Nile, Gezira, and Jebel Marra. The possibility of participation of these experienced technicians in surveys of this as well as the other project areas outlined in this report would seem worthy of consideration. It might be possible to include a wider survey including vectors of disease and endemic disease evaluation of the type proposed for the Rahad and Jongeli Schemes by the Ministry of Health.

In conversations with Ministry of Health, nutrition and endemic disease personnel in Khartoum, interest was expressed in cooperative surveys of the proposed AID project areas. Perhaps this possibility could be explored within the scope of work for the AID Health Team scheduled to go to Sudan later this year.

C. Northern Kordofan Province

The project proposed by the AID traditional sector agriculture team for North Kordofan Province has an extremely complex set of inputs that are aimed at preserving the area's very fragile environment while improving its agricultural output (particularly of subsistence food crops).

The project has a large experimental component in its early phase, the outcome of which will play an important role in determining the nature of the inputs that will be required in the later phases.

Once these essential activities have been identified, it will be vital to address each one with regard to its positive and negative potential for affecting health. The initial inputs, however, are mainly directed toward establishing a research-oriented center that will strive

to find methodologies to accomplish the objectives that are worthy of replication and extension.

The health needs of the project like the goal directed inputs will have to evolve with the project.

In this section, the activities that have been examined for health impacts are those necessary for establishing the center and some that appear to be inevitable, regardless of the outcome of the experiments.

The writer urges that a health consultant be given an opportunity to address potential impacts of each new approach prior to it's adoption.

1. Importation of Susceptible Non-Immunes

The largest, single input initially will be the services of a large staff of expatriate specialists for an extended period of time. Most of the impacts examined so far have been related to the health of beneficiary populations. In this case, however, some mechanism for protecting the staff must be found if the project is to attract the scientific talent it needs.

The construction of a health unit on the grounds of the center would seem appropriate. It would be difficult to justify the services of a physician for this unit. There is a good possibility that a nurse could be found that could see to the needs of the expatriate staff as well as the needs of the workers and Sudanese counterparts. The writer is particularly partial to recruiting a team for this purpose, i.e., an expatriate scientist married to a qualified nurse. The likelihood of finding this combination is greater than one might suspect.

2. Relocation of Villagers and/or Villages

This problem is not unrelated to the first one. Even though the migration anticipated will be away from the project area, the possibility

of moving people into areas that have unfamiliar diseases should be regarded with caution. On the other side of the coin, one of the sociological factors that has potential for inducing people to relocate is that the new site can provide the people with services that they are presently without.

Toward that end, the establishment of health and educational services at the new site prior to relocation can be an added incentive to accomplish the objective. The assistance of the Ministry of Health is essential in this matter, as they have responsibility for placing primary health care units. It is conceivable that the project could assist in the relocation by providing buildings for health units in the areas slated for relocation.

3. Introduction of Vehicles

Beside the obvious risk associated with vehicular accidents, the presence of vehicles has the possibility of providing a positive impact by facilitating the distribution of medical supplies, potable water and personnel where needed throughout the project area and its beneficiaries.

4. Development of New Water Points

The judicious placement of new sources of water will be a crucial component of the agricultural program. The opportunity for simultaneous development of safe drinking water supplies should not be lost. The technique employed will undoubtedly involve the drilling of new bore holes and where the soil characteristics permit, Hafirs. The Hafir constitutes a legitimate traditional technique for surface water harvesting that can provide water of high quality but only if protected from direct use by people and animals. The fencing of Hafirs as outlined in the Health Profile Section can be quite effective. One of the major sources of

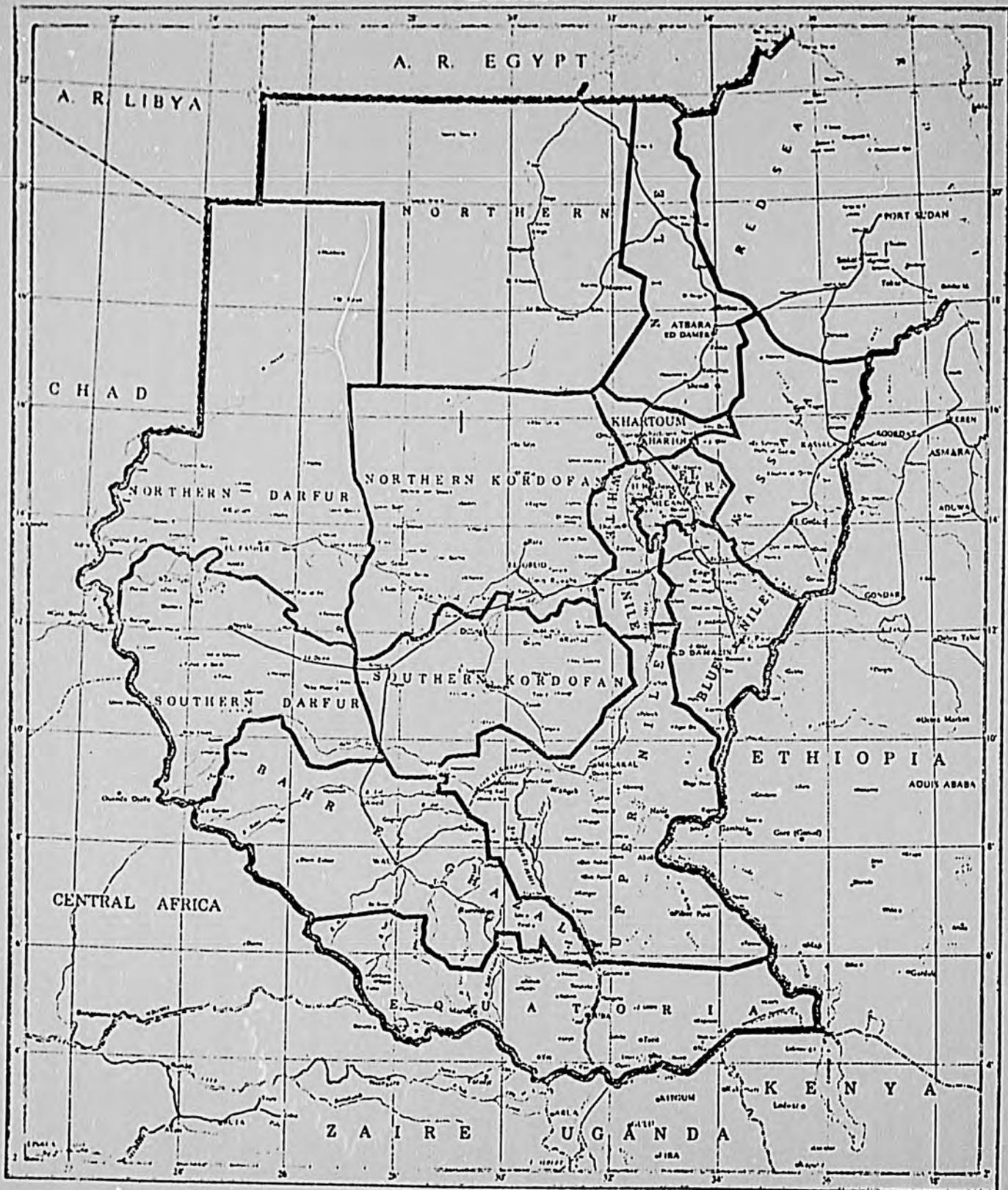
Schistosomiasis in Northern Kordofan has been identified as the unprotected Kafir. In areas where the soil is too porous to use Hairs, alternate methods of water storage, i.e., stand pipes, should be considered to provide quantities of safe drinking water. The use of water storage stand pipes provides a method of separating human drinking water supplies from those used for watering animals. (A common practice which should be discouraged.) The concomitant introduction of adequate sanitary facilities (water seal latrines, showers and clothes washing facilities) is a possibility which should not be overlooked.

3. Complimentary Programs

As with the other areas visited by the agricultural team, it was found that very little information exists with regard to the nutritional status of the residents of Northern Kordofan. Local health authorities view this paucity of information as serious. Reports of malnutrition and vitamin deficiencies are common.

It would be of significant value to have survey type information about the nutritional status of the residents (particularly as a guide for program planning). Authorities in the Ministry of Health share this concern and would be glad to undertake a study in the project area. It is recommended that the members of the AID Health Team explore this possibility during their visit later this year.

SUDAN



Scale 1:400,000
 REFERENCE
 Name of Country KHARTOUM
 Name of Province ED DAMIES
 Name of District
 Name of Town
 Name of Province
 Name of District
 Name of Town

● SITES VISITED

USEFUL CONTACTS

1. Dr. Ali Ahmed Idris MB.BS.DPH,D.EPID. Director General Epidemiology
Directorate Ministry of Health, Sudan
2. Mr. W.H. Jonathanson Senior Controller Public Administration Equatoria
Province Agricultural Production Corp. N'zara, Sudan
3. Dr. S. Singh, Public Health Advisor P.O Box 88 Juba, Sudan
4. Mrs. Azizi, Nurse Midwife WHO Maternal Base Family Planning Program,
Khartoum, Sudan
5. Mr. Alan Williams Director International Voluntary Services Juba Sudan
6. Ms. Kabuzi Teacher Home Economics and Hygiene YWCA Program Amadi, Sudan
7. Dr. Isaiah M. Deng Medical Inspector Maridi, Sudan
8. Mr. Eli Kaughman Director Across Juba, Sudan
9. Ms. Erika Waser Nurse Across Clinic Rumbek, Sudan
10. Mr. Mike Barrett Govt Experimental Farm Juba, Sudan
11. Drs Anton, Pacifico, Batchu Singh; Provincial Hospital Juba, Sudan
12. Dr. Charles E. Macnealy WHO Geneva Switzerland
13. Mrs. Suzanne Wesley Stasy; Nutrition Specialist P.O. Box 317 Khartoum, Sudan
14. Mr. James Maclaughlin; Catholic Relief Services Khartoum, Sudan
15. Dr. Mutamad A. Amin; Bilharzia Specialist, Lecturer, Faculty of Medicine
Univ of Khartoum Sudan
16. Dr. R.E. Abdalla; Leishmaniasis Specialist, Faculty of Medicine, Khartoum
Sudan
17. Dr. Osman El Zubeir; Asst. Commissioner for Health South Kordofan Province
Kadougli Sudan
18. Dr. M.S.S. Gassouma-Division of Eye Diseases and Filariasis Khartoum, Sudan
19. Di. Asim A/R Daffalla Asst Researcher Institute for Tropical Medicine NCR
London 56 Grays Inn RD
20. Dr. Abel Rahman El Tom Head of Department of Public Health Faculty of Medicine
Khartoum, Sudan
21. Dr. Salah El Said; Director El Obied Provincial Hospital, Sudan
22. Drs. Malik, Makin and Bashir; Staff Physicians at El Obied Hospital

23. Dr. Abbas Mukhtar; Under Secretary Ministry of Health Khartoum Sudan
24. Dr. Osmah Bashir; Gynecologist Director South Kordofan Provincial Hospital Kadougli, Sudan