

PD-AAI-048

625-0940

PROJECT PAPER

SAHEL WATER DATA NETWORK AND MANAGEMENT II

(AGRHYMET)

625-0940

AUTHORIZED: February 16, 1982

AMOUNT: \$7,000,000

FEB 1 1982

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FROM: AAA/AFR/DR, John W. Koehring

SUBJECT: Sahel Water Data Network and Management II Project 625-0940

Noted
JK

I. Problem: Your approval is requested for: (a) a grant of \$7,000,000 from funds available under Section 121 of the FAA of 1961, as amended, the Sahel Development appropriation to the World Meteorological Organization for the Sahel Water Data Network and Management II project (625-0940); and (b) a determination that the certification requirement set forth in Section 121(d) of the FAA does not apply to this project. The planned obligation for FY 1982 is \$1,300,000.

II. Discussion:

A. Project Description

The plan to assist the Sahel countries strengthen their agrometeorological and hydrological services was initiated by a 1973 resolution of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS). In 1975, a multi-donor mission recommended a 15-year program, divided into three phases of approximately five years each. The first, 1976-1981, set out to establish a regional training and data processing center in Niamey, Niger and to identify and fulfill requirements to strengthen and modernize the national services so that a fully functioning regional agrometeorological and hydrological information network could be developed during Phase II. At the same time the CILSS established an AGRHYMET Executive Committee to manage the program.

During Phase I, A.I.D. contributed \$6,268,000 while other donors and CILSS member countries together granted \$20,257,000. As Phase I now draws to a close, the AGRHYMET Regional Center in Niamey is training about 50 Sahelians annually in relevant fields, data processing and agricultural applications. The national services in Gambia, Senegal and Mali have been strengthened, while those in other Sahelian countries are in the process of being upgraded through the addition of modern equipment and training. Phase II will be carried out until 1987, to be followed by a final five-year period during which practical applications of the regional network will be developed for the Sahelian countries. This Project Paper constitutes A.I.D.'s participation in Phase II of the AGRHYMET program, the period in which enhancement of all the national services will be completed, leading to the operation of a regional network.

The purpose of Phase II of the AGRHYMET program is to complete the development of a regional (Sahel-wide) agrometeorological and hydrological data system which will provide information to farmers, herders, planners and other users. This will enable Sahelian farmers and national planners to make short- and long-term decisions based on more timely, complete and accurate weather and climatic data. As a component of CILSS' Agrometeorological/Hydrological program (AGRHYMET), A.I.D.'s role in this Phase II multi-donor project is to: (a) provide technical assistance and telecommunications and data processing and analysis equipment for the national services; (b) train Sahelians in various levels of data

processing; and (c) support operations of the AGRHYMET Regional Center in Niamey, Niger. The World Meteorological Organization (WMO) of the United Nations is the executing agent of this project and the project Grantee, while the U.S. National Oceanic and Atmospheric Administration (NOAA), under a PASA, will be responsible for the provision of technical assistance, training and equipment which A.I.D. is funding, as has been the case in Phase I.

Conceptually, the Sahel Water Data Network and Management II project supports AID's strategy in the Sahel region as it serves to strengthen those institutions which can plan and coordinate donor assistance to the Sahel and strengthen African capability to become architects of their development planning, implementation and evaluation. The AFR Food Sector Assistance Strategy paper states that "the building of (these) institutions is a long-term but absolutely essential undertaking for sustained agricultural growth". AGRHYMET's potential contribution to increased agricultural productivity is unquestionable. Furthermore, it complements many non-agricultural entities such as utility operations, river basin projects and transportation systems.

There are three primary beneficiaries of the Sahel Water Data Network and Management II project. Among the beneficiaries are the farmers who comprise 65% of the total population. Secondly, benefits accrue to Sahelian scientists and technicians associated with the project through increased competence and capabilities gained as a result of 40 person-years of training. Finally, host countries and their citizenry benefit as a result of the rational, economic and productive use of water resources as well as an increased institutional capability to provide ancillary services to other sectors of the economy.

B. Financial Summary

A.I.D.'s first year obligation is \$1,300,000. Life-of-Project funding is \$7,000,000.

Estimated Budget (\$000)

<u>A.I.D.</u>	<u>FY 1982</u>	<u>Life-of-Project</u>
Technical Assistance	\$ 440	\$ 1,710
Equipment and Commodities	377	1,675
Training	65	1,075
Other Costs	418	2,540
TOTAL	\$ 1,300	\$ 7,000

AGRHYMET Phase II costs are an estimated \$66.6 million, of which AID's contribution is \$7 million. CILSS member countries will contribute \$21.3 million and \$38.3 million will come from the United Nations Development Program (UNDP), The Netherlands, Germany, France and Belgium.

C. Socio-Economic, Technical and Environmental Description

The Project Paper contains adequate technical, financial, social, economic and administrative analyses, and provides adequate implementation plans. The Project Review found that the project will have a positive impact on participating countries' agricultural sectors as well as their economic and institutional capacity.

There are no human rights implications in this project.

The PP includes an Initial Environmental Examination recommending a negative determination which has been approved by the Bureau Environmental Officer.

D. Committee Action, Conditions and Covenants

One condition precedent is proposed prior to disbursement of funds. It will require WMO to provide A.I.D. a financial plan reflecting donor and CILSS country commitments necessary to carry out the Phase II integrated program ultimately agreed upon by the AGRHYMET Executive Committee and the CILSS Member States.

The requirements of Section 611(a) of the FAA have also been satisfactorily met.

The Project Review concluded that this is a sound, workable project and recommended transmittal to the ECPR, which was held December 16, 1981. The ECPR recommended this project for approval.

The responsible officer in the field is Cameron Pippitt, USAID/Niger. The AFR/DR officer responsible for this project is Glenn Slocum.

III. Waivers

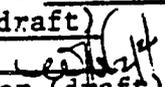
No waivers are requested in this project.

IV. Justification to the Congress

This project required a Congressional Notification which was sent to Congress on December 23, 1981. The House Appropriations Committee has put a hold on this Notification pending inclusion of a certification in accordance with the requirements set forth in Section 121(d) of the new Foreign Assistance Act (FAA). This requirement states that no new obligations of Sahel Development Program funds for disbursement by a foreign government can be effected until the Agency has determined that the recipient government is capable of maintaining a financial accounting system which provides adequate identification of and control over the receipt and expenditure of those funds. USAID/Niger has certified that no local cost financing will be released to Sahelian governments but will be controlled by the U.N.'s World Meteorological Organization, the U.S. National Oceanic and Atmospheric Administration and by USAID/Niger. Therefore, you are being asked

to sign a determination (Tab 1) that the Section 121(j) certification requirement does not apply to this project. A similar statement has been added to the Congressional Notification; this will satisfy the requirements of the House Appropriations Committee, which has indicated that no additional notification period is needed.

V. Clearances Obtained

AFR/DR:NCohen (draft)
AFR/SWA:FGilbert (draft)
AFR/DR/SWAP:JRMcCabe (draft)
AFR/DR/ENGR:JSnead (draft)
GC/AFR:LDeSoto (draft)
DAA/AFR:WHNorth 
AFR/DR/SDP:JHester (draft)
AFR/DP:SSharp (draft)

VI. Recommendation: That you sign: (a) the Section 121(d) determination at Tab 1; and (b) the attached Project Authorization at Tab 2, and thereby approve life-of-project funding at \$7,000,000.

Drafted by: AFR/DR/SWAP:RHaynes/GS locum:fn:1/28/82 ext 27886

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Department of State

ATTACHMENT A
OUTGOING
TELEGRAM

PAGE 01 STATE 316197
ORIGIN AID-35

8687 #49688 A106922

STATE 316197

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ORIGIN OFFICE AFW-DJ
INFO AFCA-03 RELO-01 LV-00 /000 AB

INFO OCT-00 INR-10 AF-10 EB-00 L-03 ANAO-01 /007 R

DRAFTED BY AID/AFR/SWA:JBIERKE:OH
APPROVED BY AID/AFR/SWA:FEGILBERT
AID/AFR/SWA:AGMACARTHUR:DRAFT
AID/AFR/SWA:JWOODS:DRAFT

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UNCLAS STATE 316197

AIDAC

E.O. 12865: N/A

TAGS:

SUBJECT: TIFICATION OF ADEQUACY OF HOST GOVERNMENT
ACCOUNTING SYSTEMS

FOLLOWING IS A REPEAT
QUOTE

O 2801, 1Z OCT 81
FM SECSTATE WASHDC
UNCLAS STATE 278344

REF: STATE 215646

1. FOR MONTHS NOW WE HAVE ADDRESSED THE PROBLEMS RELATED TO THE ACCOUNTABILITY AND PROPER MANAGEMENT OF AID LOCAL COSTS FINANCING WHICH HAVE BEEN CRITICIZED IN SAHEL AUDIT REPORTS.
2. THIS PROBLEM MUST BE DEALT WITH SHORTLY BECAUSE THE UNCERTAINTY RE THE USE MADE OF FUNDS FOR LOCAL COSTS FINANCING COULD THREATEN THE ABILITY OF SAHELIAN DEVELOPMENT PROGRAMS TO ATTRACT RESOURCES FROM ALL SOURCES. MOST IMMEDIATELY THIS POTENTIAL REACTION PRESENTS ITSELF WITH REGARD TO CONGRESSIONAL APPROPRIATIONS FOR FY 82 AND BEYOND. THERE HAVE BEEN SUGGESTIONS IN CONGRESSIONAL COMMITTEE DISCUSSIONS THAT THE FY 82 APPROPRIATION FOR THE SAHEL BE DRASTICALLY REDUCED. IN ADDITION, SENATOR KASTEN HAS PROPOSED AN AMENDMENT TO THE SENATE VERSION OF THE AUTHORIZATION BILL THAT WOULD REQUIRE BEGINNING IN FY 82 THAT AID FUNDS WILL NOT BE, BEGIN QUOTE, MADE AVAILABLE TO ANY (SAHELIAN) GOVERNMENT FOR DISBURSEMENT BY THAT GOVERNMENT UNLESS AID'S ADMINISTRATOR DETERMINES THAT THAT GOVERNMENT WILL MAINTAIN AN ACCOUNTING SYSTEM WHICH WILL PROVIDE ADEQUATE CONTROL OVER THE RECEIPT AND EXPENDITURE OF SUCH FUNDS. END QUOTE. WE ARE ARGUING AGAINST THE FIRST SUGGESTION ON THE BASIS OF THE DAMAGE SIGNIFICANT REDUCTION OF AID FUNDING WOULD IMFLICT ON THE OVERALL SAHEL DEVELOPMENT PROGRAM. CONCERNING THE SECOND WE HAVE CONCLUDED THAT PROJECT-BY-PROJECT CERTIFICATION IS A USEFUL SUGGESTION AND NECESSARY TO THE CREDIBILITY OF THE SAHEL DEVELOPMENT PROGRAM. THUS, WE ARE PLANNING TO INSTITUTE IT WITH EFFECT FROM THE BEGINNING OF FY 82.
3. EACH MISSION DIRECTOR AND FIELD OFFICE HEAD IS REQUIRED TO CERTIFY IN WRITING FOR EACH ACTIVE PROJECT THAT EITHER: (A) THERE IS NO LOCAL COST FINANCING COMPONENT; (B) FUNDS FOR LOCAL COST FINANCING WILL NOT BE RELEASED DIRECTLY TO THE COOPERATING GOVERNMENT BUT RATHER

HANDLED BY SOME OTHER METHOD (WHICH THEN WILL BE SPECIFIED) OR; (C) THE JUDGEMENT OF THE MISSION DIRECTOR AFTER DRAWING ON THE ADVICE OF HIS STAFF, INCLUDING HIS CONTROLLER AND PROJECT OFFICERS, IS THAT ADEQUATE CONTROLS EXIST TO INSURE FUNDS FOR LOCAL COSTS FINANCING WILL BE ADMINISTERED IN A FASHION WHICH ASSURES ADEQUATE CONTROL OVER THE RECEIPT AND EXPENDITURE OF SUCH FUNDS. SUCH A CERTIFICATION WILL APPLY TO FUNDS RELEASED AFTER THE END OF FY 81. MISSION DIRECTORS ARE HEREBY INSTRUCTED TO INSURE THAT NO REPEAT NO RELEASES OF FY 82 FUNDS FOR LOCAL COSTS FINANCING TAKE PLACE UNTIL THEY ARE ABLE TO PROVIDE A CERTIFICATION AS REQUIRED ABOVE. AFTER DECEMBER 31, 1981, RELEASES OF ALL YEAR FUNDS FOR LOCAL COSTS FINANCING SHOULD BE HELD UNTIL SUCH CERTIFICATIONS ARE PROVIDED.

4. WE ARE INSTITUTING THIS SYSTEM IN ORDER TO CREATE A SITUATION IN WHICH THERE CAN BE NO FURTHER ADVERSE AUDIT FINDINGS REGARDING FUNDS APPROPRIATED AFTER FY 81 FOR LOCAL COST FINANCING.

5. WE PLAN TO PLACE AT YOUR DISPOSAL A LIMITED AMOUNT OF CONTRACT ACCOUNTING SERVICES TO EXAMINE EXISTING SAHELIAN SYSTEMS AND RECOMMEND CHANGES IN THOSE CERTIFICATION SITUATIONS WHEN YOU REQUIRE SUPPLEMENTARY RESOURCES. AS THIS ASSISTANCE IS VERY LIMITED, IT CAN BE OFFERED ONLY IN THOSE RELATIVELY FEW INSTANCES WHERE YOU ARE UNABLE TO RESOLVE EVEN TEMPORARILY THOSE TECHNICAL PROBLEMS IMPEDING CERTIFICATION. CLARK

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ATTACHMENT B
OUTGOING
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ORIGIN AID-35

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STATE 313799

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ORIGIN OFFICE FM-02
INFO AAF-01 AFEW-04 AFOP-02 AFCA-03 GC-01 GCAF-01 GCFL-01
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DRAFTED BY AID/FM/C:MMATTHEWS:MFR/MJ
APPROVED BY AID/FM/C:CMCHRISTENSEN
AID/AFR/SWA:FEGLIBERT (DRAFT)
AID/DAA/AFR:WHNORTH (DRAFT)
AID/AFR/SWA:AGHACARTHUR (DRAFT)
AID/AFR/SWA:JBWOODS (DRAFT)
AID/AAA/AFR/PMR:CCHRISTIAN (WNAF)
AID/AFR/SWA:JSHAMPAIN (DRAFT)
AID/FM/C:TMCHANON (DRAFT)
AID/AFR/SWA:GEATON (DRAFT)

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UNCLAS STATE 313799

AIDAC

E.O. 12958: N/A
TAGS:

SUBJ: CERTIFICATION OF ADEQUACY OF HOST GOVERNMENT
ACCOUNTING SYSTEMS

REF: STATE 276344

1. PRIOR TO RELEASING MONIES AFTER THE PERTINENT DEADLINES OUTLINED IN PARA 3 OF REFTEL, MISSION DIRECTORS OR FIELD OFFICE HEADS ARE REQUIRED TO MAKE A WRITTEN CERTIFICATION FOR EACH PROJECT THAT EITHER, (A) THERE IS NO LOCAL COST FINANCING, (B) LOCAL COST FINANCING WILL NOT BE RELEASED DIRECTLY TO THE COOPERATING COUNTRY BUT HANDLED VIA ANOTHER MECHANISM OR (C) THAT IN HIS/HER JUDGMENT, HOST GOVERNMENT ACCOUNTING SYSTEM HANDLING AID FINANCED LOCAL COSTS IS ADEQUATE. AN ADEQUATE ACCOUNTING SYSTEM IS ONE WITH APPROPRIATE INTERNAL CONTROLS TO PREVENT MISUSE AND WASTE OF AID FINANCED ASSETS; ENSURES COMPLIANCE WITH UTILIZATION CONDITIONS OF PROJECT AGREEMENTS; PROVIDES A SYSTEM OF REPORTING THAT MEETS USAID AND IMPLEMENTING ORGANIZATION REQUIREMENTS AND IS EASILY AUDITABLE FROM THE REPORTS THROUGH THE ACCOUNTING SYSTEM TO THE SOURCE DOCUMENT.

2. ACCOUNTING SYSTEM GENERAL STANDARDS - IT IS THE IMPLEMENTING ORGANIZATION'S RESPONSIBILITY TO ESTABLISH AN ACCOUNTING SYSTEM WHICH WILL PROVIDE FOR:
ACCOUNTING SYSTEM WHICH WILL PROVIDE FOR:

A. METHOD OF INSURING THAT APPROVED BUDGETS IN PROJECT AGREEMENTS AND/OR SUBSEQUENT IMPLEMENTATION LETTERS ARE NOT OVERSUBSCRIBED. (A JOURNAL CONTROLLING OR DEDUCTING THE IMPLEMENTING ORGANIZATION COMMITMENTS PRIOR TO ISSUANCE AGAINST THE APPROVED BUDGET CATEGORY WOULD

SUFFICE.)

B. INFORMATION NEEDED TO ADEQUATELY IDENTIFY RECEIPT OF AID FUNDS, EXPENDITURE OF AID FUNDS BY PREVIOUSLY APPROVED BUDGET CATEGORIES. (SEPARATE BANK ACCOUNT USED IN CONJUNCTION WITH AN EXPANDED TYPE OF CHECKBOOK TO ALLOCATE COSTS TO APPROVED CATEGORY WOULD ACCOMPLISH THIS.)

C. REPORTS THAT ARE SUPPORTED BY ENTRIES IN THE ACCOUNTING RECORDS AND ARE EASILY REFERENCED TO SOURCE DOCUMENTATION. (DOCUMENTATION FILED IN AN ORDERLY SYSTEM TO ACCOMMODATE REFERENCES OF ACCOUNTING RECORDS AND REPORTS THAT ARE COMPILED DIRECTLY FROM ACCOUNTING RECORDS WILL PRODUCE AN EASILY AUDITABLE SYSTEM.)

D. ACCURATE AND TIMELY REPORTING.

E. APPROPRIATE INTERNAL CONTROLS (SEPARATION OF FUNCTIONS, PRE-NUMBERING OF CHECKS AND OTHER DOCUMENTS, TWO SIGNATURES ON CHECKS ARE SOME EXAMPLES OF INTERNAL CONTROL MEASURES.)

3. MISSION DIRECTORS AND FIELD OFFICE HEADS SHOULD MAKE CERTIFICATION STATEMENTS AFTER DRAWING ON THE EXPERTISE AND ADVICE OF THEIR STAFF. IF FURTHER REVIEW IS REQUIRED USAID SHOULD CONSIDER CONTRACTING FOR APPROPRIATE ACCOUNTING SERVICES. HOWEVER, THE DESIRED ADEQUATE ACCOUNTING SYSTEM FOR AID PROJECTS IS A MINIMUM SYSTEM THAT SHOULD BE DETERMINABLE WITHOUT AN ALL ENCOMPASSING FULL SCALE ORGANIZATION AUDIT. DISCUSSIONS WITH CONTROLLER PERSONNEL IN NIGER AND SENEGAL INDICATE THAT THE MAJORITY OF PROJECTS CAN BE CERTIFIED WITH LITTLE OR NO ADJUSTMENT TO THEIR CURRENT SYSTEMS.

4. SUGGESTED STATEMENT OF CERTIFICATION OF H.C. ACCOUNTING SYSTEM FOR NEW ACTIVITIES:

"A REVIEW HAS BEEN UNDERTAKEN OF (IMPLEMENTING ORGANIZATION) ACCOUNTING SYSTEM FOR USE IN ACCOUNTING FOR AID FUNDS UNDER PROJECT (NUMBER AND NAME). THE REVIEW RELATED TO THE ACCOUNTING AND ADMINISTRATIVE PROCEDURES WHICH (IMP. OPG.) PROPOSES TO FOLLOW UPON RECEIPT OF AID LOCAL CURRENCY RELEASES. IT DID NOT INCLUDE SAMPLING TESTS OF COMPLIANCE WITH SUCH PROCEDURES. IT IS MY OPINION THAT THE INTERNAL ACCOUNTING CONTROLS TO BE UTILIZED PROVIDE REASONABLE, BUT NOT ABSOLUTE, ASSURANCE AS TO THE SAFEGUARDING OF AID FINANCED ASSETS FROM MISUSE, WASTE AND NON-COMPLIANCE WITH PREVIOUSLY AGREED PROJECT PURPOSES. REASONABLE ASSURANCE RECOGNIZES THAT EVALUATION OF CERTAIN METHODS AND PROCEDURES REQUIRES ESTIMATES AND JUDGMENTS BY MANAGEMENT. IT IS ALSO RECOGNIZED THAT ANY ACCOUNTING SYSTEM'S EFFECTIVENESS CAN BE LIMITED BY ERRORS, MISTAKES IN JUDGMENT, CARELESSNESS, NON-COMPLIANCE WITH CONTROL PROCEDURES, AND CIRCUMVENTION BY COLLUSION. HOWEVER, WITH THIS UNDERSTANDING IN MIND, IT IS MY BELIEF THAT (IMPLEMENTING ORGANIZATION) ACCOUNTING SYSTEM WITH ITS INTERNAL CONTROLS AND PROCEDURES WILL PROMOTE OPERATING EFFICIENCY, ENCOURAGE COMPLIANCE WITH PROJECT PURPOSES AND PROVIDE ACCURATE, TIMELY REPORTING AS MUTUALLY REQUIRED BETWEEN AID AND (IMPLEMENTING ORGANIZATIONS)."

SIGNATURE

5. THE CERTIFICATION IN PARA 4 ABOVE CAN BE AMENDED FOR ONGOING PROJECTS BY CHANGING LANGUAGE AS REQUIRED, I.E., "IT DID NOT INCLUDE SAMPLING TESTS OF COMPLIANCE WITH SUCH PROCEDURES", SHOULD BE CHANGED TO "IT INCLUDED SAMPLING TESTS OF COMPLIANCE WITH SUCH PROCEDURES."

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6. GC NOTES THAT THIS CABLE CONSTITUTES INTERIM GUIDANCE TO IMPLEMENT CERTIFICATION REQUIREMENTS CONTAINED IN AUTHORIZATION LEGISLATION BEING CONSIDERED BY CONGRESS. UPON ENACTMENT, FORMAL DELEGATION OF AUTHORITY WILL BE TRANSMITTED TO THE FIELD. HAIG

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ATTACHMENT C
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PAGE 01 NIAMEY 00308 191556Z 2737 070899 AID1885
ACTION AID-35

ACTION OFFICE AFFW-04
INFO AAAF-01 AFDR-08 PPCE-01 POPR-01 PPPB-03 GC-01 GCAF-01
GCFL-01 ENGR-02 AFDA-01 COM-02 RELO-01 DAEN-01 MAST-01
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E. O. 12065: N/A

SUBJECT: SAHEL WATER DATA NETWORK AND MANAGEMENT II,
E PROJECT 825-0940

REF: A) STATE 010845; B) STATE 09677
- C) 81 STATE 313799; D) 81 STATE 278344;
- E) 81 STATE

1. PURSUANT TO REFS B, C AND D, MISSION DIRECTOR ROSENTHAL CERTIFIES THAT NO FUNDS FOR LOCAL COST FINANCING WILL BE RELEASED DIRECTLY TO THE COOPERATING GOVERNMENT (IN THIS CASE A REGIONAL ENTITY, THE CILSS) BUT WILL BE HANDLED BY ANOTHER METHOD. SPECIFICALLY, FUNDS UNDER THIS PROJECT WILL BE RELEASED TO:

- 1) THE U. S. DEPT. OF COMMERCE'S NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION, NOAA;
- 2) THE WORLD METEOROLOGICAL ORGANIZATION, WMO, HEADQUARTERED IN GENEVA; AND,
- 3) USAID/NIGER TO PAY DIRECT PASA PERSONNEL SUPPORT COSTS.

2. FURTHER, THE PROJECT AGREEMENT FOR THE SUBJECT PROJECT WILL BE SIGNED BY A. I. D. (AUTHORITY HAS BEEN REQUESTED FOR USAID/NIGER DIRECTOR TO SIGN ON BEHALF OF A. I. D.) AND THE WMO (PROBABLY ITS DELEGATED REPRESENTATIVE IN NIAMEY). THUS, NO HOST COUNTRY AGENCY WILL BE A DIRECT PARTY TO THE AGREEMENT.

3. MISSION TRUSTS THAT USAID DIRECTOR'S CERTIFICATION CONTAINED IN PARA ONE ABOVE ALONG WITH INFORMATION PROVIDED IN PARA TWO FOR AA/AFR'S DETERMINATION WILL SATISFY THE BUREAU'S REQUIREMENTS AND THOSE OF THE NEW FAA SECTION 121 (D). IF FURTHER INFORMATION IS REQUIRED TO EXPEDITE THIS PROJECT AUTHORIZATION, PLEASE ADVISE BY PRIORITY CABLE. CHAVEAS

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PROJECT AUTHORIZATION

Name of Country: Sahel Regional

Name of Project: Sahel Water Data
Network and Management II

Number of Project: 625-0940

1. Pursuant to Section 121 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Sahel Water Data Network and Management II project for the Sahel Region involving planned obligations of \$7,000,000 in grant funds over a five-year period from the date of authorization, subject to the availability of funds in accordance with the AID OYB/allotment process, to help in financing foreign exchange and local currency costs for the project.
2. The project seeks to facilitate the decision-making process of Sahelian farmers, herders and national planners through the provision of more timely, complete, accurate climatic and weather data. AID's contribution to the multi-donor AGRHYMET project consists of providing high technology telecommunications, data processing and analysis equipment as well as technical assistance and training.
3. The Project Agreement, which may be negotiated and executed by the officers to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

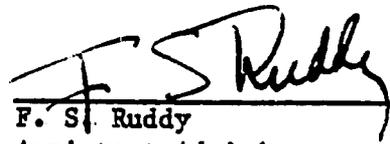
Goods and services procured by the World Meteorological Organization (WMO) and financed by A.I.D. under the Project shall be procured in accordance with WMO procurement policies and procedures as provided for in A.I.D. Handbook 1, Supplement B, Chapter 16, Section 16C32(2). Goods and services procured directly by A.I.D., except for ocean shipping, shall have their source and origin in the United States and the Cooperating Countries, except as A.I.D. may otherwise agree in writing. Ocean Shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States and the Cooperating Countries.

b. Condition Precedent

The Grant Agreement shall contain one condition precedent prior to initial disbursement of funds under the Project as follows:

"Prior to disbursement of funds to WMO for activities in support of the Phase II program, and with the exception of funds provided under this Grant Agreement to continue activities initiated in Phase I, the World Meteorological Organization shall provide to A.I.D. a financial plan reflecting donor and CILSS country commitments necessary to carry out the Phase II integrated program ultimately agreed upon by the AGRHYMET Executive Committee and the CILSS Member States."

Date 2.16.82



F. S. Ruddy
Assistant Administrator
for Africa

PROJECT PAPER

SAHEL WATER DATA NETWORK AND MANAGEMENT

PHASE II

(625-0940)

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET	1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete	Amendment Number _____	DOCUMENT CODE 3
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2. COUNTRY/ENTITY Sahel Regional	3. PROJECT NUMBER 625-0940
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4. BUREAU/OFFICE AFR 06	5. PROJECT TITLE (maximum 40 characters) Sahel Water Data Network & Mgt. Phase II
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6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 09/30/87	7. ESTIMATED DATE OF OBLIGATION (Under 'B:' below, enter 1, 2, 3, or 4) A. Initial FY 82 B. Quarter 4 C. Final FY 86
-----------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

8. COSTS (\$000 OR EQUIVALENT \$1 =)						
A. FUNDING SOURCE	FIRST FY <u>82</u>			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	1,300		1,300	7,000		7,000
(Grant)	(1,300)		(1,300)	(7,000)		(7,000)
(Loan)						
Other U.S.						
Host Countries (by CY)	700	2,200	2,900	5,100	16,139	21,239
Other Donor(s) (" ")	5,800	2,800	8,600	24,300	14,021	38,321
TOTALS	7,800	5,000	12,800	36,400	30,160	66,560

9. SCHEDULE OF AID FUNDING (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) SH	750S	874						7,000	
(2)									
(3)									
(4)									
TOTALS								7,000	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each) 876 877 873 968	11. SECONDARY PURPOSE CODE 754
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12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)	A. Code INTR R/AG TNG TECH	B. Amount 7,000 800 500 300	
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13. PROJECT PURPOSE (maximum 480 characters)

To develop a regional system, including national elements, which will record, process, interpret, transmit, disseminate and document complete, timely, accurate, and meaningful weather and climatic information in the Sahel.

14. SCHEDULED EVALUATIONS Interim MM YY MM YY Final MM YY 03 82 03 83 03 86	15. SOURCE/ORIGIN OF GOODS AND SERVICES <input checked="" type="checkbox"/> 000 <input type="checkbox"/> 941 <input type="checkbox"/> Local <input type="checkbox"/> Other (Specify) _____
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16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY	Signature: John L. Lovaas Title: USAID/ Acting Mission Director, Niger	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION Date Signed: MM DD YY 6/8/87 MM DD YY 08/13/87
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INSTRUCTIONS

The approved Project Data Sheet summarizes basic data on the project and must provide reliable data for entry into the Country Program Data Bank (CPDB). As a general rule blocks 1 thru 16 are to be completed by the originating office or bureau. It is the responsibility of the reviewing bureau to assume that whenever the original Project Data Sheet is revised, the Project Data Sheet conforms to the revision.

Block 1 - Enter the appropriate letter code in the box, if a change, indicate the Amendment Number.

Block 2 - Enter the name of the Country, Regional or other Entity.

Block 3 - Enter the Project Number assigned by the field mission or an AID/W bureau.

Block 4 - Enter the sponsoring Bureau/Office Symbol and Code. (*See Handbook 3, Appendix 5A, Table 1, Page 1 for guidance.*)

Block 5 - Enter the Project Title (*stay within brackets; limit to 40 characters.*)

Block 6 - Enter the Estimated Project Assistance Completion Date. (*See AIDTO Circular A-24 dated 1/26/78, paragraph C, Page 2.*)

Block 7A. - Enter the FY for the first obligation of AID funds for the project.

Block 7B. - Enter the quarter of FY for the first AID funds obligation.

Block 7C. - Enter the FY for the last AID funds obligations.

Block 8 - Enter the amounts from the 'Summary Cost Estimates' and 'Financial Table' of the Project Data Sheet.

NOTE: The L/C column must show the estimated U.S. dollars to be used for the financing of local costs by AID on the lines corresponding to AID.

Block 9 - Enter the amounts and details from the Project Data Sheet section reflecting the estimated rate of use of AID funds.

Block 9A. - Use the Alpha Code. (*See Handbook 3, Appendix 5A, Table 2, Page 2 for guidance.*)

Blocks 9B., C1. & C2. - See Handbook 3, Appendix 5B for guidance. The total of columns 1 and 2 of F must equal the AID appropriated funds total of 8G.

Blocks 10 and 11 - See Handbook 3, Appendix 5B for guidance.

Block 12 - Enter the codes and amounts attributable to each concern for Life of Project. (*See Handbook 3, Appendix 5B, Attachment C for coding.*)

Block 13 - Enter the Project Purpose as it appears in the approved PID Facesheet, or as modified during the project development and reflected in the Project Data Sheet.

Block 14 - Enter the evaluation(s) scheduled in this section.

Block 15 - Enter the information related to the procurement taken from the appropriate section of the Project Data Sheet.

Block 16 - This block is to be used with requests for the amendment of a project.

Block 17 - This block is to be signed and dated by the Authorizing Official of the originating office. The Project Data Sheet will not be reviewed if this Data Sheet is not signed and dated. Do not initial.

Block 18 - This date is to be provided by the office or bureau responsible for the processing of the document covered by this Data Sheet.

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ACRONYMS / ABBREVIATIONS

AAR	Automated Aircraft Reporting
ABN	Niger Basin Authority
AGDAR	Air-to-Ground Data Relay
AGRHYMET	Agrometeorological/Hydrological Program
APT	Automatic Picture Transmission
ASDAR	Aircraft-to-Satellite Data Relay
ASECNA	Agency for the Safety of Air Traffic in Africa (Franco-African)
CBLT	Lake Chad Basin Commission
CIEH	Inter-State Committee for Hydraulic Studies
CILSS	Inter-State Committee for Drought Control in the Sahel
CRTO	Regional Center for Remote Sensing (in Ouagadougou)
DCP	Data Collection Platform (on wide-bodied aircraft)
GDPS	Global Data Processing System
GTS	Global Telecommunications System
HYDRONIGER	Hydrological Forecasting System for the River Niger Basin
ICRISAT	Internat. Crop Research Instit. for the Semi-Arid Tropics
IITA	International Institute for Tropical Agriculture
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration (US)
NWPC	Numerical Weather Prediction Centers
OCLALAV	Organization for Combatting Acrididae and Bird Pests
OICMA	Inter-State Office to Combat Migrating Crickets
OMVG	Organization for Development of the River Gambia
OMVS	Organization for Development of the River Senegal
ORSTOM	Office for Scientific and Technical Research Overseas (French)
PDUS	Primary Data Users Station
RTH	Regional Telecommunications Hub (of GTS)
SSB	Single Sideband Radio
UNSO	United Nations Sahelian Office
UPS	Uninterrupted Power Supply
WARDA	West Africa Rice Development Association
WMO	World Meteorological Organization
WWW	World Weather Watch (of WMO)

I. PROJECT DESCRIPTION

A. SUMMARY AND RECOMMENDATIONS

The Sahel Water Data Network and Management Project is the vehicle for U.S. assistance to the CILSS Agrometeorological/Hydrological (AGRHYMET) Program for the Sahel.

The AGRHYMET Program goal is to enable Sahelian farmers, herders and national planners to make short- and long-term decisions in their agricultural and livestock production planning and operations, based on more timely, complete and accurate weather and climatic data, and on better knowledge as to cyclical events and their impact on water, soils, vegetation and crops. The purpose of AGRHYMET is to develop a regional system which will produce this data and information and make it available to farmers, herders, planners and other users. The system includes agrometeorological and hydrological services in each of the CILSS countries, and a regional information processing center and training facility which is located in Niamey, Niger. Information and knowledge which AGRHYMET will produce will improve agricultural production in CILSS countries and land-use and environmental conservation decisions for the Sahel.

Phase I of AGRHYMET began in 1975, with U.S. assistance through Project 625-0917 commencing in 1976. This Project Paper considers the needs for a second phase of AGRHYMET and proposes grant assistance of \$7 million over the period 1981-1985 as the U.S. contribution. This will be part of the funding required for the integrated regional program which has tentatively been detailed and costed by the World Meteorological Organization. The cost of the integrated program is estimated at \$66.6 million for Phase II. The participating countries of the Sahel will be expected to finance \$21.3 million of the total (\$3.1 million of which would be indirect, through CILSS) and donor organizations asked to fund the other \$45.3 million.

Inputs for the system being developed include hydrological and meteorological installations and equipment for recording, reporting, transmitting, analyzing and disseminating information; training in observations, reporting, analysis and equipment operations and maintenance; and ancillary support in building construction and in operations.

Phase II is a transitional phase during which all the basic elements of an operational system will be completed and consolidated into networks, and user-directed operations will commence. When the system is in full operation at the conclusion of Phase II, it will include the operating of fully equipped field observation stations; continuous data recording and regular reporting through a modern transmission and

receiving system; verification and analysis of the data at national centers and at the regional center; dissemination of the information to primary producers and planners; and continuous application of the information by producers in their agricultural planning decisions and activities. The full operational phase also will include regular maintenance of instruments and equipment, documentation and publication services and a continuing training element for technician replacements and for maintaining and upgrading expertise.

Under this program, individual donors have funded particular elements of the program related to their own special skills and technological experience. The U.S. has concentrated its assistance on high technology telecommunications and data processing and analysis including equipment, technical assistance and training. Most of the U.S. assistance is being provided through an AID agreement (PASA) with the National Oceanic and Atmospheric Administration (NOAA) which serves as implementing contractor. High technology emphasis will continue during Phase II, as installations in the participating countries are completed. Greater attention in U.S. assistance will be given during Phase II to supporting AGRHYMET in developing practical applications concepts and ventures which, during subsequent phases, can begin to impact on food crop and other production in the countries.

U.S. assistance to AGRHYMET during Phase I amounted to \$6,268,000 which was about 28% of total donor contributions (\$22,708,000). The largest contributor has been the UN Development Program (\$11,725,000), for technical assistance, training, equipment and operational support. The Netherlands contributed \$3,283,000 for similar inputs. Belgium provided data bank equipment and related technical assistance amounting to \$912,000. Other donor assistance came from Switzerland (\$265,000), France (\$155,000) and The Federal Republic of Germany (\$100,000).

The ultimate integrated program has not changed conceptually from the initial plan as described in the first phase Project Paper, Project 625-0917 (also see Annex B). Adjustment of the time frame for accomplishing the purpose has been necessary, however, in large part because of problems in finding sufficient qualified candidates for training to fill critical positions, the inability of some countries to implement as planned and delays in procurement of equipment. A third problem was the substantial inflation which has greatly raised participating and donor country costs and reduced the quantity of inputs which initial funding could provide. Some inputs originally programmed for Phase I must now be re-programmed for the second phase*. Phase I has been a start-up period with primary attention going to developing the regional coordinating and training capability. Most of the objectives for this have been met during Phase I, but progress in developing the country systems and capabilities has been slower and will take precedence during Phase II.

* For a comprehensive report on progress and problems during Phase I, see the report of the second evaluation of AGRHYMET (CAC-V.Doc 6, April 14, 1980) and PID for Phase II submitted in March 1981.

Issues which were raised during the PID review in AID/W and cited in STATE 09 3028 are addressed in Section I-D and other appropriate sections of this paper. Comments of Sahel USAID's pursuant to STATE 09 6058 have been taken into account in the project design.

WMO has drawn up an integrated implementation program, which is Annex G of this PP. The program includes anticipated U.S. participation through this project. The program plan was drafted in collaboration with technical assistance from the U.S. in the fields of telecommunications and data processing. The plan benefits from the contributions of technical and planning services within many of the Sahelian countries which are involved at present in the AGRHYMET program. The program will undergo further technical refinements and cost adjustments as WMO continues to consult with donors and recipients alike so that the program in its scientific and practical dimensions and its financial requirements will respond to the capacities of all parties involved. The objective of WMO's integrated programming process is to provide the basis for an activity which can ensure feasibility for financing as well as technical validity. As presently designed in Annex G, the costs to the Sahelian countries and to donor organizations may be in excess of what will be finally achievable for both groups.

Following the annual meeting of the Coordinating and Advisory Committee (CAC) at WMO headquarters in Geneva in early September 1981, projected donor contributions to the AGRHYMET program for Phase II appear to be of about the same order of magnitude as or somewhat above what was made available to the program's Phase I. While CILSS and Member States have yet to pronounce themselves on anticipated funding levels for the next five years, initial indications from CILSS and country representatives present at the CAC meeting point towards a measured increase in their financial participation as compared with Phase I. Additional elements of the contributions of the recipients will be revealed during the course of CILSS ministerial meetings, scheduled for December 1981, and the AGRHYMET Executive Committee meeting scheduled for late October 1981. Any slight modifications and further refinements of the technical or the financial aspects of the Phase II integrated program will not impact substantially on the projected U.S. contribution, as outlined in this PP. WMO has requested that the U.S. participation to Phase II concentrate on rendering operational the basic national and regional network across the eight Sahelian states. The scheduled U.S. inputs are considered the essential elements to the installation and functioning of a fully equipped network that covers all of the steps necessary to meeting program objectives. Participation at a level inferior to that which is requested in this PP would mean that important components of the national and regional network would have to be eliminated or tabled. This would have the effect of jeopardizing the optimum functioning of the integrated program, which in turn would have serious negative consequences for the prospect of the program ever being able to deliver the sort of useful information that is its central objective. Any diminution (or prolonged delay) in the furnishing of the inputs as described in this paper would also risk creating a snow-ball effect on the other donor commitments beyond those already made, including cases where WMO is engaged in efforts to attract new donors who were not participants in Phase I support of the AGRHYMET program.

Without the basic information infrastructure to be supplied under this project, the contribution of other donors becomes much less relevant. The development of a regional program which includes eight national components assumes a linkage system which is complete and operational. That is the role assigned to the U.S. contribution by the WMO Integrated Program. To assure success of the ultimately agreed-upon Phase II integrated program, AID will require in the grant agreement with WMO, as executing agent for this project, that WMO obtain commitments from CILSS Member Countries and other donors in support of the basic package. USAID/Niger recommends authorization of life-of-project funding of \$7,000,000 beginning with an initial obligation of \$1,100,000 in FY 1982. The Project Assistance Completion Date (PACD) is September 30, 1987.

B. . PROGRAM FRAMEWORK

1. Structure and Strategy

The conceptual plan for development and operation of the AGRHYMET system is discussed in detail in Annex B (for the history of the program and of U.S. participation, see the Project Paper for Phase I). The AGRHYMET system has built upon those hydrological and meteorological facilities and operational services as existed in the countries prior to 1973, modernizing and adding to recording stations and networks, expanding operational cadres and enhancing expertise through training. Modern efficient telecommunications (largely U.S. financing) will provide important linkages within and among the countries, as well as external ties to global systems; computer equipment (U.S. financed) will provide modern analysis and data management capability within countries and for region-wide operations. Informational "products" for which methodology is being developed by AGRHYMET will be available for users when the regional system is fully operational at the end of Phase II.

Initial assumptions as to the time frame within which the ultimate AGRHYMET system could be achieved were overoptimistic, as stated earlier, and Phase II will be a period for completing and consolidating the essential elements for a fully operational system (see Annex G). The objective by the end of Phase II is to have all the basic elements of AGRHYMET in place, including equipment; trained operating personnel; regional coordinating and training capability; an agreed upon system for recording, observing, reporting, analyzing, transmitting and disseminating weather and climate information; an agreed upon system for regular calibration and maintenance of instruments and equipment; a mechanism for skills-maintenance through refresher training; and a developed procedure for continuing research and development of practical applications. Full operations on a regional level will not take place until after Phase II, although countries in which installations and operating capability are advanced will be conducting some degree of operations during this phase. The full impact of applications of AGRHYMET information on agriculture and other production can only be felt after full operations are begun. However, these will be anticipated during Phase II through emphasis on identifying and developing such applications which will include dialogue with potential users, and collaboration with agricultural and other research organizations. Finally, this period will see progress toward a phase-out of technical assistance in operating and support as Sahelians achieve training and experience sufficient to manage and operate AGRHYMET on their own. However, some technical assistance will be necessary beyond Phase II, particularly with regard to newer technology elements of the program as they may be introduced.

2. Inputs and Outputs

a) Technical assistance has been a major input requirement during Phase I and will continue to be during the coming phase. Costs of most of this are covered through UNDP funding which provides for advisors in agrometeorology and hydrology covering each member country. UNDP funding also provides technical assistance for the Regional Center which during Phase I (through CY 1989), amounted to about \$2.7 million.

Technical assistance which has been provided by AID has been through NOAA. This includes a technical advisor for the installation and maintenance of equipment and instruments that comprise part of the AID contribution to the Regional and country facilities; a data processing specialist, provided under a NOAA contract with the Digital Equipment Corporation which is the supplier of equipment at the Regional and National Centers. This specialist is responsible for furnishing technical assistance to programmers in each of the participating countries, and for conducting short courses and seminars in data processing. Short-term consultancies are arranged by NOAA as required. (See III-A for discussion of NOAA administrative functions in the U.S.).

b) Equipment procurement. Most equipment for the Regional Center will have been installed by the commencement of Phase II. New equipment purchases will primarily be for installations in participating countries, and will include replacement of obsolete existing equipment plus supplemental units of agrometeorological and hydrological instruments and telecommunications and data processing equipment. The U.S. will finance the larger part of the latter two categories as indicated previously. Most of this will complement similar equipment procured during Phase I. There remain certain pieces of equipment which must be procured in order to complete the installations which were begun during the past five years. In one case, the Cape Verde national installation, peculiarities of the network, due to the unique problems posed by inter-island communication, will require additional equipment which was deferred under the Phase I project.

Important quantities of spare parts will be on the equipment list. Many of these parts will be centrally located at the Regional Center, where a parts and logistics manager will handle inventory and dispatch parts on demand to national centers from a specially built and outfitted parts warehouse currently under construction. In addition, certain pieces of equipment, such as solar radiation measuring and recording instruments, which have received constant use under weather-exposed conditions, have a life of only four to five years, and therefore are to be replaced. A supply of tools and equipment will be provided to each trainee as he/she assumes a place within the eight national centers.

Each center is to have its own electronics workshop (scheduled for Federal Republic of Germany assistance), and certain specialized tools and calibration instruments to maintain U.S.-supplied equipment will be necessary.

In the case of at least one equipment replacement which is anticipated over the next five years, the small diesel generators used to power single-side-band radio transmissions from remote observation stations may be replaced by solar-cells. This new system, which should reduce operating costs and eliminate awkward logistical problems, is currently being tested by NOAA. While this is not specifically budgeted in the procurement plan for Phase II, some installations may be made at selected locations.

The dissemination of weather information, programmed under this second phase, will be facilitated by a continuous weather broadcast system. While much of this information can be diffused by existing national short and medium wave band radio communication, it is desirable to augment this information in certain important intensively cultivated zones, such as along river basins. AID is funding a progressive installation of a VHF-FM system in priority sites. The system will also be useful to transmit short recordings (5-10 minutes) of an educational nature related to agriculture, weather, water resources, etc. A variety of small, but essential, items completes the equipment list. These include new software packages, computer science publications, and books for the AGRHYMET Regional Center library. In order to help the Regional Center better coordinate a constant exchange of data processing information, a micro-fiche system will be established, with reader/printers installed at all national centers.

c) Training: The AID inputs to training to date have centered primarily on relatively sophisticated electronic equipment of U.S. manufacture. The training has been provided in the U.S. and has totalled approximately 185 person months during Phase I. Forty person years of additional training is programmed for U.S. financing during Phase II.

With the exception of a one to three month on-the-job training that each trainee who returns to the Sahel from the States may be asked to go through under the supervision of the resident NOAA technician at the regional or one of the national centers, all U.S. funded training is carried out in the United States. This training will continue to be programmed in two distinct areas, both related to the successful operation of the automatic data processing facilities and the telecommunication set-up which ties the regional and the national centers into the AGRHYMET program network.

The International Training Office of NOAA is to continue to serve as the major point in the placement of the candidates who are accepted for U.S. training. In addition to placing trainees in academic and technical institutions, the NOAA training office monitors and reports on the progress of students, and intervenes on those occasions where course and/or social adjustments may be necessary. NOAA is to maintain a comprehensive planning program which takes into a continuously up-dated account, all of AGRHYMET's high-technology training needs and make timely recommendations to AGRHYMET for meeting those needs in rhythm with the installation of equipment and the demand for data information, analysis, and management.

(1) Instrument/Computer Maintenance Technicians

The AGRHYMET program calls for at least two trained electronics technicians to be assigned to the Regional Center and to each of the national centers.

Some of this training was accomplished under Phase I, and technicians are in place in The Gambia, Mali, Senegal and at the Regional Center. Other technicians are currently in training; still others remain to be identified. Trainees are generally, assuming they have the requisite aptitude, trained on both telecommunication systems and on maintenance and repair of the computers utilized by the program. The course of study (to date administered at the Capitol Institute of Technology, in Kensington, Maryland) requires 93 quarter credit hours and can last up to two years. Graduates who complete course requirements receive an Associate in Arts Degree. Experience to date recommends that if entry qualifications are deficient, the trainee may be placed first in the Electronics Technician Certificate program, in order to give him/her a better background in basic electronics. Additional work, adjusted to the particular needs of the trainee and the AGRHYMET program, are to be pursued at specialized institutions, such as the Control Data Institute in Arlington, Virginia and the "factory schools" of Digital Equipment Corporation (DEC), manufacturer of all data processing equipment in the AGRHYMET program.

(2) Programmers, Systems Analysts and Computer Scientists

For the AGRHYMET network to become fully operational, at least two Programmer/Computer Scientists will be assigned to the Regional Center and one to each of the national AGRHYMET facilities.

The first computer scientist to be trained under Phase I has assumed his responsibilities at the Regional Center. Four other trainees in this category are currently in training; additional candidates will be recruited under this Phase II. Generally, all candidates applying for training in these positions will have at least a junior college level degree in mathematics, or a related scientific discipline.

Trainees accepted to this program, are expected to complete broad academic work in computer science and calculus before specializing in scientific and theoretical computing, system analysis and operation research/application models. Trainees at the lowest entry level may graduate and return to take up their position with a B.S. degree in Mathematics and Computer Science from such institutions as Millersville State College, Millersville, Pennsylvania. Depending on the program requirements for staffing, with particular reference to the program's announced plan for Sahelianization, those with proven academic skills and an ability to assume leadership responsibilities in data processing and analysis may be given the opportunity to achieve a Master of Science degree in Technology of Management, such as is offered by the American University, Washington, D.C.. Additional familiarization and training in AGRHYMET-related areas of interest are scheduled as appropriate at such places as the National Meteorological Center (Computer Division), the National Severe Storms Forecast Center (NSSFC), and the National Climatic Center (NCC) in Ashville, North Carolina, besides practical course work offered by DEC, the computer vendor. The purpose of these specialized studies is to familiarize, train and give on-the-job experience to the participants in climatological and archiving problems of the sort that they may be called upon to face in the Sahel.

A further description of the U.S. situated training programmed for Phase II is found in section 3.2.1. of Annex G.

In the case of trainees who are residents of Sahelian countries of francophone or lusophone expression, the AID contribution will continue to fund English language training at facilities in the Sahel (usually in English language programs directed by the U.S. International Communication Agency within each country) or at the American Language Institute, Georgetown University, Washington, D.C.. Proficiency in English is a necessary precondition to taking U.S. training, and has been deemed an essential contribution to the effectiveness and resourcefulness of technicians, scientists and managers when they return to work in the AGRHYMET system.

Training of agrometeorological and hydrological personnel for CILSS member countries is one of the prime functions of the Regional Center. Such training is financed by other donors. The center is now well organized to carry out this function and provides courses for Class II agrometeorologists and III hydrologists and agrometeorologists. * Ad hoc courses are arranged when needed, for example, training courses in radiation measurements. The duration of the training of Class II and III agrometeorologists, hydrological technicians and instrument technicians is 21 to 24 months. Training of meteorological observers is carried out in the countries themselves. The instructors from the Center supervise this training during their periodic visits to the countries. A detailed syllabus has been prepared for the training of multi-purpose observers, to be given by roving experts. Practical training in agrometeorology is available at the Center. The practical training of hydrological technicians is given in the countries themselves. The Regional Center students return to their countries, at the end of the first year of the course, for two months of practical training. Also, when they return to their countries at the end of their training at the Center, they follow practical training for two to three months before taking up their duties.

Nine experts (one each in agrometeorology, agronomy, climatology, and general meteorology, two in hydrology and three in instruments) form the corps of instructors at the Center. They are assisted by one associate expert in hydrology. Two Class II agrometeorology courses were completed up to 1980. One course in each of the following disciplines was begun in 1981: Class II agrometeorology; Class III agrometeorology; Class III hydrology.

d) Construction of facilities. The Regional AGRHYMET Center in Niamey is largely completed. Some expansion of current capacity for trainees has been proposed by AGRHYMET (raising capacity from 50 to 70 students), and provision of housing accommodations for senior staff of the Center. Other construction is for in-kind contributions of the participating countries of small buildings to service remote weather recording stations and for the national hydrological and meteorological services. Only Regional Center construction is programmed for donor assistance in Phase II.

The U.S. contribution to the construction program is modest and is limited to the completion of support structures for the data processing facility at the Regional Center. Originally programmed for funding under Phase I, delays in the arrival of the ADP and power supply equipment had the effect of postponing the necessity for support structures until

* WMO Classification:

- Class IV - Meteorological Observer Assistants, Computer Aides
- Class III- Sub-professional Meteorologists and Hydrologists;
Computer Operators
- Class II - Meteorologists and Hydrologists, Computer Programmers/
Analysts; Electronic Maintenance Technicians
- Class I - Chiefs of Service; Professor/Instructors;
Computer Scientists/Managers.

Phase II, while high priority needs at inflated costs ate into the ear-marked construction funds. Approximately \$125,000 is programmed in Phase II for the construction of a central parts warehouse and a shelter for two 60KVA back-up generators.

The parts warehouse is to be partially climate-controlled and will serve as a central point where spare parts and replacement equipment for national centers, as well as the Regional Center will be systematically inventoried, stored and shipped upon request to each of the Member States. The shelter for the two back-up generators will provide for proper installation of a power source which can help to offer a continuous, economical and dependable supply of energy and thereby guarantee use of the center's equipment and facilities.

e) Operational support. Has been a critical major requirement for donor assistance, and will continue to be so during Phase II. Those operations relating to the Regional Center have been largely funded by UNDP, supplemented by relatively smaller contributions from US and the Netherlands in 1979 and 80. Contributions from other donors are being solicited for Phase II for this purpose. The amount indicated for the US contribution is \$200,000 (including inflation) during Phase II. Member States are preparing to meet most of their own operational costs and in some instances may be called upon to contribute such costs through the CILSS support grant to the Regional Center. In fact, in-country operational support from donors is included in the integrated program for this period (see Annex A and G) to absorb some of the financial impact of new reporting stations, additional personnel and mobility, and other needs for effective program operations. (See IV-B for discussions on recurrent cost financing).

During Phase II, increased impetus will be given to identification and development of practical applications for AGRHYMET-produced weather and climatic data, advisories and interpretations (see I-D1 and 3). Several AGRHYMET initiatives along these lines were begun in Phase I and will be given additional priority, encouragement and financial support during the second phase. Two of these initiatives are included for funding assistance from the U.S. through this project:

(1) Support to the operations of the prototype user trial and demonstration facility at the Regional Center, for which \$30,000 per year, plus an inflation factor, is programmed for each of the five years. This facility will permit the undertaking of a series of agrometeorological work on approximately fifty of the seventy-two hectare AGRHYMET grounds. The agricultural plots are placed alongside of meteorological observation stations so as to facilitate research and the student's appreciation of the integrated relationship of the two disciplines. Plots are laid out according to real dimensions, and according to farm methodologies and technologies utilized in the Sahel. Several national, regional and international research institutions have been invited to collaborate with AGRHYMET in laying out trials. This will bring the benefits of additional agronomical expertise to AGRHYMET and allow the students to work in close contact with agronomists and institutions with whom they will be called to work in the future.

The principal purposes of the agrometeorological work at the AGRHYMET center are (a) practical instruction for students who are assigned agronomic and meteorologic problems to solve, so that they can some day provide a meaningful input to crop production from their position in a Sahelian country meteorological service ; (b) observation of the development of various Sahelian plant cultures (food, forage and cash-crop) as the growing season progresses, according to the farming techniques utilized, by measurements in the field (of water balance, yields, plant physiology, entomological activity, etc) ; (c) provide trial plots which serve as the basis for the students' yearly reports.

The field work is divided into three areas :

(a) pasturelands, on which the effect of different conditions is observed on indigenous and exotic species of forage crops ; (b) uplands, with various soil compositions of sand and clay, on which rain-fed crops (millet, sorghum, cowpeas, groundnuts, corn, and cotton) are sown ; and (c) bottomlands where cereal crops can be irrigated and rice is planted. In addition, there are specially adapted agricultural sites (with windbreaks and terracing) and specific plots of fruit orchards, vegetable gardening and botanical and foodstuffs gardens for the use of the students.

(2) A second applications-development initiative which is programmed for US assistance is a series of seminars/workshops to be conducted at the Regional Center, two per year. These sessions will promote a dialogue between AGRHYMET and potential users in the countries. They will bring key officials to Niamey to become familiarized with the AGRHYMET program and potential, to participate in colloquiums aimed at giving AGRHYMET a better understanding of the nature, scope and timing of weather and climate information which would be of greatest value to potential users, and would help AGRHYMET to tailor its analyses and reporting accordingly. It would also assist AGRHYMET to develop the most effective methods for disseminating its information. Attendees of the sessions (about 25 in each) would include specialists in agricultural extension and research, pest control, range management, environmental protection, land use planning, rural development, irrigation schemes, agricultural economics, forestry, and national planning, among others. Not only will these seminars /workshops directly generate useful knowledge for AGRHYMET, they will also have an important impact on generating wide appreciation among key officials of the governments as to the potential value of AGRHYMET.

(3) Another operational activity of AGRHYMET in promoting development of user applications is, for the most part, funded apart from the AGRHYMET program. This is in the category of basic and applied research which is conducted by a number of organizations in and outside the Sahel. A few examples of these which began cooperation with AGRHYMET during Phase I are as follows :

- Three trials were carried out during the 1980 growing season in cooperation with a joint CILSS/FAO project, "Development of Forage Plants and the Improvement of the Sudano-Sahelian Zone " :

(a) To examine the possibility of improving the production and quality of the natural vegetal cover by the introduction of leguminous forage plants, Siratro and Stylosanthes hamata, on fertilized (P_2O_5) and non-fertilized plots. Agrometeorological observations are made on the seasonal development of the vegetal cover and the leguminous crops, and comparisons drawn on net production.

(b) To explore the possibility of introducing leguminous crops (including Doliches Lablab) on bare, clogged soils and on sandy-clay soils, previously considered unuseable, for the purpose of rendering them cultivable in a few years ; diminish the sheet erosion and water run-off on such soils.

(c) To reduce as much as possible the surface water run-off and erosion on sandy, sloping soils by the implantation of cultivated contour bands of forage crops ; economize water utilization ; observe whether plants survive until net rainy season ; note the effects that forage plants can have on soil characteristics.

- Three trials were carried out with the cooperation of the National Agronomic Research Institute of Niger (INRAN) :

(a) A five hectare plot of typically sandy-alluvial silty soils was planted with seed varieties which were selected and treated at the INRAN research center in Tarna, Niger. The trial permitted students from the Agrometeorological Engineering Section to participate in all important field work, in particular : land preparation, seeding, weeding and harvest, and to carry out relevant seasonal observations (water balance, damage caused by birds, insects, effects of climate, plant disease, etc.)

(b) Five hectares of sloping sandy soils were dressed with alternating bands of rain-fed cereal and leguminous crops (in association) and forage crops so as to demonstrate an effective method of soil erosion control and to aid in retaining soil moisture to the benefit of the plants. Development of the plants under these conditions, according to agrometeorological standards, was followed by the students. Seeds for the trial were furnished by INRAN.

(c) A series of 8 parcels of land, in three repetitions, were planted in millet, cowpeas and millet/cowpeas mixed, with the purpose of understanding water utilization. Similar trials were tried the same year at the INRAN research station at Tarna.

- AGRHYMET collaborated with scientists from the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria, in a series of repetitions of twelve cowpea varieties in order to determine water needs and drought resistance characteristics in particular.

- The micro-climatological research group of Nottingham University, England, carried out an experiment to find the optimum density for cropping millet. Students participated closely in following the field work so as to gain a familiarization of the instrumentation used.

- Currently, the University of Reading, England, has begun to study the use of digital satellite data for interpolation between sparse rainfall measuring stations and for the operational mapping of soil moisture conditions. This project will be carried out over a three-year period and

from its early planning stages was formulated in collaboration with the AGRHYMET center and the Meteorological Service of Niger.

- The International Center for Research in Semi-Arid Tropics (ICRISAT) is active in the Sahel and is opening a research station in Niger. While awaiting the installation of their activities on land to be furnished by the Nigerien government, ICRISAT is using three hectares of land on the center grounds, planted in millet for rain-fed culture. Some exotic material is integrated with local checks, and observations are being made on millet physiology, plant pathology and entomology. One hectare will be developed during the dry season to carry out irrigated millet trials.

- Niger Basin Authority (NBA): A draft agreement between AGRHYMET and the NBA exists concerning cooperation in the implementation of the Hydrological Forecasting Project (HYDRONIGER). Plans call for collaboration in the common use of observation stations, telecommunication facilities and technological forecasts. HYDRONIGER operations will require some automatic data processing time and software products which can be obtained at the AGRHYMET computer center. Similarly, AGRHYMET would hope to use data from HYDRONIGER to improve its products. The requirements of the two activities for everyday access to the automatic data processing facilities, the location of both organizations in Niamey, and the high cost in establishing a separate data processing center, make it almost imperative for both parties to work out a mutually satisfactory utilization plan. Discussions to this end are currently under way in WMO.

Given the present physical plant at the AGRHYMET center, questions remain regarding the possibility of admitting all NBA-nominated students for hydrological course work at the center. Training aids and housing may have to be expanded, with HYDRONIGER contributing to costs.

- Another AID funded Sahel regional activity, Integrated Pest Management, enjoys a formal working relationship with the AGRHYMET Regional Center. Currently, one FAO entomologist, engaged under IPM, is assigned to the center and is in charge of a pilot operation in entomological observation. This "resident expertise", programmed to continue in future years, is available to students at the center in the classroom and in the field.

3. Critical Assumptions.

The Logical Framework Matrix (Annex A) lists a number of assumptions which could be of significance in the development of the AGRHYMET networks, operational systems and informational output or in the effective application of the AGRHYMET informational products. The assumptions are these:

a) That inputs can be provided in a timely way, as programmed. There were some delays in procurement of some U.S.-funded equipment during Phase I but they did not seriously impede the orderly installation of basic equipment requirements. Indeed, there were calculated delays in shipping many items, as facilities at the Regional Center and in the countries were not yet ready for their installation. Need for similar adjustments in implementation actions will have to be expected and accommodated during Phase II (see 2 (b) above), since the program is concerned with several countries, each of which has its own abilities and problems in adhering to master plans for the integrated program. Generally it is not expected that donor inputs will be significantly delayed during Phase II, except for reasons involving the readiness of the countries.

b) That sufficient qualified trainee candidates can be provided by the countries to meet training needs. Again, during Phase I, this was somewhat a problem, particularly for candidates for the senior grade positions. Competition in Sahel countries is keen for personnel who have reached the baccalaureate or bachelors degree level of training. Since the regional AGRHYMET program is a new, not yet operational program, potential candidates are less aware or appreciative of its career opportunities. This should change during Phase II as the program becomes better known.

c) That the WMO/CILSS planning for the Phase II integrated implementation plan will be sufficient and realistic. The detailed planning to date, exhaustively presented in Annex G, is part of a continuing process of adjusting Phase II inputs to suit the realities of technical requirements and financial possibilities. The integrated plan, in its present form, is described as "tentative and preliminary". WMO and CILSS are currently working to bring Phase II into line with guidance which is offered by participating parties to the AGRHYMET program. The Seventh Annual Session of the Coordinating and Advisory Committee (CAC) in September 1981 was the occasion for significant modifications within the implementation plan. The assembled donors and responsible authorities of the CILSS and the Member States made important contributions towards the definition of a program which is at once coherent and realizable. Furthermore, WMO is instructed by the CAC to undertake a country-by-country review of proposed national programs to assure that material and human inputs and operational costs are in every case directly relevant and essential to the attainment of program objectives. WMO will be meeting over the course of the last quarter of CY 1981 and first quarter CY 1982 with the meteorological and hydrological services, as well as agricultural and planning officers of the participating countries. WMO and CILSS are to evaluate country programs for consistency with the design of the integrated AGRHYMET system which was the basis for Phase I planning. WMO and CILSS recognize that

further program analysis is necessary and that cost options must be sought which are consistent with maintaining the technical integrity and utility of the ultimate system.

The U.S. is supportive of such a WMO/CILSS review and is prepared to participate in this sort of close analysis. Recommendations for adjustments, particularly to the national programs, may be expected as WMO and CILSS focus more directly on the technical and funding opportunities and limitations.

d) That the equipment and training provided are appropriate for the eventual operating system. The system was carefully designed in its concept (see Annex B and the Project Paper for Phase I) and evaluations during Phase I raised no questions as to the basic technologies or the means of achieving the operational system.

e) That participating countries will fully cooperate and efficiently coordinate with AGRHYMET operations. There appears to be no problems as far as intent is concerned. All the countries have participated in the conceptualization and structural planning of AGRHYMET since its inception, and the desirability of the program was identified by them as one of the initial priority needs at first meeting of CILSS in September 1973. While the countries have achieved uneven progress in development of their networks and expertise, there is every indication that they are fully committed to the program and are cooperating to the fullest extent of their capabilities. Donor support assistance is foreseen in the integrated plan for Phase II to help countries meet such costs during this period.

f) That practical applications of significance can be identified and developed. A number of these have been identified, some of them currently under special study. Examples of possible applications of long term cyclical forecasts would be these:

(1) Seasonal rainfall forecasts which would help farmers to select appropriate crops for cultivation and appropriate varieties based on relative droughts

resistance.

- (2) Judgements by farmers as to areas and perimeters which might receive sufficient rainfall to support rain-fed cultivation of millet, sorghum and other crops in any given year.
- (3) Potential in any given year for double-cropping ; optimum sequencing of selected crops.
- (4) Better estimating of areas of basins which should be expected to receive sufficient saturation to permit recession cultivation in any given year.
- (5) Estimates as to volumes of surface water which would be expected to be available for irrigated production in given locations.
- (6) Estimates as to trends in sub-surface aquifer levels which would impact on water availability for pumping ; estimates as to rate of aquifer recharge.
- (7) Estimates as to general pest infestation trends, as related to cyclical seasonal rainfall. Nature of pests expected (locusts, mites, fungus , birds, rodents, etc.)
- (8) Judgements by agricultural services as to particular assistance needs of farmers for any given year, based on seasonal rainfall expectations (emphasis to be given through extension services in advice to farmers, assistance in pest management and erosion control, etc.)
- (9) Judgements by herders as to best options in locations to graze their herds for any given year, based on expected quality of pasturage which is likely to result from seasonal rains, considering cyclical forecasts.
- (10) Anticipation by agricultural services and other governmental agencies as to impending competition for cultivable land and animal watering resources, as cyclical droughts influence herders to gravitate into the better-watered cultivation areas.
- (11) Judgements by national planners as to potential food production deficits relating to anticipated droughts in any given year.
- (12) Improved national planning anticipating requirements for repair of roads, tracks, dams, etc., based on expected seasonal rains, surface run-off, erosion vulnerability, etc.

Some examples of possible applications of accurate daily weather reports and short-term forecasts would be these :

- (1) Judgements by farmers as to best times to prepare their soil for cultivation.
- (2) Best times/moments for planting/transplanting.
- (3) Best times/moments for weeding.
- (4) Best times/moments for applying fertilizers and insecticides.
- (5) Emergency protective ditching and diking to protect cultivation from heavy run-off.
- (6) Judgements as to best times to release water from saturation basins for recession cultivation.
- (7) Best moments for harvest.
- (8) Needs for emergency crop protection after harvest.
- (9) Anticipated needs for emergency repairs to bridges, roads, dams, etc.

Development of these and other applications will, in many cases, require a number of years for accumulating the necessary relevant weather data and observing its impact on crops, soils, pasturage, river flows, etc. The process of identifying practical applications and making information most useful for these purposes will be a dynamic and continuing one, as the AGRHYMET system develops knowledge and as early applications achieve success and recognition.

g) That information disseminated through AGRHYMET can be responsive to user needs in form, scope and time. To ensure that information content and dissemination will be meaningful and useful, the AGRHYMET program is involving potential users in the process of developing its informational system (see I-B 2e).

There are other critical assumptions which will relate more to a future beyond Phase II. These concern the development of confidence by users of AGRHYMET information as to its accuracy and applicability in their farming, herding and national planning decisions and operations ; the assumption that national pricing policies for food staples and that other national policies affecting production are an incentive to farmers to maximize their production ; and that the governments perceive sufficient economic, social and environmental benefits from AGRHYMET to motivate them to assume an increasing proportion of recurrent costs for the program.

C. RELATIONSHIP TO RDSS AND REGIONAL DEVELOPMENT PRIORITIES.

Adopting the strategy and plan of the CILSS/Club regional development framework, the A.I.D. Regional Development Strategy Statement for the Sahel identifies food self-sufficiency as "the highest priority goal of the Sahelian states and of A.I.D." The second principal objective is growth and development. Most of the individual Sahelian states have also adopted these as their individual government development goals.

The A.I.D. regional strategy for achieving these goals comprises six major elements : rainfed agriculture, irrigated agriculture, livestock, resource conservation, transport and infrastructure, and human resources. The AGRHYMET Program is directly supportive of five of these major elements, and has applicability to the sixth (transport and infrastructure).

The potential benefit of long and short-term weather forecasting to farmers is evident. The single most oft-mentioned constraint to increased agricultural production in the Sahel is the erratic and unpredictable nature of the weather. The RDSS notes that the CILSS-Club development strategy "has as its top priority the achievement of food self-sufficiency and reduced vulnerability to future droughts". The AGRHYMET Program is specifically designed to develop and disseminate information which will help farmers and governments to know, with more assurance than they can now, to what extent they can depend upon the weather to nourish their crops. With this information, the farmers and governments will be able to choose alternative crops or cultivation techniques, planting and harvesting schedules, or storage and marketing programs to ameliorate the negative or accentuate the positive effects of weather patterns.

In the area of livestock production, the AGRHYMET Program will provide analyses which will offer herders increased alternatives for water resources and grazing, and may serve to reduce animal population concentrations and densities in areas which cannot continue to support them without irreversible ecological damage. This in turn, will have positive implications for soil conservation and vegetative regeneration.

The RDSS states that the AID strategy is to initiate "direct impact programs aimed at increasing food production and improving rural infrastructure and social services. At the same time, necessary first steps aimed at long-term sustained agricultural growth in the Sahel will be undertaken. These include the creation of various institutions needed to implement development programs, the training of manpower in technical and managerial skills needed for modernization ; and growth and the filling of information gaps that are constraints to progress in most sectors". AGRHYMET fits this institutional description.

Finally, the RDSS refers to the need to "examine the development problems and needs in the Sahel on a transnational basis... (since) many of the problems in one state are common to most of the region, and the efforts required to deal with them... require a regional investment for their economic efficiency". In this context AGRHYMET is mentioned specifically in the RDSS as an example of a type of activity for which consolidation of donor inputs and management is particularly desirable in order to avoid duplication of effort. It is also a good example of an activity which can be carried out most efficiently in a regionally managed program.

AGRHYMET fits the specific criteria for projects which AID expects to undertake under its Regional Development Strategy ; it serves as one of the better examples of a regionwide development activity which has given rise to increased regional planning, coordination and cooperation among Sahel states ; and it has the potential for serving the everyday practical needs of the region's farmers. It thus contributes in a very specific way to the accomplishment of AID's development goals as described in the RDSS and as provided in AID's mandate from the Congress.

D. ISSUES ADDRESSED IN PHASE II DESIGN.

Several issues were identified in the PID and included in the PP guidance cable (State 093028 April 11,81) for attention during Phase II design. They have been addressed in various parts of this PP :

1. Development of practical applications by users for AGRHYMET information ; I-B3f identifies potential applications as currently perceived by Agrometeorologists with the program. Initiatives to encourage countries to take maximum advantage of AGRHYMET information are included in I-B2e.
2. Recurrent costs to governments, and their assumption of those costs is discussed in IV-B.
3. Research and development of practical applications, coordination with research organizations, application trials and demonstrations at the Regional Center, involvement of potential users in designing informational packages and dissemination methodology are all discussed in I-B2e.
4. AGRHYMET program administration and financial management are addressed in III-A and IV-C1.

5. Economic and social benefits are addressed in II-B and C.
6. AGRHYMET linkages with other organizations are discussed under III-A (except for those organizations participating in development of practical applications; mentioned above).
7. Coordination among USAIDs is at III-C.

II. PROJECT FEASIBILITY

A. Technical Considerations

AGRHYMET is a high technology system. It depends on modern instrumentation and equipment for recording, transmission, data processing and dissemination. Well-trained professionals, maintenance technicians and operators are required. AGRHYMET builds on, expands and enhances hydrological and agrometeorological services, modernizes and enlarges existing networks, and supplies the latest techniques for data interpretation and dissemination. The technological approach is based on the conceptual plan for the integrated program (see Annex B).

Despite mixed achievements during the first five years of the program, there has been no suggestion that the approach should be altered - only that the time frame for achieving the ultimate system needs to be more realistic in terms of capabilities of the countries to achieve the improved networks and the essential expertise. The expansion of the integrated program during Phase II, therefore, continues the conceptual plan as originally designed, including the technological approach.

U.S. inputs into the integrated program have been for solar radiation instrumentation, communications, data processing equipment, and associated training and technical assistance. This will continue through Phase II. A summary technical analysis of these U.S. inputs and for some possible ancillary activities follows: (For more detailed technical discussion of U.S. inputs, see Annex C)

1. Data Processing

Ten computers have been purchased and five are installed and operating - four in the Regional Center and one in The Gambia. Plans are to install computers in the other National Centers, except for Chad, by the end of 1984; however, this is dependent on the ability of the countries to meet pre-installation requirements. A pencil and tablet digitizer will be added to each installation for the purpose of extracting data from recording charts semi-automatically

2. Telecommunications

The single-side band (SSB) installations are complete in The Gambia. Installations of SSB in Mali, Senegal, and Upper Volta are in progress. They are expected to be completed by mid-1983. Cape Verde, Mauritania, and Niger radio installations should begin soon with plans to complete installation by the end of 1984.

The plan includes development of Continuous Broadcast Systems for disseminating information directly to users such as farmers, herdsman, and others. A system will be installed in The Gambia and at the

Regional Center by 1983 to gain experience and training for this medium of dissemination. Others should be completed by 1985.

3. Maintenance and Installation of Data Processing and Telecommunications Equipment

Three full-time technical personnel and other part-time personnel are provided through U.S. inputs to assist Sahelian personnel in the installation, maintenance, and operation of data processing and telecommunication systems. Two of the full-time personnel are resident at the Regional Center. This support will continue through 1983, after which support will be reduced to one full-time person resident at the Regional Center and other part-time assistance as required.

4. Training

Class II (and possibly Class I, if candidates are available) Computer Specialist and Electronics training will be carried out in the United States. Programs are well established which will lead to an associate degree or equivalent for Class II and a B.Sci or equivalent for Class I for those who complete the work satisfactorily. Several students have finished work in these programs and others are now in training. The integrated plan calls for training more Class I and Class II personnel for a total of 62 person years, as requested by the national services; the U.S. Phase II contributions will finance 25 person years for the countries and 15 person years for Regional Center personnel.

Class III and Class IV Computer Specialist training will be a combined effort of the National Services and the Regional Center. Both Class III and Class IV will spend approximately six months at the Regional Center in primarily workshop-type training supplemented by classroom and self-study work. Because there is a shortage of student housing at the Regional Center, the first full curriculum cannot be given until 1983. However, national services can begin to train Class III and IV within their own countries with currently existing self-study materials and other equipment as it becomes available.

5. Data Bank Projects

The Institut Royal Meteorologique, Brussels, has taken the responsibility for microfilming, converting to computer format, quality controlling and archiving the meteorological records of the Sahel. The Belgium Government has financed this project for the past few years, and is expected to continue to do so during the next five years. Belgium expects to integrate conventional observations from other sources, such as ASECNA, into its data set. The final set will be archived at the Regional Center and at national centers. Most of the ASECNA data set is now stored on magnetic tape in the AGRHYMET Computer Center in Niamey.

The FAO (Food and Agriculture Organization) has proposed to extract detailed quantitative precipitation data using a combination of meteorological satellite data and surface observations using NOAA software converted. Since this five-year plan does not provide for adding new surface observation stations, the technique proposed by FAO could provide a more comprehensive data set than what an expanded surface network could provide. The operating costs could be substantially less than maintaining an elaborate surface network. The plan calls for studying proposals to install a satellite ground station and to process data received on the AGRHYMET computers. However, funds must be found (estimated at \$100,000 per year) to finance this before it can begin. The data would become part of the climatological data base at AGRHYMET for use in applications development and for operational purposes to benefit agriculture. The work of Belgium and this activity would go hand-in-hand.

B. ECONOMIC FACTORS

The potential uses of the AGRHYMET Program are many, but the effective exploitation of the information resource in current West African societies may be limited for the near future. The most important assumptions about the economic value of the Program involve successful communication of the information derived from the system to rural people who have the ability and the willingness to use the information. The first problem, of course, is communication of "real time" media. The second is the ability of the potential consumer to exploit the information to his/her maximum benefit or, alternatively, of the system to present the information in such a way that recommended action is clear. The third problem, and perhaps the most important, is convincing consumers that information and recommendations provided by the system are valid. The project addresses each of these problems in one way or another, but until progress is made in overcoming them, the value of the AGRHYMET system will be severely limited. The continuous broadcast system is included in the AGRHYMET budget and is included in the U.S. contribution in order to overcome the first problem - real time and communications to farmers, public officials, and others. The continuous broadcast system would also be used as an educational channel to help overcome the other two problems.

Other economic, social, technical and natural factors (e.g., government price policies, strength of traditional decision-making processes, quality of seeds, and weather) also influence the potential economic effects of the AGRHYMET system. It is difficult, therefore, to isolate and quantify the potential or actual value added to the agricultural sector by the availability of AGRHYMET information. By fixing the values of all other factors, however, a general influence of the program can be demonstrated.

The following examples of the projected value of the system are divided between those which can result from circumstances in which project assumptions hold true (i.e., rapid communications systems are developed, and farmers, herders and governments learn how and become willing to use data provided by the AGRHYMET system), and those which can result from circumstances as they actually exist. First, the former:

The most apparent economic justification for a weather information system in the Sahel is the one which relates to increased food production. There are a number of variations on the theme. Following are just a few examples:

1. If only 1 in 50 Sahelian farmers will be influenced by AGRHYMET-produced information/recommendations to plant or harvest crops at more appropriate times relative to hydro-, meteo- and climatological situations, then the following economic effects will result, depending upon the percentage effects of the change on production:

<u>Percentage loss assumed attributable to inappropriate planting or harvesting schedule of 1 in 50 farmers</u>	<u>Resulting percentage effects (loss) in total Sahelian production</u>	<u>1/ Worth (\$000)</u>
10%	.2%	3,314
20	.4	6,628
30	.6	9,942
40	.8	13,256
50	1.0	16,570
60	1.2	19,884
70	1.4	23,198
80	1.6	26,512
90	1.8	29,826
100	2.0	33,140

These figures show that increases in Sahelian crop production attributable to even relatively low levels of influence and effect by the AGRHYMET Program, i.e., a 10-20% increase in production by 2% of farmers, will result in rapid amortization of the investment cost of the system.^{2/}

2. Alternative cropping systems made possible by increased understanding of weather patterns also could contribute to increased harvests. There are a few farmers in the Sahel who try each year to squeeze two harvests into the period of the rainy season. They often fail, but succeed often enough that the temptation remains and the attempts continue. When failure occurs, it is usually because farmers plant with the very first rains of spring and then watch their crops wilt as follow-on rains fail to materialize quickly enough to sustain the new vegetation. Depending on the particular annual hydro- and meteorological patterns, many of these farmers could double their harvests or, depending on the situation, decrease their losses, based on recommendations of the AGRHYMET Program. If only 1 in every 500

^{1/} FAO Production and Trade Yearbook gives a 1977 Cereals Production Estimate for Sahel Countries of 4,734,000 MT. At average cost of \$350/MT, total value equals \$1,657,000,000.

^{2/} If the Sahel countries had borrowed \$50 million at 10% interest for 30 years for investment in the AGRHYMET system, the annual payment, including principal and interest, would have been \$5,303,962.

Sahelian farmers were able to double his harvest, then the result would be a .2% increase in total Sahelian production. During some years, such increases would cover a major part of the costs of amortization of the AGRHYMET system investment.

3. One of the major complaints of the nomadic herders who inhabit the pastoral zones of the Sahelian countries is that farmers often move into the pastoral zone north of the areas in which normal rainfall patterns can support farming. The farmers are encouraged for a few years by unusually high levels of rainfall and good harvests, but when annual rainfall drops to normal levels, the farmers' crops die and they migrate south, leaving behind decimated and eroding land where there was once pasture. The practice probably should not be encouraged, but it might at least be modified if farmers (or herders themselves) could be told when soil moisture and weather patterns seemed most likely to support cultivation in the northern areas and, alternatively, when cultivation would probably result only in increased erosion and reduced grazing for nomad herds. Since one of the major problems for northern herders is the ready access to food grains, this effort could influence not only the herders' ability to establish a greater independence from southern grain markets which tend to favor other economic groups, but could reduce the level of environmental degradation resulting from the unwise cultivation of low rainfall areas. Though it would be difficult to quantify the economic, social or environmental risks and benefits of the increased but more careful (more technically sound) exploitation of the northern lands, it is evident that the potential benefits could be significant both in terms of improved environmental and increased economic well-being of the Sahelian countries.

4. Another major potential economic and environmental benefit which can be derived from the AGRHYMET Program relates to the use of the northern pastoral zones for livestock production. If herders are better informed about the areas of the zone receiving moisture, then they will, it is assumed, be less likely to graze their cattle in dry areas where grasses would not nourish the cattle adequately and where ecologies could not withstand the effects of grazing herds. On the other hand, if informed about such areas, the herders would be more likely to send their herds to high moisture areas to benefit from having their cattle graze better grass. The potential economic value of this moisture data becomes even more significant when combined with studies of range growth and grazing patterns and remote sensing data.

It would be difficult to quantify the value of these potential economic and environmental effects since no credible estimate of the annual losses of grazing land to overgrazing is available, and since no accurate data exists to demonstrate how much well-watered pasture goes ungrazed each year. A study of cultivation occurring north of the 300 mm iso yet in one department of Niger, however, showed that over

1,300 square kilometers of land were under cultivation. The current annual agricultural production potential of that land now reaches approximately \$150/hectare. If cultivation in this area is not carefully controlled, the land will be destroyed for purposes of agriculture and livestock production. If, with assistance from the AGRHYMET system, a portion of the land in this one department alone can be maintained in production, the recurrent benefits will be significant. Combined with the protection value afforded similar land in other parts of Niger and the other Sahelian countries, the worth of AGRHYMET's contribution to land conservation might well exceed the costs of its establishment and operation.

There is an important factor which increases the potential value of the AGRHYMET Program as an economic and social instrument for planning in the Sahel. It is that the program increases in value directly with the potential for disaster. It is in this context that the value of the program is assured. Sahelian farmers have learned from generations of experience to plant their crops at a certain time of the year to obtain optimum benefit from spring and summer rains. If the rains were to come according to usual patterns, then the information supplied by the AGRHYMET Program would, presumably, coincide with that of traditional information systems and be of relatively small benefit to farmers who would have followed traditional planting patterns anyway. The more disparate the weather patterns, though, the more valuable becomes a tool which provides some indication of the timing, nature and geographic scope of the new patterns.

The value to farmers and herders themselves is most important, but a second major justification for the AGRHYMET Program lies in its ability to give governments advance notice of abnormal weather patterns and potential crop losses. Aside from values to civil aeronautics, this service is perhaps the most important current justification for the program. The effects of AGRHYMET data on government decisions to prepare early for crop failures or poor harvests could be translated into:

- (1) reduced costs of food grains purchased at favorable prices rather than at emergency procurement prices;
- (2) reduced transport costs attributable to non-emergency, planned procurement and shipping; and
- (3) reduced losses resulting from more careful planning and cautious handling of grains, and reduced necessity for long-term storage.

The most important economic value of AGRHYMET lies, naturally, in its effect on the reduction of total food imports to the Sahel, but it has a considerable economic value in terms of the possible alternative purchase and delivery programs which might attend the necessity to supply food to hungry people.

Finally, as was noted in the economic analysis for the first phase of the program, the effort is extremely well designed from the standpoint of cost-effectiveness. Economies of scale have been realized by establishing a regional training and data processing center that can provide trained manpower and services for the region as a whole. Similarly, the use of an international specialized agency of high professional reputation (WMO) is proving to be an efficient device for managing the program and coordinating donor inputs. It also assures a high standard of technical backstopping for the seven national programs. The elaboration of a flexible, multi-donor approach provides latitude for individual donors to emphasize contributions in which they have technological or cost advantages.

It should also be pointed out that other development sectors will derive benefits from the AGRHYMET system. River basin developments will be enhanced by an advanced flow warning system. Transportation systems will rely on accurate weather forecasts. Utility operations will make use of the same information. Private businesses will profit by being able better to schedule events according to more accurate weather predictions.

C. SOCIAL SOUNDNESS ANALYSIS

1. Project Social Interventions

In order for AGRHYMET to implement a regional program for information collection and dissemination for the purpose of more effective management of water resources, a socio-political decision has to be made by the Sahelian governments and the rural population concerned. The plan has to be thought out and put into practice with the participation and concurrence of the farmers and herders, as well as of the government planners and technical agents--particularly of those involved in rural development activities.

Farm-level agricultural extension activities will play a major part in the dissemination of crop and rangeland-significant information to farmers and herders. A determining factor in the effectiveness of the information is the attitude of farmers and herders to be willing to implement suggested cultivation and herding practices. Incentives will be needed to secure the collaboration of these ultimate beneficiaries, the users, in taking active steps to employ rational water and land utilization methods and technologies, and thereby move the rural economy towards a restoration of a balanced ecosystem.

The social implications inherent in the ecology sector are enormous. Without concerted action by the rural population, renewable resources, including water, will continue to decline until all resources are a scarce and dear commodity beyond the reach of most farmers and herders. The resource base can deteriorate to such a point that its restoration in any shape will be outside of the scope of practical reality. This project hopes to establish the base work to bring about changes in planning strategies which will influence the availability and the utilization of the basic resource elements: water, soil and vegetation. The project will also hope to set in motion a popular capacity and spirit for self-control over natural resources that has not existed for many decades. If successful, the project will have found ways to bring governments and herder-farmers into closer communication towards mutually desired goals of increasing agriculture and livestock production and improving human welfare and conserving natural resources. The project will hopefully also have indicated some mutually acceptable means of achieving these goals.

2. Beneficiaries and Potential Opposition

The rational, economic and productive use of water resources can play an important role in contributing to such macro-economic variables as income, employment and foreign exchange. Increases to output of agricultural production, generated by improvements in resource utilization, such as are planned under this project, figure critically in the present consumption patterns of the subsistence rural sector, as well as of the urban, low-income-earning consumers. Water management can, therefore, be profitable to the economies of Sahelian countries.

As a result of this project, the eight Sahelian states will acquire a central data bank of information about natural resources and about agricultural production, and the relationships between climate and agricultural production increases. This information can be used in regional and national planning exercises. Sharing of climatological information in real and delayed time, between Sahelian states, can be a sensitive political issue. CILSS-member states have committed themselves, in principle, to a cooperative effort in order to meet a common challenge. An incomplete network would weaken some of the forecasting capabilities of the program and diminish its effectiveness to potential beneficiaries.

Direct beneficiaries include the technicians and scientists from CILSS-member states, who will be trained under this program. Training requirements are noted elsewhere in this document. Most members of the national meteorological and hydrological services will be exposed to at least some retraining. Most of the training will continue to take place at the Regional Center. Professional and academic training of personnel in superior categories will be in Europe and the United States. A series of seminars/workshops is being planned to involve related national agencies in formulating their water needs, in interpreting data in terms of their respective country, and in suggesting proper formats for data dissemination. Finally, there will be the involvement of personnel concerned with the actual dissemination of the information to users. In all, the program will affect, through training, several thousand Sahelians. This group represents the "human infrastructure" which is essential to the program's larger purpose.

The ultimate beneficiaries of the program are the farmers and the herdsmen who make up some 90% of the CILSS countries' population of about 26 million. The objective will be to increase their productivity and output by providing them with timely, accurate and readily understandable weather information so that they may improve their on-farm (or on-range) management practices and decision making. More accurate information about the probable volume and location and spacing of the first monsoon showers will help cultivators farming rain-fed plots to plan their tillage and soil preparation practices and to minimize seed losses through premature planting. More accurate information about run off from up-stream river sources will help irrigation farmers plan the preparation of their seed beds and to strengthen ditches and dikes against possible losses. More accurate flood recession information could permit more efficient cultivation practices along the flood plains, lakes and ponds of the Sahel, and even permit double cropping.

It should be pointed out that the success of the program does not assume or require the introduction and adaptation by the farming population of new technologies. Rather, the program involves employing traditional and new technologies to provide better water data information to the farming and herding population, thereby enabling them to increase their productivity using their present husbandry and cultivation practices. There is, however, an implicit assumption in the AGRHYMET Program that the information being developed is a significant improvement over present (or non-existent)

information systems. In Phase III (1986 and thereafter), the process of getting the farmer and herder to use the AGRHYMET products is going to be difficult and time consuming. It will be a trial and error process, complicated by the fact that AGRHYMET's information is largely untested, and there will be errors in initial applications. Each time there is an error, the program may lose time and the attention of the potential user.

Another characteristic of the program which will directly benefit the farming and herding populations and the countries of the region generally, will be the introduction of an early-warning system to mitigate the consequences of future droughts. As with the other benefits, this too will depend on the establishment of more functional and reliable data measurement networks and the reporting of the data in "real time" to national headquarters and to the Regional Center. Such data can then be correlated with historical records, and with special climate/crop studies that are being planned, to permit increasingly accurate seasonal rainfall outlooks, thereby giving governments, farmers and the outside world several months of lead time to anticipate, to adapt and to take measures to soften the impact of adverse climatic fluctuations.

Opposition to the project is unforeseen, and if it does arise, is not expected to be direct. No one is threatened by a better planning and utilization of water resources for agricultural production, least of all, if all sectors of the user population are significantly drawn into the planning process. Conceivably, some indirect opposition may spring from the other sectors of administration who may argue that resource planning should be done by the production services.

The long-term strategy for water management in the Sahel is the integration of farmers, herders, and government technicians and planners into a multi-purpose, essentially agricultural economy that concerns and develops resources for future generations while it generates better living standards for everyone. The AGRHYMET Program offers some promise that the ecosystem in the Sahel can be better understood and made to produce sufficient food to feed the inhabitants.

III. ADMINISTRATION AND IMPLEMENTATION

A. ORGANIZATIONS

A major concern expressed by the Second Evaluation Mission (see report of April 1980) was the lack of clear designation of responsibility for direction of AGRHYMET. A working document, never formalized, which ostensibly reflected understandings between CILSS and WMO, served as the basis for program direction. However, responsibilities were vaguely defined and variously interpreted, resulting in inefficiency and friction in management and coordination. A new formal agreement between CILSS and WMO, signed on 16 March 1981, resolves that problem and provides the clear delegations, definitions of responsibilities and operational procedures essential for direction and management of this complex program. The program not only is complex in its technologies and network linkages and workings, but also in the number and variety of governmental and other organizations which participate. The framework for their participation in AGRHYMET program planning, development and operations is detailed in Annex D. These are the basic arrangements, in summary:

1. The participating CILSS countries are Cape Verde, The Gambia, Senegal, Mauritania, Mali, Upper Volta and Niger (Chad participation currently is minimal because of the unsettled political situation there). Through their coordinating directorate, CILSS, these countries have formally designated the World Meteorological Organization (WMO) as executing agency for their AGRHYMET Program.
2. WMO, from its headquarters in Geneva, Switzerland, provides administrative, technical and financial management backstopping to AGRHYMET.
3. A CILSS-nominated, WMO-appointed Director of the AGRHYMET Regional Center serves as scientific and technical coordinator of the AGRHYMET Program.
4. An Executive Committee, consisting of two representatives of each of the CILSS member states (chosen from among Directors of Meteorology, Hydrology and Agricultural Services), a representative of the CILSS Executive Secretariat, a representative of WMO, and (ex officio) the Director-General of the Sahel Institute and the Chairman of the Coordinating and Advisory Committee (see below), is responsible for supervising the implementation of the entire program on behalf of the CILSS member states, and for defining the objectives and guidelines for action and extensions of the program. This Committee also acts as Administrative Council for the Regional Center.
5. The Coordinating and Advisory Committee, consisting of a representative each from CILSS, from WMO, from UNDP, from UNSO, from any donor country, and (ex officio) the Chairman of the Executive Committee,

is responsible for coordinating international contributions necessary for implementation of the program.

With the clarification of arrangements contained in the new CILSS/WMO Agreement, there is assurance that administration and technical backstopping for the program can be reasonably smooth and effective, and that appropriate mechanisms are in place to identify problems and work out resolutions. While "committee-heavy" and, therefore, somewhat ponderous to address any crisis situations which might require quick resolution, nonetheless, it appears to be an appropriate institutional structure for a program involving so many different country and agency interests and participants. WMO is eminently suited to perform its executing function, both technically and administratively. Backstopping for the program primarily comes from the Sahel Division of the Technical Cooperation Office (The TC Office is concerned also with WMO projects in Asia, Latin America, and elsewhere in Africa). Also advising and assisting is the WMO Scientific and Technical Programs Directorate, particularly through the Office of Regional Applications. Planning and financial management backstopping is assured through the WMO specialized sections concerned (see IV-B1 and Annex D for fuller discussion of financial management arrangements).

Formal provisions are incorporated in the CILSS/WMO Agreement (Section V) relating to program evaluations and monitoring. For more detailed discussion of this, see Part V of this paper.

Under the Director-General, the AGRHYMET Regional Center in Niamey is organized with specialized divisions (Directorates) for the following functions:

- Training of agrometeorologists, hydrologists, instrument technicians, and, for these, ancillary training in practical applications for AGRHYMET-produced data and information.
- Activities and operations, including computer programming, telecommunications, data processing, data banks, data analysis (agrometeorological, hydrological, climatological), forecasting and climate assessments, transmission/dissemination, and maintenance of electronic equipment.
- Applied research, including liaison with external research organizations, which are concerned with applications in operational agrometeorology, economical use of water, utilization of hydrological data, and solar and wind energy; experiments and demonstrations in agricultural plots at the Regional Center and similar activities in the countries; and dialogue with users and potential users of AGRHYMET-produced data, information and analysis.
- General services, concerned with buildings and grounds, warehouse stocks, vehicles, printing services, utility services, repair workshops, and general housekeeping functions.

- Administration and financial management, concerned with accounting, disbursing, personnel management, office services etc.

These divisions are assured of proper functioning by expatriate (ex-Sahel) technical assistance during the period while qualified Sahelians are in training who can eventually assume full responsibility. Transfer of responsibility for supervising the divisions or for assuming full operational positions within the divisions will be accomplished on a case-by-case basis, whenever the Director-General is satisfied that the individual capabilities are sufficient.

AGRHYMET has important links with other organizations which are mutually supportive of their programs. Those relating to research organizations for development of practical applications have been discussed in Section I-B2. Other important coordination and liaison is as follows:

- ASECNA (Agence pour la Sécurité de la Navigation Aérienne) and AGRHYMET are cosignatories to an agreement which provides the program with access to synoptic meteorological data. AGRHYMET cooperates with ASECNA in using designated single side band radio frequencies to transmit and receive reports from observer posts scattered across the Sahel. Many of the directors of the Sahelian national meteorological services are also directors of the national representation of ASECNA. In some instances, the AGRHYMET national facilities are coincident with or adjacent to the ASECNA installations. The modernization of aviation navigation technology may impact on the role that ASECNA synoptic stations may play in the future. AGRHYMET, of course, has an interest in ASECNA continuing the meteorological reporting network.

- ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer), the French governmental research organization, relates to AGRHYMET in several ways, all in the area of hydrology:

- hydrology advisors are assigned, as needed, to AGRHYMET francophone national components under contract with WMO;
- responsible for conducting the hydrologic training courses at the Regional Center;
- the collection of rainfall data across the Sahel is assured by ORSTOM, and its collected records have been put on tapes in the AGRHYMET data bank.

- EAMAC (Ecole Africaine et Malgache d'Aviation Civile), with facilities in Niamey, Niger, is in charge of training meteorologists, primarily for employment within the ASECNA system. A formal accord exists with AGRHYMET which permits an exchange of students and instructors, so as to reinforce the level of training at each institution in fields of common interest.

- OMVS (Organisation de la Mise en Valeur du Fleuve Senegal): This river basin commission is a potential "user of the AGRHYMET data and information, much of it to be generated at observation posts within the watershed. Linkages and cooperation are to be strengthened and formalized as the AGRHYMET telecommunications and data processing units in the three member countries become operational within CY-1982.

- GRBO (Gambia River Basin Organization): The unique geographic/topographic situation of the Gambia will permit the installation under the AGRHYMET Phase II program, of a Continuous Broadcasting System (CBS). FM transmissions will enable the Gambian Agrometeorological Services to make weather information available to farmers within the river basin region.

- LCBC (Lake Chad Basin Commission): Resumption of contacts with the LCBC will depend in a large part on the improvement of the political climate in Chad. There exists a large body of data and information related to the Chad Basin that is planned to be incorporated within the AGRHYMET network in order to render Sahelian forecasting more effective.

- Sahel Institute (Bamako, Mali): Contacts to date with AGRHYMET have been tentative and preliminary, owing to the gradual development of a Sahel Institute role. While no specific coordination/collaboration arrangements have yet been formalized, it is expected that the Institute will be assuming functions of significant interest to AGRHYMET, particularly in areas of coordinating agronomic and other research activities in the Sahel.

- OCLALAV (Organisation Commune de Lutte Antiacridienne et de Lutte Antiaviaire): AGRHYMET's contacts with this regional crop protection/pest control organization are related to linkages with the Integrated Pest Management program. Advance warning of harmful insect and bird infestation are improved through better observation and more efficient communications.

- WARDA (West African Rice Development Association): Informal exchanges and visits to date are expected to be broadened, with an anticipated accent on cooperation in rice experimentation under Sahelian climatological conditions.

- Ecological Monitoring in the Sahel (625-0943): This activity is currently proposed for AID funding. If approved, AGRHYMET would hope to participate, along with national structures, in the identification of observation/reporting posts and in the establishment of ecological indicators, so as to maximize the potential for mutual reinforcement of programs.

- GERDAT (Groupement d'Etudes et de Recherches pour le Développement de l'Agronomie Tropicale): There is a good history of field cooperation and information exchange between French agronomic expertise and the AGRHYMET program. GERDAT experience is particularly advanced in certain technologies that interest AGRHYMET: irrigated cultures and windbreaks.

Within the participating countries, AGRHYMET functions are primarily a concern of the Hydrological Services and the Agrometeorological Services. UNDP finances technical assistance to these services which is back-stopped by WMO. Coordination between the services is provided by the ministry within which they operate (except for Niger, where two different ministries are involved).

US organizations which are concerned with planning, coordinating, supporting and monitoring US-financed assistance to AGRHYMET include:

- USAID/Niamey, where the Director is the official delegated responsibility for liaison with AGRHYMET, and for the implementation of the Sahel Water Data Network and Management Project 625-0940. A Project Manager is assigned (part-time) to perform the day-to-day monitoring which the project has required, and other USAID staff, notably the Controller and Program Office have performed supporting functions similar to those provided for bi-lateral projects. It should be noted that the USAID Director is the US representative on the AGRHYMET Coordinating and Advisory Committee. Allotments for US contributions to AGRHYMET are made to USAID/Niamey and the Director is signatory to annual grant agreements with WMO.

- AID inputs to AGRHYMET are through the above-mentioned grant agreements, but only discrete elements are funded for direct expenditure by WMO (usually budget line items for contributions to WMO administrative costs, Regional Center administrative costs, etc.). The major portion of US inputs is sub-obligated through a PASA with NOAA, as mentioned earlier. NOAA secures and provides technical advisors, consultants and services, procures and oversees the installation of equipment and administrative training fellowships in the U.S. Liaison between NOAA and AID/W is with AFR/DR/Sahel and West African Projects Office.

B. IMPLEMENTATION PLAN

Important implementation actions for Phase II include:

- Grant agreements between donor countries and WMO (various dates)
- Country agreements between participating Sahel countries and WMO (various dates)
- AID Participating Agency Service Agreement with NOAA (immediately after or coincidentally with Grant Agreement)
- Baseline evaluation study and reporting system development - at start Phase II
- Training at Regional Center (several various courses at various times during Phase II)
 - Outlining and scheduling courses
 - Securing teaching staff; organizing teaching materials
 - Announcing training openings
 - Evaluating candidates; selecting trainees
 - Conducting training
 - Arranging employment assignments in countries
- Training outside countries and Regional Center (numerous grants by various donor organizations for training in Europe, US and elsewhere)
 - Verifying needs for training
 - Identifying schools; determining qualifications
 - Announcing grant openings
 - Evaluating candidates; selecting grantees
 - Installing grantees in schools; follow-up
 - Arranging employment assignments in countries
- Equipment installations (different types for the agrometeorological and hydrological services in the participating countries)
 - Contracting for procurement
 - Site preparation (shelters, foundations, power and communications, connections)
 - Securing of consultant or expert services
 - Equipment shipment, receiving, inspection, delivery to sites and installation
 - Calibration and instruction in operation
 - Establishment and initiation of system of regular servicing, recalibration, preventive maintenance, depending on type and purpose of equipment
- Annual program reviews for each country (see V-B), various dates for individual countries which are determined year-by-year

- Annual plus special ad-hoc sessions of AGRHYMET Executive Committee which are scheduled on case-by-case basis
- Annual plus special ad-hoc sessions of Coordinating and Advisory Committee which are scheduled on a case-by-case basis
- Annual budgets for Regional Center operations prepared by Center Director and presented to Executive Committee and CAC
- Semi-annual seminars at Regional Center (see I-B2e), scheduled on case-by-case basis
- Other seminars scheduled ad-hoc, in countries or at Regional Center
- Regular WMO financial reporting on AGRHYMET budgets and expenditures (see IV-C1)
- In-depth evaluations, scheduled generally for near the end of calendar years 1983 and 1985

The multiplicity of actions, countries and implementing agencies involved in the Phase II integrated program would make for a massive and complex schedule, if all actions were consolidated and detailed in one exercise. Such an exercise has not been prepared by the WMO design team for Phase II integrated plan and implementation timing is presumed only by calendar years of planned funding. Based on the experience of Phase I, further detailing has been considered infeasible for such a program. Even general annual targets were very badly missed during Phase I because of many uncontrollable variables affecting the several countries. Implementation target dates for U.S. inputs during Phase I also were not met, for reasons discussed in I-A and elsewhere in this PP. It can certainly be expected that the best laid plans for Phase II will likewise suffer timing impediments or influence over which there is inadequate control. Nonetheless, an illustrative implementation schedule for U.S. inputs has been prepared for general information and for guidance to those offices which will be concerned with project monitoring (see Table III BI)

Illustrative Implementation Schedule -- AGRHYMET Phase II

(US Inputs and Actions by Calendar Year)

	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
	* * /	* * * /	* * * /	* * * /	* * * /	* * * /
Project Authorization (last QFY)	X					
Grant Agreement with WMO	X	X	X	X	X	
PASA with NOAA	X	X	X	X	X	
Baseline Study; Evaluations		X		X		X
Procurement Actions Initiated		X	X	X	X	X
Computers and V.P.S. Installed; Pencil and Tablet Digitizers Delivered Senegal, Mali, Upper Volta Niger and Cape Verde Mauritania			X		X	
Pencil and Tab. Digitizers Delivered to The Gambia and to Reg. Center		X				
Continuous Weather Broadcast Equip- ment Delivered and Installed The Gambia and Reg. Center Senegal, U. Volta, Mali, Niger Cape Verde, Mauritania			X	X		X
Communication System for Cape Verde NOAA Arranges Detailed Design Equipment Procurement Delivery and Installation		X		X X		
DEC Contract Renewal by NOAA For Calendar 1982	X					
For Calendar 1983		X				

The foregoing table does not indicate scheduling for NOAA technical assistance, which will continue through Phase II. Training is likewise not scheduled specifically since it will depend on the availability of qualified candidates. The sequence of processing candidates for U.S.-financed training is this:

1. Countries submit candidates' names and dossiers to the Regional Center, which reviews and nominates the candidates to NOAA.
2. NOAA determines appropriate schools and coordinates the acceptance of the candidates by the schools.
3. NOAA facilitates entry by the candidates and monitors progress of training. Keeps WMO, AGRHYMET and USAID/Niamey informed.

C. PROJECT MONITORING

1. The Integrated Program: As indicated in III-A, WMO is the executing agency and thus has primary responsibility for overseeing the progress achieved in project implementation. The Executive Committee of AGRHYMET is concerned with "supervising the implementation of the entire program..." but since the Committee meets infrequently (annually except for specially called ad-hoc sessions), its supervision is not on a day-to-day basis. Monitoring of project activities in the countries is a responsibility of the directors or the concerned services, with the advice and assistance of their UNDP experts. The Resident Representative of the UNDP in each country is charged with organizing annual reviews of progress in the particular country (see V-B). Coordination of donor inputs to AGRHYMET is a responsibility of the Coordinating and Advisory Committee which meets with the same frequency as the Executive Committee and thus has no day-to-day coordinating role. In practice, the Director-General of the Regional Center and the Chief of the Sahel Office in Geneva are mainly concerned with following the pace and achievements of the various segments of the integrated program, and in facilitating and coordinating implementation to the extent possible. Donor in-kind contributions are monitored through WMO financial management mechanisms (see IV-C-1).

2. Monitoring U.S. Participation in AGRHYMET: The implementing contractor for AID is NOAA (see III-A) which is charged with initiating, following and reporting on implementation actions. Much of this takes place in the U.S. (procurement of equipment, contracting for consultants, arranging for U.S. training). Installation of equipment in the Sahel is supervised by NOAA field personnel. As indicated in III-A, USAID/Niamey is delegated responsibility for overseeing the implementation in the Sahel of U.S. assistance to the AGRHYMET program. The Project Manager in USAID/Niamey performs the day-to-day monitoring functions in close liaison with NOAA field personnel and with the AGRHYMET Regional Center Director. He drafts the annual grant agreements with WMO and PASA agreements with NOAA and receives and reviews reports of progress and implementation as prepared by NOAA and the Center Director. USAID/Niamey also receives financial management reports from WMO/Geneva as mentioned in IV-C1.

USAID's in the AGRHYMET participating countries are regularly informed of project developments which are scheduled to occur in their respective countries, especially as concerns AID inputs to the Program. USAID's have designated responsible officers to serve as liaison for this purpose. To date, there has been little need to call on USAID's for assistance in project implementation, and generally USAID's are satisfied with being kept informed. A technique for improving their knowledge of the program status, achievements and problems might be periodic discussions with the UNDP officials who monitor the technical assistance provided in the countries, and who also are concerned with annual reviews (see V-B).

IV. FINANCIAL ANALYSIS

A. BUDGET TABLES

1. As currently detailed (ANNEX G), the Integrated Program Phase II totals \$66.6 million for calendar years 1982 through 1986, including elements proposed for U.S. funding. The participating countries would finance (in cash or kind) \$21.3 million of total costs, and donor organizations would be requested to contribute \$45.3 million. These estimates are considered by WMO as tentative and preliminary, inasmuch as country and donor commitments had not yet been coordinated at the time of preparation of the budget (see Part VI).

Proposed U.S. assistance would total \$7 million. Budget details of the U.S. assistance are at ANNEX E. They are summarized in TABLE IV-A as follows:

TABLE IV-A
SUMMARY COST ESTIMATED AND FINANCIAL PLAN

(US \$ 000)

Input Elements	Source	AID Grant		Host Country		Other(s)		Total
		FX	LC	FX	LC	FX	LC	
Technical Assistance		1710	---	---	---	10000	3804	15514
Equipment		1675	---	100	242	8500	1050	11567
Training		1075	---	---	1240	500	5539	8354
Construction		125	---	1000	3110	1300	1314	6849
Operation & Other		2415	---	4000	11547	4000	2314	24276
Totals (incl. 10 % infla. p.a.)		7000	---	5100	16139	24300	14021	66560

* U.S. amounts include apportionments of inflation and contingencies.
Total apportioned \$ 2,091.6.

2. Costing of Project Outputs/Inputs (in US \$000)

TABLE IV-B

Project Inputs	Project Outputs *				Total
	# 1	# 2	# 3	# 4	
AID Appropriated: Tech. Asst.	1150	390	---	170	1710
Equipment	1675	---	---	---	1675
Training	---	1075	---	---	1075
Operations & Other	---	---	1900	640	2540
Host Countries: Equipment	342	---	---	---	342
Training	---	1240	---	---	1240
Construction	4110	---	---	---	4110
Operations & Other	---	---	---	15547	15547
Other Donors: Tech. Asst.	---	6500	804	6500	13804
Equipment	8550	---	---	1000	9550
Training	---	6039	---	---	6039
Construction	2514	---	100	---	2614
Operations & Other	---	---	100	6214	6314
<u>Totals (incl. 10% inflation p.a. and contingencies)</u>	<u>19716</u>	<u>15294</u>	<u>1779</u>	<u>29771</u>	<u>66560</u>

* Outputs: # 1 - Facilities constructed and equipped
 # 2 - People trained
 # 3 - Applications developed
 # 4 - Operations conducted

3. Projection of Expenditures by Fiscal Year (in US \$000)

TABLE IV-C

Fiscal Year	AID	Host Countries	Other(s)	Total
1982	600	4000	6000	10600
1983	2500	5000	9000	16500
1984	2000	4239	8000	14239
1985	1000	4000	8000	13000
1986	900	4000	7321	12221
<u>Totals (incl. infla. and contingencies)</u>	<u>7000</u>	<u>21239</u>	<u>38321</u>	<u>66560</u>

B. AGRHYMET RECURRENT COST FINANCING

A realistic appraisal of the ability of Sahel countries to assume AGRHYMET recurrent costs must take into account the very difficult judgements which must be made by national decision makers when annual budget allocations are apportioned. Inevitably, perceived priorities relate to public and national security requirements in the first instance, national debt financing, basic civil service payrolls, basic public health and education requirements, and other fundamental imperatives. Financial burdens beyond these imperatives must take second priority. The countries face increasing difficulty in making any residual resources cover commitments they have already made. Reasons for this are several-fold.

The primary reason is the balance of payments gap which is becoming substantially larger annually in each of the Sahel countries. Increasing balance-of-payments problems, in major part, are due to their dependence on imported equipment, commodities and services which have suffered major inflation costs in the past several years. At the same time, the quantity of import requirements of these countries has been going up. Fuel to run generators for expanding electrical systems; replacement parts; cement and construction steel for new buildings; fertilizers and insecticides; new and replacement fleets of trucks and other vehicles; expatriate instructors and health technicians to supplement limited numbers of qualified nationals to cover expanded services are examples. True, there have been price increases for commodities which these countries export, but returns from these have in no case kept pace with the increases in their import requirements.

A second factor exacerbating the problem is the growth of basic services in the "imperative priority" category, including expansion and modernization of national security cadre and equipment (police, national defense); expanded highway systems to be maintained; and expanded government payroll resulting from returning trainees, graduates of agricultural and health extension in-country training, etc.

A third important reality in the imperative priority list is an ever-increasing national debt which must be serviced by each country. This concern is somewhat assuaged by the willingness of lending organizations to extend loan periods, re-finance, forgive interest payments arrears, and other considerations. However, the basic indebtedness continues to grow, including servicing commitments.

The financial facts of life within which national decision makers apportion available resources, therefore, impose on them harsh constraints as to allocations which can be applied to expanding recurrent costs. Costs easiest for them to give priority to relate to production-enhancing and income-generating activities, particularly those with substantial and early benefits which can be easily recognized and tapped to augment government revenues.

While AGRHYMET will certainly impact favorably on food production, and perhaps substantially, the impact may be over the longer term (after Phase II) as the networks are completed, as data is accumulated and evaluated in practical application terms, as effective dissemination systems are in place, and as farmers and herders develop appreciation and confidence that AGRHYMET information can be more valuable to them than their traditional experience. Much of the impact of AGRHYMET will be dispersed in production increases or loss reductions affecting large numbers of farmers. These may not be easily attributable directly to AGRHYMET "advisories" and information. Also, these increases, while reducing the countries' food deficits and requirements for imports, may be difficult to tap as increased sources of government revenue. Indeed, national policies promoting self-sufficiency in food production might be jeopardized if the farmers' incentives to increase production are dampened by taxes on such production.

This means that AGRHYMET cannot, for a relatively long time, offer to CILSS states a direct source of government revenues which can readily be applied to finance the country recurrent costs of AGRHYMET operations, or its contributions through CILSS to financing the regional AGRHYMET operations. In absence of such early revenues, AGRHYMET recurrent costs requirements will face unfavorable competition from other activities which have more immediate, direct and capturable (revenue) benefits. How long before AGRHYMET can expect more favorable priority will depend on current unknowns referred to above, and, particularly, on the acceptance by the farmers of AGRHYMET information and their effective application of that information. Other benefits from AGRHYMET (land utilization policies and decisions, dams and irrigation planning, environmental protection decisions, etc.) can be expected to give some incentive to governments to support AGRHYMET activities.

C. FINANCIAL MANAGEMENT SYSTEM AND CONTROLS FOR AGRHYMET

These are discussed in two parts: the AGRHYMET Executing Agency (WMO) general system and the arrangements specifically relating to application of U.S. funding.

1. WMO General System for AGRHYMET:

A new, vastly improved system was installed by WMO early this year which allows tracking of the application of funds for more meaningful and useful management, budgeting and accounting. The system contains these elements:

- a) Performance budgeting, with accounts coded to budget line items;
- b) Donor contributions tied to specific budget items which donors wish to finance, if they so request;
- c) A system of accounts and reporting broken down by appropriation (donor grant), obligations and disbursements, enabling donors to identify the use of their contributions. Statements provided each three months. Obligation documents recorded on these statements;
- d) Certified, audited statements published annually;
- e) Allotments to the substantive units of the Secretariat of WMO or to the activity managers in the field, based on estimated costs of activities. These also include contractual commitments for staff and for supply of utilities. Obligation documents drawing down the allotments are purchase orders, travel authorizations, special service agreements, and fellowship awards, among others. Allotments are cancelled at the end of each calendar year;
- f) Budget clearance is in WMO headquarters in Geneva, limited authority delegated to activity managers in the field for incurring obligations.
- g) WMO headquarters in Geneva performs internal audits. At his discretion, the external auditor of WMO may examine all records maintained by AGRHYMET.
- h) The World Meteorological Congress established the WMO financial regulations. These are applied uniformly to AGRHYMET as well as to all WMO headquarters and field activities.
- i) Five bank accounts are currently used for AGRHYMET: three CFA accounts in Niamey (imprest account, guest house, and an account for

students' housing), a trust fund \$ account in New York which is a pool account for all trust fund activities, and a swiss franc pool account in Geneva for all UNDP and Technical Cooperation Trust Fund activities.

j) The AGRHYMET system for authorization of payments is based on verification that the expenditures have been committed in an authorized way within the budget plan and that the invoices are accurate. Cases of expenditures exceeding obligations are reported to WMO headquarters in Geneva (except for minor differences within normal business practice). Over-commitment of funds allocated must be reported to WMO headquarters "with full details and explanations." No payment in such case is to be made prior to receiving headquarters' clearance.

k) Both at headquarters and in Niamey, checks must be signed by two WMO officers. They must be accompanied by the related invoice statements. Signing officers are designated by the Secretary-General of WMO.

l) The cash imprest account in Niamey is disbursed by the Center Director, or, by delegation, by the Senior Administrative Officer. Replenishment of up to a maximum of \$3,000 equivalent in CFA francs is based on submitted accounting records. Regular cash counts are conducted, with verification of balances against disbursement documents.

This new system of financial management will provide the knowledge of progress against plans which was lacking in the previous system, as observed in the report of the Second Evaluation Mission in April 1980. It also provides proper financial management delegations and controls to insure accuracy, efficiency and propriety in financial operations.

2. Obligations, Sub-Obligations and Expenditures Involving U.S. Contributions to AGRHYMET:

As mentioned in III-A, U.S. funding assistance to AGRHYMET (through the Sahel Water Data Network and Management Project) is allotted to the Director, USAID/Niamey for obligation by grant agreement with the World Meteorological Organization. For the most part, the U.S. reserves to itself the function of sub-obligating through a PASA arrangement with the National Oceanic and Atmospheric Administration (NOAA). Under the terms of the PASA, NOAA initiates contracts for equipment, technical services and training required as U.S. inputs to AGRHYMET. NOAA makes all necessary administrative arrangements from its Washington office. Provisions for NOAA's reporting of its activities on behalf of the project have been insufficient during Phase I, particularly as regards specific actions such as contractual commitments, equipment procurement,

status of shipments, funding committed and expenditures. USAID/Niamey has had difficulty monitoring the use of PASA funds and the total status of implementation. This has not been so critical a problem inasmuch as nearly all NOAA implementation actions involve the Regional Center in Niamey, and the AID Project Manager in USAID/Niamey has maintained very close liaison with the Regional Center direction. However, specific reporting procedures and detailed requirements for NOAA will be specified in the PASA agreement for Phase II. It will include clear statements as to elements and amounts authorized for funding, discretionary flexibility in use of funds, and details needed in regular financial reporting.

Certain elements of the U.S. grant agreement with WMO involve cash grants to WMO for specific budget purposes. During Phase I, these included U.S. contributions toward construction of the Regional Center (WMO implemented and multi-donor funded), U.S. contributions to WMO costs of administering AGRHYMET and U.S. contributions to certain operating costs of the Regional Center. \$125,000 for construction is included in the U.S. inputs budget for Phase II, and some operational support is contemplated (see IB2e and Annex A). The new financial management and reporting system of WMO will provide complete and timely information on sub-obligations and expenditures by WMO for this purpose. Monitoring these and NOAA accounting reports will continue to be a responsibility of USAID/Niamey. It will particularly involve the Controller and the Project Manager.

WMO audit systems are considered to be appropriate and adequate. However, U.S. grant agreements with WMO include the usual standard provisions which permit AID to have access to accounting records relating to use of U.S. funds.

V. EVALUATION AND MONITORING

A. SUMMARY OF ARRANGEMENTS

The agreement between CILSS and WMO establishes the structure and operation of the AGRHYMET program (Annex D). It provides for routine annual reviews involving CILSS member states, UNDP, WMO, and representatives of donor countries and organizations which may wish to participate. There is also provision for the organization of periodic evaluation missions comprising representatives of the same organizations. These missions visit installations implemented under the program to assess in depth progress and problems encountered and to recommend further operations. WMO proposes three such evaluations: one soon after the commencement of Phase II which will establish benchmarks, procedures and guidelines, and the others near the end of CY's 1983 and 1985.

Implementation administration and USAID project monitoring are discussed in Section III-C; financial reporting and audits are in IV-B.

B. ANNUAL REVIEWS/MONITORING

The annual reviews and monitoring follow UNDP guidelines covering tripartite projects. UNDP is the primary donor organization assisting AGRHYMET. The guidelines are addressed specifically to:

- 1) measuring the progress of project activities and sub-activities and the production of outputs against established schedules and indicators of progress;
- 2) identifying and assessing factors affecting the progress of project activities and sub-activities and the production of outputs;
- 3) assessing the prospects of the project achieving its immediate objective;
- 4) reviewing steps taken by the governments to utilize the project's results, when available, as part of a program of coordinated, inter-dependent efforts aimed at achieving the development objective to which the project is related;
- 5) identifying necessary actions, and deadlines by which they should be carried out, in order to take opportunities for improving, or correcting, problems relating to the implementation of the project, and to use results effectively; and

- 6) specifying the parties which will be responsible for taking necessary actions.

The annual reviews are performed country by country. They are designed to identify actions necessary to assist the implementation of the project. The reviews are based on progress reports prepared by the Director of the AGRHYMET Regional Center who serves as the scientific and technical coordinator of the integrated program (see II A and Annex D); on project implementation plans and base-line data; on reports from previous annual reviews, and on budget and expenditure reports. The UNDP Representative in each country takes the initiative to schedule the reviews. A senior WMO representative is designated to participate. The country representative has usually been a senior official of the Planning Ministry (level of Directeur de Cabinet). Reports of the reviews are submitted to the countries, CILSS, WMO the Regional Center and to donor organizations.

C. PERIODIC IN-DEPTH EVALUATIONS

These evaluations cover the total integrated program in area and scope. The terms of reference are prepared by WMO and sent for information to CILSS and to donor organizations. The composition of the team is intended to provide a substantial element of independent or quasi-independent evaluation through qualified officials or consultants who have not been directly concerned with the formulation and implementation of the project. Illustrative of the terms of reference are those provided by WMO to the Second Evaluation Mission for AGRHYMET. The mission submitted its report in April 1980 to the Coordinating and Advisory Committee (CAC-V/Doc. 6, 14IV 1980). The TOR is in three parts: program implementation, future needs and management considerations.

1. Implementation: evaluation of progress made since previous review, problems encountered in implementation, and recommendations for resolving problems. In particular:

- progress in strengthening the national meteorological and hydrological services;
- structure for coordination of meteorological, hydrological and agricultural activities and the working of these;
- implementation progress against development objectives;
- the efficiency of the services' operations and the supply of inputs for operations;
- the state of the networks; evaluation of stations;

- system for maintenance of equipment and networks;
- issuing of meteorological and hydrological advisories, warnings and other communications; and
- contributions to the project, both national and international.

2. Future Needs: Analysis of the project in its different national and regional components, taking into consideration the installation of an operational system of data collection, analysis and dissemination. In particular, to study the countries' needs for agrometeorological and hydrological information, as well as for its broadcasting to potential users by the national centers and the Regional Center.

3. Management Considerations:

- the administrative structure and successes and problems encountered in management of the different national and international contributions; and
- the terms of reference and the functioning of the Executive Committee and the Coordinating and Advisory Committee as well as their relations with WMO in the implementation of the project.

The experience of the second evaluation exercise indicated the desirability that the time frame for in-depth evaluations should be sufficient to ensure adequate review of the AGRHYMET program and elements in each of the participating countries as well as for the Regional Center. This is especially important for a program of high technology with wide dispersion of many stations and operating cadre over eight countries, varying successes and problems country-by-country, and a multiplicity of donor interests, activities and contributions. USAID officials concerned with advising on the integrated program and with monitoring US assistance inputs will ensure that the time and funding allocated for these evaluations is appropriate to permit a satisfactory result. Where single country tripartite evaluations may be feasible within a three or four week period, a program such as AGRHYMET needs a substantially longer period for a comprehensive review.

D. EVALUATIONS OF PURPOSE AND GOAL ACHIEVEMENTS

Not until the end of Phase II is it expected that the operational networks and systems will be in place and fully functioning. Therefore, the system of annual and in-depth reviews will primarily address input and output achievements relating to the AGRHYMET network structure and operational expertise during the initial years of this phase. However,

attention will be given to progress in the development of other program elements which will be essential to effective practical applications of the weather and climatological information which the fully operating system will provide:

- development of specific applications and tailoring of data gathering, analysis and dissemination processes to best facilitate those applications;
- involvement of potential end-users (farmers, herders, agricultural extension and other agricultural services officials, environmental protection officials, river basin development officials, national planners, etc.) in dialogue with AGRHYMET. The objective of this involvement is to develop users' appreciation of the system and its potential benefit, and to enlist their participation in developing meaningful information content and appropriate dissemination methods (see I-B-2-e).

Without these elements, goal objectives will not be achieved in any early time frame and the program will not have the significant impact expected in Phase III. Some countries may be able to enjoy direct benefits during the later years of Phase II, if their country systems are fully developed and made operational early in Phase II. Evaluation of these benefits will doubtless be subjective at first. Evidence that information is getting to potential users, indications that such individuals are using the information to make judgements and operational or planning decisions can be used as evaluation indicators. Positive impact of decisions on production, environmental protection, etc. will require progressive analyses over considerable time. This may be exceedingly difficult to quantify in a cause-effect relationship. It cannot be expected that goal achievement indications will be significant during Phase II.

VI. CONDITIONS ; NEGOTIATING STATUS

AGRHYMET Phase II planning has been under discussion by the participating Sahel countries, WMO and donor organization representatives for nearly a year, culminating in the integrated plan which is Annex G. This plan is tentative and it must be reviewed and formally accepted by the countries and donors. In concept, there should be little problem in its acceptance, since it is based on a system and technology which was developed and accepted at the beginning of Phase I, and has been in implementation for five years.

This Project Paper urges that the U.S. encourage and financially assist the WMO to conduct a careful re-assessment of the ultimate AGRHYMET system structure as currently designed, and to seek options which would be more affordable to the participating countries (see I A and Annex H). Such an assessment should be done with care to ensure that the program will achieve a technically balanced and useful operational system, and that the system and operations will provide information of direct benefit to farmers and herders, as well as to other users. The following Condition Precedent should be incorporated in the U.S. Grant Agreement with WMO which will obligate first year funding for Phase II:

"Prior to disbursement of funds to WMO for activities in support of the Phase II program (Annex G of the Project Paper), and with the exception of funds provided under this Grant Agreement to continue activities initiated in Phase I, the World Meteorological Organization shall provide to A.I.D. a financial plan reflecting donor and CILSS country commitments necessary to carry out the Phase II integrated program ultimately agreed upon by the AGRHYMET Executive Committee and the CILSS Member States."

Sahel Water Data Network and Management -- Phase II

Project 625-0940 (AGRHYMET)

- Goal - To facilitate decisions by farmers, herders and national planners which will improve agricultural and other planning and operations, and increase production output.
- To facilitate decisions by national planners for more rational policies and action plans relating to land use and environmental protection/conservation.
- Goal Indicators - Improved production; reduced losses due to weather problems.
- Improved national planning decisions and actions
 - Relating to land use
 - Relating to water exploitation
 - Relating to environmental protection/conservation
 - Relating to estimates of production and food deficits.
- Verification
- Forecasts and statistics re harvests and production
 - Project plans for agricultural development schemes
 - Environmental impact evaluations
 - Erosion control, dune stabilization and other environmental improvement/protection schemes
 - Transhumance and migration trends
 - Project evaluations.
- Goal Assumptions
- Primary producers and national planners gain confidence in accuracy of AGRHYMET information and in potential value of applying this information in production and other planning and operating decisions
 - That sufficient economic, social and environmental benefits are achieved as to motivate countries to assume their share of AGRHYMET continuing costs
 - That national pricing policies for food staples are an incentive to farmers to maximize their production.
- Progress Toward Goal -- Phase I
- Governments participating in AGRHYMET planning and initial "User" seminars
 - Five countries have organized inter-ministerial committees, including agriculture, for coordination and planning of AGRHYMET-related activities.
- Further Progress Expected -- Phase II
- AGRHYMET information solicited by and available to primary producers and national planners
 - Beginnings of application of AGRHYMET information by users.

Purpose - To develop a regional system, including national elements, which will record, process, interpret, transmit, disseminate and document complete, timely, accurate and meaningful weather and climatic information in the Sahel.

End of Project Status (Purpose)

A. End of Phase II

- AGRHYMET equipment and operating personnel are in place and functioning in the participating countries and in the regional center.
- System for maintenance of equipment is operational, including instrument calibrations, and equipment repair and replacement when required.
- System for maintaining operational expertise is functioning, including training for replacement personnel and for maintenance and upgrading of skills.
- User needs have begun to be identified and information for dissemination is tailored to those needs.
- Progress towards a phase-out of technical assistance.

B. After Phase II

- Mechanism for incorporating continuing advancements in technology for recording, analyzing, disseminating and applying weather and climatic information is in place and functioning.
- Support for specific applications development projects directed towards AGRHYMET.

Indicators (Purpose)

- Equipment installed
- Equipment accurately and adequately performing
- Operating personnel assigned and adequately performing
- Training regularly conducted at Regional Center; other training being given
- User seminars, inter-ministerial committees and other AGRHYMET/User collaboration activities conducted
- Project evaluations

Assumptions (Purpose)

- That the schedule for outputs can be met
- That the equipment and training given are adequate and appropriate for the operating system
- That participating countries fully cooperate and coordinate with AGRHYMET operations
- That applications of significance can be identified and developed
- That information can be responsive to user needs in form, scope and time.

Outputs

- Regional Center built and furnished at end of Phase I; training capacity enlarged for twenty more trainees during Phase II
- Regional Center Sahelian faculty in training Phase I and on the job during Phase II; technical assistance to Center begins to phase out at end Phase II
- Equipment for Regional Center procured Phase I; installation completed and equipment operational Phase II
- Training of personnel for the national services commenced at the Regional Center during Phase I; continues during Phase II with increased emphasis on practical applications
- Development and experimentation of practical applications begun at Regional Center at end Phase I. Expanded and emphasized during Phase II with trials in some countries. Full applications and continuing research after Phase II
- Personnel and training needs in countries identified during Phase I and training commenced in-country, at Regional Center (see above) and outside Sahel. Training completed in Phase II, except for replacement personnel and for re-training which continues beyond Phase II. National services fully staffed with trained personnel by end Phase II.
- Equipment and rehabilitation/replacement needs in countries identified during Phase I and implementation begun; rehabilitation and replacement completed during Phase II

Magnitude of Outputs (End Phase II)

Observation stations in six CILSS countries outfitted and/or rehabilitated

Personnel completed 62 person years of training

Training capacity for 70 students at Regional Center

Telecommunications network within six member countries and link with Regional Center

Data processing and dissemination equipment in place in countries and at Regional Center

Verification

- AGRHYMET reports
- Evaluation exercises

Assumptions relative to Outputs

- That the planning for the Phase II integrated program has been complete and realistic
- That inputs are timely, including donor and participating country funding and procurement and training actions
- That qualified candidates for all training requirements can be found.

(US \$ 000)

<u>Inputs for Phase II *</u>	<u>US</u>	<u>Countries</u>	<u>Other Donors</u>	<u>Total</u>
Technical Assistance	1710	----	13804	15514
Equipment Purchases	1675	342	9550	11567
Training	1075	1240	6039	8354
Construction of Facilities	125	4110	2614	6849
Oper. Support and Other	2415	15547	6314	24276
Totals	7000	21239	38321	66560

* AGRHYMET Phase II is CY 1982 through 1986. US inputs will be funded and obligated FYs 1982 through 1986. See Annex E for details.

CONCEPTUAL PLAN

WHO SAHEL PROGRAMME

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CENTRE FOR TRAINING AND APPLICATIONS
OF AGROMETEOROLOGY/OPERATIONAL HYDROLOGY

(WMO SAHEL AGRHYMET PROGRAMME)

1. INTRODUCTION

This conceptual plan describes the goals which the WMO Sahel AGRHYMET Programme should have achieved at the end of the phase now being implemented, and outlines the infrastructure considered necessary to ultimately obtain an optimum operating level. It is thus a substantiation of certain ideas formulated by Professor Bernard as the "Horizon 1980" after his mission through the Sahel countries in 1974. A detailed implementation programme of the timing and inputs required to achieve these goals is presented in a separate document.

2. OBJECTIVES

The objective of the AGRHYMET Programme is to assist the Sahelian countries to strengthen the national Meteorological and Hydrological Services, so that they can play their proper role in the application of meteorology and hydrology for their national economic development. In particular, these applications should further the utilization of scarce water resources and contribute to increase agricultural output, reduce its cost and minimize the undesirable effects of meteorological and hydrological constraints on agricultural production.

Types of products and services required by users

These goals can be achieved by providing the rural community in its widest sense (government services involved in economic, agricultural and water resource planning and the services concerned with the application of such planning, as well as farmers, herdsmen, etc.), with meteorological and hydrological information relating to activities such as the following:

- The water regime experienced by the major crops on the major soil types and the prospects of its evolution.
- Irrigation requirements of irrigated crops.
- Risks of the outbreak of diseases and pests.
- Meteorological conditions affecting agricultural operations, such as sowing, weeding, fertilizer application, pest control, harvesting and storage.
- Adverse meteorological conditions, such as extreme temperatures and humidities affecting crops in their different stages of growth.

- The probabilities of occurrence of rain, frequency of drought, periods of excessive winds and other phenomena which affect agricultural production.
- River flow and incidence of floods and low flows.
- Flows affecting the operation and management of small and medium size water reservoirs at the village level.
- Hydrological regimes in water courses affecting public health, navigation, water supply and other activities.

The above list is not exhaustive and, as knowledge about the relationship between weather and agricultural production increases, more requirements will be formulated and should be met. Information might also be provided to health services, urban and transportation authorities, etc.

3. STRATEGY

The above information will be obtained through analysis of meteorological, agrometeorological and hydrological observations from the Sahel countries and elsewhere. This analysis will be based in part on statistical treatment of accumulated data, in part on the interpretation of real-time data and, in part, on a combination of these two techniques. Weather forecasts may also be used. This approach requires:

- The existence of properly functioning networks of synoptic, agrometeorological, climatological, hydrometric and pluviometric observing stations.
- An organized system of data management and processing.
- A telecommunication system adapted to the needs of data transmission.

An assessment of the amount of observations involved has indicated the need for data management and processing to be done by a mini-computer on the national scale and by a medium-sized computer regionally.

At present, an infrastructure exists to serve the essential goals of the World Weather Watch. Elements of an infrastructure supporting other applications of meteorology and hydrology also exist, but their exploitation could be improved. Where possible, this exploitation will be carried out by national Services. In those cases for which data on a regional rather than a national scale are required, as well as in those cases where staff and equipment are not available at national centres, the Sahel AGRHYMET Centre will, within its terms of reference, assist countries, as required. This necessitates reinforcement of, and co-operation between, both the national Meteorological and Hydrological Services and regional infrastructures involving these disciplines.

The reinforcement of the regional infrastructure includes the establishment of the Sahel AGRHYMET Centre. This centre will have a co-ordinating rôle, where required, and will participate in the analysis of observations and the preparation of information for dissemination, the regional training programme and the evaluation and application of new technologies to aid and increase agricultural production. The creation of a Sahel AGRHYMET Centre is the most advantageous, rational and economic strategy to meet users' requirements, due to the scarcity of highly-qualified personnel and sophisticated technical facilities in each national Service. The reinforcement of the national Services is discussed below.

The strategy covers the following four phases:

- The existing situation;
- The expansion phase now being implemented;
- The phase of development leading to the optimal operating level;
- The phase of operation thereafter.

Details of the developments to be implemented in each phase are described in the implementation plan.

Strengthening of national Services

The following features are included in the plan to strengthen and consolidate national Services:

- (a) Acquisition of buildings to accommodate national Services;
- (b) Training of staff within the country (Class IV, agrometeorological and hydrological), provision of fellowships for other training elsewhere;
- (c) Observational network installation and instrumentation and facilities for its maintenance;
- (d) Methodology of observations;
- (e) Data collection;
- (f) Data transmission and verification;
- (g) Data analysis at the national level, on a statistical as well as a real-time scale;
- (h) Definition of arrangements for data diffusion;
- (i) Data storage at the national level;
- (j) Formulation of institutional arrangements which best serve the requirements of each country.

For all activities within the national Services, maintenance and repair facilities will have to be created, maintenance procedures agreed upon and competent personnel trained.

Observational networks

The observation networks will include synoptic, climatological, agrometeorological, hydrometric and pluviometric stations.

The actual number of stations is insufficient and the instrumentation of some existing stations is incomplete. The number of stations needs to be increased and instrumentation upgraded.

Observations from selected stations will be transmitted in real-time. Data from other stations will be collected in delayed mode.

Data management and processing

Data management and processing will be required both at the national and regional levels:

(a) The national level

(i) Data collected in real-time

Data received in real-time (by telecommunication) at the national centres will be recorded, verified and archived, and converted into a form suitable for rapid processing by mini-computer. This processing includes verification, analysis for those programmes for which only observations on a national scale are required, and preparation for onward transmission, if such data are required for analysis at the Sahel AGRHYMET Centre or a World Weather Watch regional centre. They are also made available for storage in the national data banks;

(ii) Data collected in delayed mode

Data collected in delayed mode will also be included for processing by mini-computer. After verification, they will be stored in data banks and remain instantly accessible for analysis. Data from stations transmitting in real-time will be corrected by comparison with data submitted periodically;

(b) The regional level

(i) Data collected in real-time

Real-time reception at the Sahel AGRHYMET Centre will consist of data originating from the World Weather Watch centres and data originating from satellites. They will be received on a medium-sized/high-speed computer, so that the information for users can be obtained rapidly;

(ii) Other data:

Data submitted periodically by mail to national centres will be transmitted in semi-processed form to the Sahel AGRHYMET Centre for inclusion in the regional data bank. Batches of back data will be included, as soon as received, or converted for storage on the computer.

Data processing of real-time and other data includes programmes for which data on a regional scale are required, as well as those for which national mini-computers lack the necessary capacity.

The establishment of both a national and a regional data bank is necessary. Each bank has its own function in statistical analyses. The regional bank serves non-real-time analyses that require either the data from a wide area, or analyses for which the capacity of the national mini-computer is insufficient. Together with national data banks, it provides mutual security in case of loss through power failure at either side, or of erasures during processing. It also provides easy access for regional or inter-state users outside the direct sphere of the AGRHYMET Programme. Data banks will be organized to permit ready access by weather parameters, by station or by time.

The system of collection, processing and storage of hydrometric data at national level will have to be co-ordinated and agreed with national Hydrological Services.

Telecommunications

Telecommunication arrangements for real-time data collection and distribution to meet the needs of the AGRHYMET Programme are required on a national and a regional scale. These arrangements will make use of existing facilities, where possible, but will also demand upgrading of the Global Telecommunications System in the Sahel area, as well as establishment, in some instances, of additional facilities and circuits.

These arrangements should permit the following:

- Collection of observations at national centres;
- Exchange and distribution of data within the Sahel, including provision of data to the Sahel AGRHYMET Centre;
- Reception of data and products from centres outside the Sahel;
- The distribution of outgoing information addressed to national Services within the Sahel area and within countries.

An important aspect of the organization of a telecommunications system in the Sahel countries is the establishment of adequate equipment maintenance and repair services. The establishment of such services, as well as the training of maintenance and repair technicians should be properly phased, relative to the installation of additional equipment.

Dissemination of processed information to users

Information formulated at the Sahel AGRHYMET Centre on the basis of the data obtained will be retransmitted to headquarters of national Services by telecommunications. Distribution within the country of this information and of that formulated locally will be a national responsibility.

This responsibility will be shared by representatives of the Meteorological, Hydrological, Agricultural and Public Information Services and others, as necessary.

The information may be disseminated nationally by the issuing of circulars to government services, as well as by broadcasts to reach primary agricultural producers.

4. DEVELOPMENT AND APPLICATION OF NEW TECHNOLOGIES CONTRIBUTING TO INCREASED AGRICULTURAL PRODUCTION

Agricultural production can benefit from the introduction of certain new technologies. Some of these are purely agronomic, operational or technical, and are outside the scope of the Sahel AGRHYMET Centre. A number of other new technologies have very definite meteorological aspects.

Some of these technologies, having been developed in other countries, semi-arid or not, must be tested and perhaps modified before they can be introduced in the Sahel. Participation of the staff and use of the facilities available at the centre is clearly indicated. Examples are the use of winds-breaks with their positive and negative effects, the determination of the most economical use of water, the incidence of either low soil, water and air temperatures or excessively high temperatures that interfere with crop development and growth, the incidence of wind and humidity conditions that prevent pollination of crops. These activities will also be incorporated in the teaching programme of the senior students. Once properly evaluated, messages concerning these new technologies may be incorporated in the information for users issued by the centre.

5. TRAINING

Strengthening and expansion of activities of national Hydrological and Meteorological Services can only be achieved if sufficient additional staff can be trained. Because of its specialization and cost, such training (except for that of observers) needs to be organized centrally for the Sahel (and perhaps other African) countries.

The Sahel AGRHYMET Centre provides training for technicians in hydrology for technicians (Class III) in agrometeorology and for agrometeorologists (Class II). Class I training in agrometeorology may be included at a future date. A survey of personnel requirements and, consequently, of training facilities was made in 1974. While accurate at that time, the increasing recognition of the importance of the agrometeorological and hydrological services by the Governments of the Sahel and neighbouring countries has led to the conclusion that the training facilities will become a permanent aspect of the centre. After an initial heavy training programme of agrometeorologists and hydrologists to satisfy immediate demands, a training programme, with a reduced frequency of courses, will have to be envisaged to face up to natural staff turnover. Then, specialized courses, such as maintenance of telecommunications equipment, maintenance of specialized meteorological and hydrological observation equipment and automatic weather stations, interpretation of satellite data, data processing, etc., will be given. Also, after the initial heavy demand from the Sahel countries has been satisfied, demands for training from neighbouring countries, already expressed, may increase and may have to be met. The training programme of the centre should therefore include facilities permitting the dispensing of four courses, at any one time, in a selection of the subjects mentioned above, with a total number of 40-50 students present at the centre at any one time. The building plans of the centre do indeed provide for training in these various disciplines.

6. OTHER ACTIVITIES OF THE SAHEL AGRHYMET CENTRE

The centre plays a co-ordinating role in the formulation of common procedures and methods, in so far as these have not yet been accepted, the planning of networks near the national boundaries and the free exchange of information. It will keep an up-to-date inventory of all stations in the Sahel and the type of observations made at each station. It will promote the collection of soil physical data used in the calculation of the water balance.

It will participate in operational testing of instruments, observation and data analysis techniques, including testing of automatic weather station and comparison of instruments. It will promote the exploitation of information from operational meteorological satellites and Lonsat-type data.

The centre will make its data available for applied research into the mechanism of weather and water balance in the Sahel, which may lead to improved forecasts.

All the major features of the centre's activities will benefit from provisions to enable visiting staff from other semi-arid areas to participate in their execution. Such visits can be encouraged by the provision of facilities and the availability of a steady flow of data. Visiting staff may participate for periods varying from one to six months or a year.

7. SPECIFIC ASPECTS OF THE HYDROLOGICAL COMPONENT OF THE SAHEL AGRHYMET PROGRAMME

The activities in hydrology, both at the national and regional level, have specific aspects which should be provided for in the implementation of the conceptual plan.

At the national level, the success of the implementation of the plan will largely depend on institutional arrangements concerning co-operation between the Meteorological and Hydrological Services. These arrangements will have to follow institutional patterns which are different in each of the countries of CILSS, ranging from a joint Hydrometeorological Service in Gambia to completely independent Services in several other countries. As a guiding principle, as far as practical and possible, joint planning and exploitation of networks, of data processing and storage, will have to be adopted. In most of the CILSS countries, the data from hydrometric stations and rainfall stations for hydrological purposes are processed according to a system introduced by ORSTOM, and the merits of this system will have to be adopted and further developed by national Services.

Telecommunications facilities for national Hydrological Services are, at present, practically non-existent (with the exception of Mali). Maximum use of the World Weather Watch system and other national meteorological telecommunication facilities will have to be made. Telecommunication for real-time data transmission for hydrological purposes will be necessary only for hydrological forecasting. Such forecasting is, at present, either operating or planned on the Upper, Middle and Lower Niger river and on the Bani and Benoué rivers. Furthermore, the region of the inner Niger delta is, at present, under intensive study and the network planning, as well as the data collection system in this region, will have to take into consideration the needs of this study. Telecommunication facilities used for hydrological forecasting will be co-ordinated with the meteorological system within and outside the World Weather Watch, although a certain degree of independence in the operation of the hydrological telecommunication systems will have to be conserved, in particular with respect to projects implemented by the River Niger Commission and the Organisation pour la mise en valeur du fleuve Sénégal.

The use of computer facilities at the centre for purposes of secondary processing of hydrological data and analyses will have to be co-ordinated with RNC and other regional water resources institutions in the region.

Due attention will have to be paid to the fact that Hydrological Services are generally part of several governmental institutions, most often connected either with exploitation of water resources for hydropower, agriculture (irrigation/génie rural) or with respect to groundwater, with geology and mines. The institutional arrangements will therefore need to be adapted to local conditions in each country.

8. CO-OPERATION WITH FAO AND OTHER AGENCIES AND ORGANIZATIONS

(a) Co-operation with FAO

In the implementation of the programme, the co-operation of and participation with FAO will be useful in the following types of activities:

- The collection of phenological data and information on studies of crops;
- Participation of a plant pathologist, an entomologist and an expert in irrigated crops on a part-time basis, the analysis of data transmitted to the centre and the formulation of information for dissemination;
- The evaluation of new technologies that will improve agricultural production;
- The training of members of the agricultural extension services in the use of this information.

This list is by no means exhaustive and, as the impact of the programme develops, new areas of co-operation will undoubtedly become identifiable;

(b) Co-operation with other agencies and organizations

The Sahel AGRHYMET Centre will co-operate with all other agencies and organizations involved in the economic development of the Sahel countries to make basic data available to itself and to other organizations and to promote the application of the processed information. In the field of hydrology, its activities will, in particular, be co-ordinated with those of the OMVS, RNC, Lake Chad Committee, for which organizations the centre will act as a source that provides basic and processed information.

10. CONCLUSION

The implementation of the above concepts is detailed in the implementation plan of the AGRHYMET Programme, a summary of which is given here.

This plan distinguishes four phases:

- (a) The existing situation; (in 1976)
- (b) The expansion phase that is now being implemented; (1976-81)
- (c) The expansion phase after which the optimum operating level will be reached; (1982 through 86)
- (d) The phase of operation thereafter.

(a) First and second phases (through 1981)

At the end of the second phase, national Services will dispose of a fully operational synoptic network and a minimum-requirement network of agrometeorological, climatological and hydrological stations. A data management and processing system, conceived to meet ultimate requirements and an adequate telecommunication network will be operational. Institutional arrangements will have been defined. The building programme of the Sahel AGRHYMET Centre will have been terminated and its data management and processing service will have completed its developmental stage. The training programme will be fully established and the other activities of the Sahel AGRHYMET Centre will all have been launched.

(b) Third phase (1982 to 87)

During this phase, the networks of all observing stations will obtain their optimum operating level, and data management and processing systems and telecommunications circuits will reach an advanced operational level. Training of staff will satisfy initial demand and national Services will be adequately manned. External support for the programme, as now envisaged, comes to an end during this period. The size of possible additional outside assistance is associated with the amount of new activity in the fields of hydrology and agrometeorology that will be undertaken in the different countries;

(c) Fourth phase

During this phase, the CILSS countries will be fully responsible for the operation of the centre. A general outline of the budget of the centre, as from 1979 onwards, is in preparation. When certain aspects of the centre's forecasts, warnings, messages are clearly beneficial for outside users (neighbouring countries, inter-state development agencies, or commercially-oriented organizations), outside contributions would be a logical compensation for costs incurred. Outside financing of non-routine activities could be part of general technical assistance programmes to the Sahel.

The cost of the operational aspects of national Services will be entirely borne by the national governments concerned from resources available to them.

TECHNICAL ANNEX

AGRHYMET PHASE II - COMMUNICATIONS AND DATA PROCESSINGA. COMMUNICATIONS

The AGRHYMET information system requires data from many sources and must distribute tailored products to a variety of users. Figure A.1 depicts the current and planned communications system for obtaining raw and processed data, for distributing products to the National Meteorological Centers (NMC's) and other users, and for disseminating information to end users from the NMC's. A description and discussion of the system follows.

A.1 Inputs to AGRHYMET

Four types of data are required by AGRHYMET to perform its functions adequately. They are surface based observations, upper air observations, remote sensed data, and products produced by large numerical weather prediction centers (NWPC's). These data are available somewhere in the World Meteorological Organizations' (WMO's) World Weather Watch (WWW) now; however, AGRHYMET is limited as to what it can receive.

A.1.1 Surface Observations

This type of observation consists of conventional meteorological, climatological, aviation and agrometeorological data. These data are received from outlying stations at the NMC's by mail and by single-side band radio. The single-side band radio network is being expanded to include agrometeorological and hydrological stations. The Gambia network is complete and installation work is underway in four other countries. Data received from these outlying sites are critical to defining the state of the environment, to provide ground truth for satellite based observations, and for highly specialized agrometeorological use. The data will be transmitted on the ASECNA low speed teletypewritersystem to AGRHYMET, to other NMC's and to NWPC's.

A.1.2 Upper Air Observations

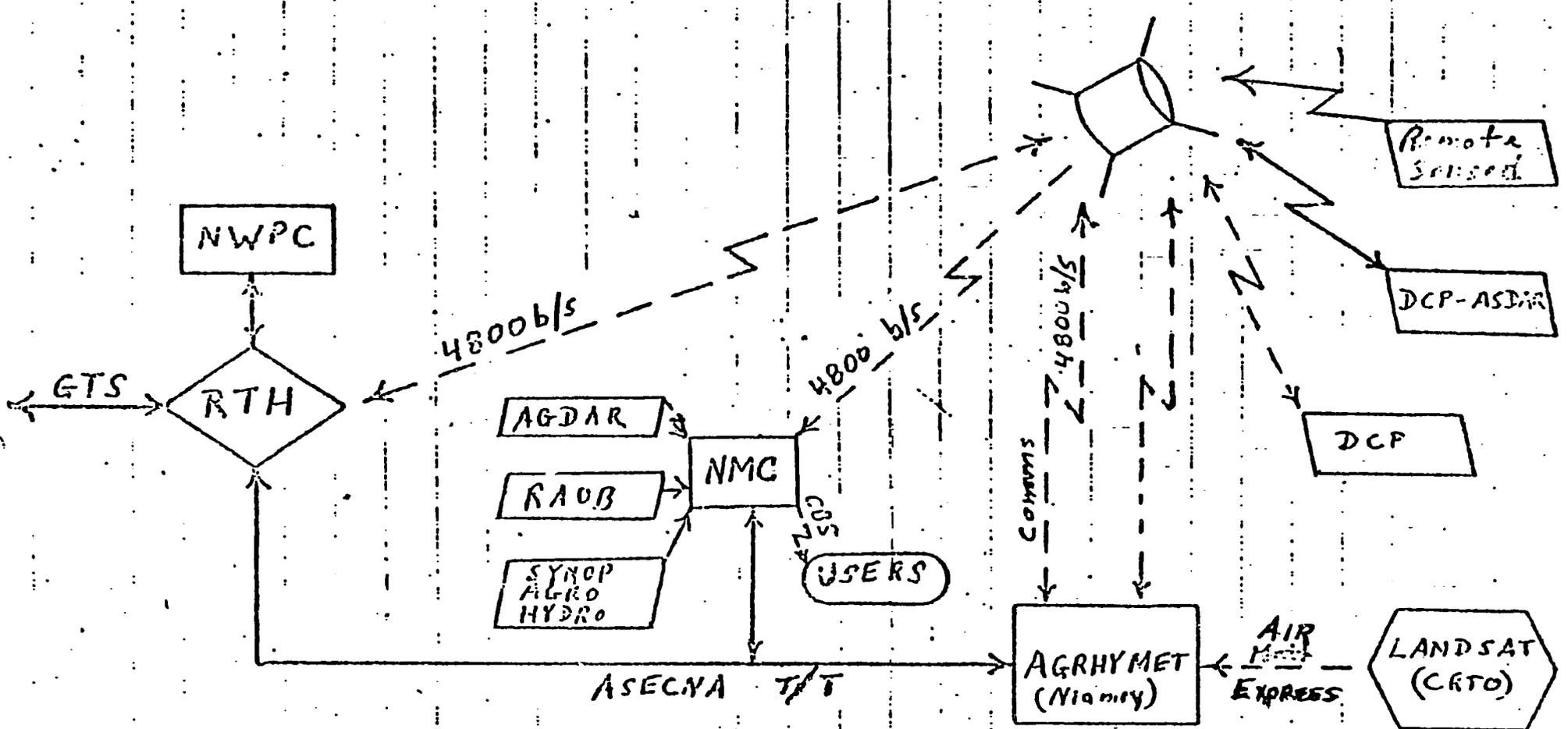
This type of observation consists of conventional radiosonde (balloon type) observational and automated aircraft reporting (AAR). Radiosonde observations are taken at one location, usually at the airport, in most of the countries. These data are also transmitted on the ASECNA teletypewritersystem for use by others.

The automated aircraft reporting system is new and under development outside the AGRHYMET program. The AGRHYMET Plan must take account of this system since it is now operational on a limited basis and since it should be expanded considerably during the next five years. Africa is a relatively sparse data area and

(As Part of The World Weather Watch)

AGRHYMET COMMUNICATIONS SYSTEM

FIGURE A.1



Legend:

- Processing Centers
- Message Switching Center
- End Users
- Subprocessing Center
- Observations
- Communications Installed or Under Construction
- Communications Planned

automated aircraft reporting can help to fill large gaps in the upper air data network by providing good flight level data enroute and good temperature and wind profile data during aircraft ascent and descent at airports. These data will help immeasurably to describe the atmosphere over the Sahel and this in turn will benefit AGRHYMET directly. Again, these reports will provide ground truth so necessary to get the best use of meteorological satellite data.

Two methods of automated aircraft reporting are being integrated. The first is the ASDAR (Aircraft to Satellite Data Relay) which is operating now. A data collection platform (DCP) is placed on wide bodied aircraft. The DCP transmits data to geosynchronous meteorological satellites which in turn transpond the data to the satellite control centers. The data are then placed on the GTS (Global Telecommunication System) so they can be used by large numerical weather prediction centers as the World Meteorological Center on Washington and the Medium Range Weather Forecast Center in Reading, England.

The second method uses the same DCP but transmits the data directly to ground stations. This is called AGDAR (Air to Ground Data Relay). Observations can be taken as rapidly as six per minute to provide a near equivalent to a radiosonde. Since wide bodied aircraft such as the DC-10 and the B-747 fly into most of the Sahel countries, there is a great opportunity to acquire these data when the aircraft are equipped with AARS. Airlines such as Air Africa, UTA, Air France, Sabena and others flying into Africa should be encouraged and perhaps even supported to place AARS on board appropriate aircraft. However, ground stations are required at each National Meteorological Center to receive and control the air-to-ground data transmissions. The data from the aircraft would enter the minicomputers at each NMC, would be reformatted according to GTS standards, and would be transmitted directly onto ASECNA teletypewriter system for distribution to others including the NWFC's.

A.1.3 Remote Sensed Observations

Remote sensed observations are taken by meteorological satellites and by land satellites (LANDSAT), LANDSAT data will be received and processed at the CRTO in Ouagadougou, Upper Volta. These data will be ready for distribution from CRTO to AGRHYMET 10-15 days following a satellite pass. Since this is non-real time data, special handling delivery should be arranged with airlines. For example, a messenger would carry the package to a scheduled airline in Ouagadougou and another messenger would receive the package from the airline in Niamey. Special arrangements with the airline and with customs will be required to make this work smoothly. It is not practical to use telecommunications at this time to distribute LANDSAT data to AGRHYMET and to the NMC's. However it would be appropriate to consider using digital LANDSAT sometime in the future when the data are readily available.

Meteorological satellites provide data in analog and digital formats. The analog or APT (Automatic Picture Transmission) format can be received on equipment already provided to AGRHYMET and to some NMC's. Imagery produced from the equipment are in paper form in low to medium resolution. The imagery produced are useful for general forecasting but are not suitable for computer processing.

Digitized satellite data are distributed by satellite in raw and processed forms. It is not appropriate for AGRHYMET or the NMC's to receive the raw digitized data since large computers and complex processing is required. It is appropriate, and in fact necessary, for AGRHYMET to receive the processed data in order to perform its missions. Raw data acquired by satellite are sent to a central station which consists of a command, data acquisition and tracking station, an operations control center and a pre-processing center. The pre-processing center references and conditions the raw data, handles data from the DCP's and distributes these digitized processed data to meteorological processing centers through a channel in the meteorological satellite.

Meteorological processing centers, such as the specialized processing center of AGRHYMET, can receive and extract those satellite data needed for their activities if equipped with an appropriate satellite receiving terminal. The integrated plan calls for an in-depth study concerning the use of satellites for data acquisition and communications for AGRHYMET in the context of the World Weather Watch Program.

Data received by AGRHYMET would be used in conjunction with surface and upper air observations to produce quantitative rainfall analyses. These analyses would be combined with centrally produced numerical weather prediction forecasts to produce various types of forecast and warning information for agriculture and hydrology. AGRHYMET has computers installed and operating which can be used for producing these user-tailored products. FAO has proposed to convert existing computer software of NOAA to operate on the AGRHYMET computers. The computer programs would produce high resolution quantitative precipitation analyses using combined satellite and surface data at AGRHYMET. Therefore, implementation of the FAO proposal and installation of the satellite receiver are the basic ingredients for AGRHYMET to make major advances in Agrometeorological assessments in "near real time" (within twelve hours after a phenomenon occurs).

A.1.4 Centrally Produced Products

The purpose of the WMO Global Data Processing (GPDS) is to make available to all members of the World Meteorological Organization processed information which they require for both real-time and non-real time application, with a minimum of duplication, using the most modern computer methods. The GPDS is organized as a three level system consisting of World, Regional, and National Centers. The AGRHYMET Center falls into the category of a specialized regional center.

To minimize duplication and to follow the GPDS scheme, AGRHYMET would receive centrally produced products from either the European Mid-range Forecast Center in Reading, England, or the World Meteorological Center in Washington, or both. The products would be in GRID form for use in agrometeorological and hydrological analysis and forecasting. Products to be received include spectral forecasts out to at least ten days, analyses, and climate assessments, as well as the digitized satellite data. The centrally produced products would be delivered to AGRHYMET by satellite along with the digitized satellite data.

A.2 Outputs from the AGRHYMET Information System

The inputs to AGRHYMET outlined in Section A.1 are essential to create products needed for agriculture, hydrology, and economic planning. Emphasis will be placed on the importance of maintaining the national surface observation networks at a high level of quality and on the importance of on-time communication of the observations to the NMC's, to AGRHYMET, and to the Global Telecommunications System. Without these observations at AGRHYMET and at the large numerical weather prediction centers, good analyses and ground truth for satellite based observations cannot be made and, as a consequence, information produced for the end users may be inaccurate or not useful.

There are three levels of product output - products from the large numerical weather prediction centers, products from AGRHYMET, and products from the NMC's. Output from the NMC's to the end users is referred to as product dissemination. Output from the NWPC's and the AGRHYMET is referred to as product distribution. In this way a distinction is made between communications of meteorological information within the meteorological system (distribution) and communication of meteorological information and products to end users (dissemination) who may be farmers, economists, planners, and other non-meteorologists or hydrologists.

A.2.1 Distribution of NWPC Products

NWPC products would be distributed to the AGRHYMET Center and to the NMC's by satellite. Transmissions would be all digital to allow alphanumeric, graphics and imagery data to be transmitted on a single channel. This will provide better error control, will provide more flexibility in scheduling, will minimize equipment and complexity of operation, and will help to minimize management complexities. Installation of analog equipment should cease and resources should be reprogrammed to go digital in order to minimize obsolescence, not only in the Sahel, but in all developing countries.

A.2.1.1 Initially products from the NWPC would be distributed via a meteorological satellite which has a communications transponder. AGRHYMET and the NMC's would receive products at least 2400 or 4800 bits per second depending on the capability of the meteorological satellite. Digital printer/plotters will record the information. Printer/plotters are able to print 1000 132-character lines per minute, to print conventional weather charts from run-length-coded digital transmissions, and to print low to medium quality digitally coded imagery. Since the communications channel will also be connected to the minicomputers now being installed at the NMC's, GRID data from the NWPC's will be available for processing by each country and by AGRHYMET to produce localized user-tailored products.

It is recognized that the distribution capacity of the meteorological satellite may limit the number of products to be received by relatively low cost ground terminals as the area of NWPC service expands beyond Sahel. Also there is a possibility that the meteorological satellite may become inoperative for months such as recently experienced with Meteosat. Therefore, provision will be made to use commercial communications satellites to ensure continuity and to provide the flexibility necessary for receiving and transmitting between more than one NWPC or Regional Telecommunications Hub (RTH) of the GTS.

The AGRHYMET Center will have installed a Primary Data Users Station (PDUS) to receive via a broad band meteorological satellite channel, processed satellite imagery and radiometric data in digital form. Data will be ingested to currently operating computers at AGRHYMET to provide the basis for detailed analyses, forecasts, and warnings. Verifications would be developed as part of a progress indicators program.

AGRHYMET would also receive NWPC GRID analyses and forecast as well as other centrally prepared information, in its operation. Since NWPC models and products for the tropics require further research and development, the Meteorological Laboratory at AGRHYMET would be expected to use NWPC products as the benchmark for improving numerical and statistical forecasting procedures over the Sahel.

A.2.2 Distribution of AGRHYMET Products

AGRHYMET products will be distributed in two forms - alphanumeric and graphic. The alphanumeric and graphic products will be distributed in near real-time via telecommunications.

As shown in Figure A.1, alphanumeric products will be distributed via the ASECNA teletypewriter network. This network is the same used for transferring observational data among the NMC's, AGRHYMET and the GTS. This network is now operational; however some NMC connections to the network still need to be made. Observational data flow from The Gambia NMC to ASECNA has recently become operational and data from some other NMC's should begin to flow within the next two years. The plan calls for staffing AGRHYMET to begin analysis and synthesis of data and to begin preparing products for distribution during the 1983-84 period. At that time the ASECNA teletypewriter system will be used to distribute AGRHYMET alphanumeric products.

Distribution of AGRHYMET graphic products could not begin until at least 1985-86 time period since the study results regarding transmit capability from AGRHYMET via satellite to the NMC's and to the Regional Telecommunications Hub will not be known for some time. Transmission rate is expected to be at 4800 b/s in order to handle digital graphics depicting in detail analyses and forecasts of various meteorological, climatological, agricultural, and agrometeorological elements. Since this communication channel will be digital, alphanumeric messages will also be included to avoid saturating the ASECNA system as the volume increases. An alternate means of distribution would be through direct link with PTT's.

A.2.3 Dissemination of AGRHYMET Products

The final link to get information to the end users is the responsibility of the National Services. This link is called dissemination and consists of two types - mail and continuous broadcast system (radio).

Mail or messenger is an already established means for providing users with published information. This information consists of weather and climate summaries, literature of an educational nature, as well as information pamphlets. These materials are not particularly time critical and therefore mail is satisfactory. The integrated plan calls for making more printed information available.

Some information is time critical. If provided to the users quickly, it can improve the probability of success in meeting the AGRHYMET objectives. A continuous broadcast system will be installed to transmit on standard 88-108 MHz frequencies to get information to the end users. These frequencies are standard on all commercially available radios, routinely-purchased by the populace. This is the key to reaching users in the field without imposing added expense on them which they can ill afford. It will also allow those who cannot read to benefit from AGRHYMET. Table A.1 lists some benefits to be derived from timely dissemination of some forecasts by user category.

Table A.1

Benefits of Timely Forecast of Dust Storms
and Severe Weather

User/Recipient

Agriculture	Cost saving, increased production
Aviation	Safety of life and property
Recreation and Public Functions	Safety
Construction	Safety
Fishing	Safety and increased production
Harbor Operations	Safety and cost saving
Health Clinics	Life saving
Pest Control	Cost saving

Three types of material will be disseminated by continuous broadcast. Routine information such as current weather conditions, forecasts, agricultural advice concerning planting, irrigation, pest control, plant growth and yield predictions, and hydrology information will be broadcast in segments and continuously cycled. Each segment will be updated individually as new information becomes available. Alert and warnings are a second type. These will be broadcast on short notice and preceded by an alert signal controlled by the NMC. The third type consists of educational materials. Segments will be 5-10 minutes long and contain explanations about new farming techniques, how and when to control pests and blight, when and where to move herds and other similar information. All three types will be broadcast by voice so those who have not yet learned to read or write will be able to benefit from the information.

The continuous broadcast will be transmitted using FM. A primary channel, which can be received by all FM radios, will carry the information explained in the previous paragraph. A secondary or stereo channel will continuously broadcast precise time information. Only those with commonly available stereo FM receivers will be able to hear time information. By including time information at the outset, usefulness of the information will begin to evolve over the years as the societies become more sophisticated. It will also help to maintain synchronization of the observing networks.

A third component of the continuous broadcast system is transmission of teletypewriter data in ASCII (CCITT Alphabet 5) code. This will be carried on a subcommunication portion of the stereo channel. Special receivers will be required to receive the teletypewriter data. This will not be a problem since only the more sophisticated users such as ministries, construction teams and transportation enterprises will need paper copy of the information to avoid allocating time to listen to a voice broadcast and take notes. Much of the information transmitted by teletype will supplement and contain more detail than the voice broadcast.

This technique of dissemination provides highly reliable dissemination at low cost. It is relatively fast to implement and can be very effective. It is the last link in the chain to get AGRHYMET information to the end users.

The first installation of the continuous broadcast systems will be in The Gambia, the only country now prepared. Its single-sideband data collection network is complete and operational and Gambia is now connected to the GTS. Its computer system is operating and being programmed. Its maintenance staff is trained and its National Meteorological Center is staffed sufficiently to operate the continuous broadcast system. Furthermore, PTT has informally agreed to provide a channel on its rural telephone system to carry the broadcast to the transmitters and to install and maintain the rural equipment, providing initial equipment, spare parts, and specialized maintenance training are provided. PTT will also provide power at each of the sites. The Gambia has indicated that there should be no problem in obtaining approval for frequency allocation. Since The Gambia is willing to take on the CWB now, it is an opportunity for the AGRHYMET Program to move ahead in the field of dissemination without impacting the large number of activities planned for the Regional Center. Experience learned in The Gambia will be used in extending CWB Sahel-wide.

A.3 Summary

This section has described the AGRHYMET communications system in the context of the World Weather Watch (WWW) and the Global Telecommunications System (GTS). It has outlined the system in terms of inputs to the AGRHYMET program and outputs expected to benefit the National Services and the end users.

The National Services are gradually increasing their capabilities through training and outside assistance. It is reasonable to expect that assistance from the large Numerical Weather Prediction Centers in the form of products now available can make substantial impact on National Service Operations today and in the future on a continuous basis. Satellite data tied to surface and upper air observations for ground truth is the only practical and economical way to fill extensive gaps in

the observation network over Africa. This communications system design for AGRHYMET is tied to this concept of operation. It fits within the context of the World Weather Watch Program and together with well trained people the system will help to reach the objectives of AGRHYMET.

B. DATA PROCESSING.

Minicomputers were purchased for the eight National Meteorological Centers and for the Regional Center during Phase I. Five are installed and operating. The minicomputer installed in the Gambia is the only one installed outside of the Regional Center. The four installed in the Regional Center are being used for training and software development as is the Gambia computer. The remaining five minicomputers will continue to be held in storage until the National Services are prepared to receive and use them. Preparation requirements include properly constructed facilities, installation of uninterrupted power systems, environmental control systems, at least two people trained as computer maintenance technicians and at least two people of Class II level trained in programming and in the use of the computers. These are the minimum requirements which were stated in the 1977 plan for data processing. The policy has been and will continue to be not to ship minicomputers to National Services until these minimum requirements are met.

The computers for the National Services were selected to provide basic automatic data processing capability for training purposes, for preparing a variety of climatological, agricultural, and hydrological data analyses, summaries, and reports; for quality controlling and archiving operations; for automatically preparing and transmitting observation messages for transmission directly to teletypewriter and other data communication systems; and for receiving data from communications for use in the NMC. Several of the computers were linked together and demonstrated to operate in a network fashion before being accepted from Digital Equipment Corporation at the factory. When adequate communications links are installed, the computers can be linked together for AGRHYMET operations.

The computer systems will be adequate for the next two years while people are learning to use the machines and while relatively simple programs are prepared to do the jobs originally intended. Later, hard disks, a printer/plotter, increased memory, and several other items may be added to those systems installed, through integrated program funding. These will improve the system capability by more than ten times. This capability will be needed to execute complex programs and to handle the increased number of users and applications. Three key applications which will be automated that are not scientific are accounting and finance, logistics, and station management. These are required to help facilitate management planning, and operations of the observational networks and the agrometeorological information system.

Power is becoming more critical in the Sahel countries as they develop. Power outages are becoming more frequent. Therefore backup power systems where they do not already exist will be installed at the same time the computers are upgraded providing funds become available. This will ensure continuity of operations of the National Meteorological Centers. Without continuity of operations, data needed for analyses and forecasting will not be available and the dissemination system will not operate to get information to the users.

A microfiche reader/printer and a microfiche duplicator, self-study training materials, and a pencil and tablet digitizer for installed computers are included in the integrated system budget. The microfiche equipment will be needed as data being archived by Belgium becomes available. The training materials will facilitate training with each country and the pencil and tablet digitizer will allow countries to quickly and more accurately convert observational data recorded in graph form on paper to digitized form which can be used for computer processing. Maintenance, expendables, and replacement parts and tools will be required on a continuous basis.

B.1. Quantitative Precipitation Analysis.

The FAO (Food and Agriculture Organization) has proposed to convert and modify existing software which will produce detailed quantitative precipitation amounts from a combination of meteorological satellite and surface observation data. Initial evaluations indicate great potential for use of this technique in the Sahel. If final technical evaluations are satisfactory, the scheme should be implemented. Costs for this have been included in the integrated plan. One cost component includes an FAO person's salary and expenses for five years to convert the software, to implement it on the AGRHYMET computers to refine the technique for applications to the African Sahel, and to train and advise agrometeorologists in AGRHYMET to use the results operationally. Farmers, hydrologists, and others will receive more specific and more accurate information they need to help increase food production and to manage water resources. The second cost component to implement this application includes a satellite ground station to receive the digitized data. This has been discussed in detail in Section A concerning telecommunications.

B. 2. Data Archiving.

The Institut Royal Meteorologique in Brussels has an on-going project to archive meteorological observations for CILLS. The archiving includes microfilming, original documents converting the data to computer magnetic tape, merging observational files from other organizations such as ASECNA, performing data quality control, eliminating duplication, and preparing archive quality microfiche and digital storage of the final product. A set of magnetic tapes for the computer containing historical data are now in the tape vault at AGRHYMET.

The project is laborious and time-consuming. Four full time people and a supervisor who spends part of his time on the project are required for the next five years to complete this work. Part of this work will also include the design of the AGRHYMET data archives system, the transfer of the archive to AGRHYMET and to train AGRHYMET personnel in the operation and maintenance of the archive. Assistance from outside the Institut will be used during the design to ensure that the system conforms to WMO and other international standards.

This project must be completed in order to provide the data base for climatological assessments and for applications development. The budget includes this activity.

B.3. Staffing Standards.

Since data processing and telecommunications are so closely linked in terms of maintenance and operations, the staffing standards for the National Meteorological Centers and for the Regional Center have been combined. Table B.1 lists the recommended number of computer specialist personnel necessary to conduct an adequate data processing and telecommunications operation at a National Meteorological Center and for the Regional Center. Table B.1 is divided into two parts - one for a full 24 hour operation and one for a limited operation of 8-12 hours a day. Table B.2 presents the standards for electronics personnel. Neither table includes personnel required in the field nor expatriates needed to provide technical assistance.

Data quality control specialists and computer operators are both Class III computer specialists. In the case of the NMCs the same person may perform both functions. At the Regional Center, however, these functions have been divided to take account of the workloads and the complexities of the jobs.

Four expatriates are currently required for data processing and telecommunications. Two are now resident at the AGRHYMET Center in Niamey. One is the NOAA technician responsible for installing and maintaining hardware throughout the AGRHYMET program. He is also responsible for developing the AGRHYMET logistics system and for providing other technical assistance as required. A second expatriate is a Digital Equipment Corporation software specialist under contract to NOAA to provide direct technical support for all computers. Part of his job includes conducting short courses and in the use of the computers. A third expatriate is an electronics technician provided by NOAA to assist in procuring, installing and maintaining computers and telecommunication equipment. He is based in the United States and travels throughout the Sahel as required. The fourth expatriate, also based in the U.S., is a NOAA person who has overall responsibility for the NOAA portion of support provided to AGRHYMET.

These four expatriates provide the management, technical assistance, and on-the-job training needed to ensure the systems are installed and implemented properly and to provide advisory assistance until the countries are able to take full responsibility for their own operations.

TABLE B.1For computer Specialists24-hour Operation

	<u>Regional Center</u>	<u>National Center</u>
Class I	4	1
Class II	5	1
Class III	7 + 6	5
Class IV	8	3
	<u>30</u>	<u>10</u>

Daytime Operation Only

Class I	4	-
Class II	5	2
Class III	3	2
Class IV	4	2
	<u>13</u>	<u>6</u>

TABLE B.2For Electronics Personnel24-Hour Operation

	<u>Regional Center</u>	<u>National Center</u>
Class I	2	1
Class II	5	2
Class III	3 Instruments	-
Class IV	-	-
	<u>10</u>	<u>3</u>

Daytime Operation Only

Class I	1	-
Class II	3	2
Class III	-	-
Class IV	-	-
	<u>4</u>	<u>2</u>

Programme for the strengthening of the Agrometeorological and Hydrological Services of the Sahelian countries and establishment of a Centre for training, research and applications of agrometeorology and operational hydrology

A G R E E M E N T

between

THE PERMANENT INTER-STATE COMMITTEE FOR DROUGHT CONTROL IN THE SAHEL
(CILSS)

and

THE WORLD METEOROLOGICAL ORGANIZATION

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I. PURPOSE OF THE AGREEMENT

The purpose of this agreement is to describe the structure and operation of the Programme for the strengthening of the Agrometeorological and Hydrological Services of the Sahelian countries and the establishment of a Centre for training, research and applications of agrometeorology and operational hydrology, and to define the rôles and responsibilities of the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS) and also of the World Meteorological Organization, in implementing this Programme.

II. ORIGIN AND OBJECTIVE OF THE PROGRAMME

A. Origin

1. Following the severe drought which began in 1969 in the Sudano-Sahelian area of West Africa, and which reached catastrophic proportions after the rainy seasons in 1972 and 1973, six countries (Chad, Mali, Mauritania, Niger, Senegal and Upper Volta) decided to set up the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS). The Gambia joined the CILSS in 1974, and the Cape Verde Islands in December 1975. Resolution 5, adopted in March 1973 at a meeting of the Ministers of these countries, requested the assistance of international organizations specializing in the study of problems relating to drought, including certain meteorological problems.

2. Resolution 1759 (LIV), adopted by the Economic and Social Council in May 1973, requested bodies within the United Nations - each acting under its terms of reference - to organize the necessary assistance, in order to meet the requests made by the Governments of the Sahelian region concerning their medium and long-term needs.

3. During a meeting, at which the agencies of the United Nations, governments, inter-governmental and non-governmental organizations were represented and which was held in Geneva in June 1973, proposals were made concerning the general lines along which the activities of the United Nations agencies should be developed within the framework of medium and long-term programmes.

4. At its first meeting held in Ouagadougou in September 1973, the CILSS adopted resolutions, requesting -

- (i) Hydrometeorological, agrometeorological and climatological studies.
- (ii) The setting up of sub-regional centres for applied meteorology, responsible, in particular, for -
 - (a) Training staff.
 - (b) Agrometeorological studies, enabling early warnings of crop failure to be issued.
 - (c) Precipitation enhancement experiments.

5. The reports submitted to the CILSS by the commissions of the meeting of experts, which preceded the Conference of Heads of State and the Council of Ministers, give additional information on the intentions of the Sahelian countries, as follows - Commission No. 1 - Agricultural and hydraulic engineering for agriculture, recommended the setting up or strengthening at national level of services responsible for data collection and research in the fields of climatology and water resources, in order to facilitate the implementation of projects in all sectors of the economy. Commission No. 2 - Environment and climatology, recommended the setting up of infrastructures which would provide essential information for agricultural economics, specifying the setting up or re-structuring of national Meteorological Services, increasing the density of observing networks, the provision of equipment, the creation of archives and a centre for studies. This Commission also mentioned, in particular, studies on possible precipitation cycles, the use of satellite pictures and improvement of forecasting methods.

6. From the outset, WMO has worked in close collaboration with CILSS and representatives of the CILSS Member States, in order to develop a programme for technical co-operation, to achieve the afore-mentioned objectives. For this purpose, a UNDP/WMO/FAO mission (May/June 1974) defined in detail the needs of the seven countries and prepared a "Programme for the strengthening of the Agrometeorological and Hydrological Services of the Sahelian countries and for the establishment of a Centre for training and applications of agrometeorology/operational hydrology". A conceptual plan and implementation programme were drawn up in separate documents.

B. Objective

1. The long-term objective of the Programme is to contribute to the social and economic development of the Sahel, by -

- (a) Continuously and adequately monitoring the meteorological and hydrological conditions by means of up-to-date observing networks.
- (b) Improving the understanding of these conditions and their variations in order to be able to forecast them.
- (c) Applying this monitoring and this understanding to human activities, more particularly to agriculture and livestock rearing, with a view to increasing and regulating the production of the resources which essentially originate in the atmosphere.

III. MANAGEMENT OF THE PROGRAMME

Implementation of this Programme calls for financing from various sources and therefore requires a well-structured organization. Two Committees have been established for this purpose -

- The Executive Committee of the Programme.
- The Co-ordinating and Advisory Committee.

1. The Executive Committee is responsible for -

- Supervising the implementation of the entire Programme on behalf of the CILSS Member States.
- Defining, on behalf of the Member States, the objectives, guidelines for action and then extensions of the Programme.

This Committee acts as the Administrative Council for the Centre under the conditions laid down in the Statutes of the Centre.

The composition of the Executive Committee, its detailed terms of reference and the way in which its functions are established in the annexed Regulations which form an integral part of the present agreement.

2. The Co-ordinating and Advisory Committee is responsible for co-ordinating international contributions whether financial or otherwise, necessary for the implementation of the Programme.

The composition of the Co-ordinating and Advisory Committee, detailed terms of reference and the way in which its functions are established in the annexed Regulations which form an integral part of the present agreement.

3. Liaison between these two Committees is ensured by representation of both CILSS and WMO on both Committees as well as by having the Chairman of each Committee as ex-officio member of the other Committee.

4. WMO, in association with FAO, has been officially designated by CILSS and UNDP and by the donor countries and organizations as the Executing Agency for the Programme.

IV. FINANCING OF THE PROGRAMME

A. Financing by the CILSS Member States

The Member States will provide the necessary services, material and facilities for implementing the Programme, in accordance with the project documents signed by CILSS, UNDP and WMO. They also subsidize the expenses of the Centre through the CILSS.

B. Financing by UNDP

1. The approved contribution of UNDP relates, on the one hand, to the Centre's training component and to the strengthening of the national Services, on the other. Details of this contribution are indicated in the afore-mentioned project documents.

2. The CILSS Member States will continue to include the implementation of national projects in their UNDP national programmes.

C. Financing by donor countries and organizations

This financing covers the extension and operation of the Centre and the buildings necessary for certain national Services, on the one hand, and the operational and applications aspects of the Centre, on the other - telecommunications material, data processing, expert services, agricultural equipment, establishment of an experimental service for users, programme of applied research.

2. Donations in cash or in kind, intended for the implementation of the Programme, are managed by WMO in accordance with the directives of the Co-ordinating and Advisory Committee and in view of the needs defined by the Executive Committee. There are specific agreements between each donor and WMO for these donations.

3. WMO and the CILSS are under the obligation to keep each other regularly informed regarding these donations received in cash or in kind.

D. Budget of the Centre

A consolidated budget has been instituted for the AGRHYMET Centre, governed by the financial provisions annexed to the present agreement.

V. EVALUATION

1. The usual procedures for evaluation of projects implemented under UNDP provide for tripartite annual reviews involving CILSS Member States, UNDP and the Executing Agency. Following these reviews, a report is prepared which, after being approved by the three parties concerned, constitutes the basis for subsequent action. Since the Programme is also financed from sources other than UNDP, the donor countries and organizations will be invited to participate in these tripartite reviews.

2. There is also provision for the organization of periodic evaluation missions, comprising representatives of CILSS, UNDP, the donor countries and organizations and WMO, which will visit the installations implemented under the Programme, analyse the progress made and the problems encountered and prepare recommendations for further operations. The terms of reference of these missions will be prepared by WMO and sent for information to CILSS, UNDP and the donor countries and organizations.

3. Apart from these reviews and evaluation missions, the Member States, CILSS, UNDP and the donor countries and organizations will receive half-yearly reports prepared by the Director of the Centre.

VI. RESPONSIBILITIES

A. General responsibilities

1. The Member States, CILSS, UNDP, the donor countries and organizations and WMO participate in the implementation of the Programme and in achieving the Programme objectives as described in the conceptual plan and implementation programme.
2. Each of the parties participating in achieving the Programme objectives is under the obligation to take no unilateral action which would be in contradiction to the terms of the present agreement.

B. Responsibilities of the Members States and of the CILSS

1. The Members States and the CILSS shall provide national personnel, training facilities, land, buildings and equipment as well as other services and facilities necessary for the implementation of the Programme, under the conditions specified in the project documents.
2. The Member States shall continue to pay remuneration in local currency and appropriate allowances to national personnel assigned to the Programme who receive grants during the time they are required to be away from the location of the Programme in order to receive training.
3. The Member States shall defray all customs duties and other dues in connexion with equipment imported for the needs of the Programme and transport, handling, storage and related expenses within the country. They shall be responsible for the safe storage of the equipment, its installation and maintenance, insurance and, if necessary, replacement after delivery to the location in which the Programme is being implemented.
4. Subject to the security regulations in force, the Member States and the CILSS shall make available to WMO all the reports, maps, files and other information, whether published or not, which might be regarded as necessary for the implementation of the Programme.

C. Responsibilities of UNDP and of donor countries and organizations

1. UNDP and the donor countries and organizations shall, through WMO, provide, for the purposes of the Programme, the services, equipment and facilities described in the implementation programme.
2. Details of the UNDP contribution as regards both the national projects and the AGRHYMET Centre are given in the budget contained in the respective project documents.
3. Details of the financial and other contributions from donor countries and organizations are the subject of special agreements between these donor countries and organizations and WMO.

D. Responsibilities of WMO

1. WMO, in consultation with the Member States and the CILSS respectively, shall assign international and other personnel to the Programme, grant fellowships and determine the standards applicable to the training of national personnel assigned to the Programme.

2. Within the limitations of the funds assigned by UNDP and the donor countries and organizations, WMO undertakes to supply the services of a Director for the Centre and of experts, as well as the equipment and the other necessary services.

3. The fellowships granted under the regional component and the national components of the Programme will be administered in accordance with the rules instituted in this connexion by WMO, at the proposal of the Member States and the CILSS respectively.

4. WMO may, by agreement with the Member States and the CILSS respectively, entrust part or the whole of the regional and national operations of the Programme to subcontractors, who will be chosen after consultation with the Member States and the CILSS respectively, in accordance with WMO procedures.

5. All equipment and supplies purchased with funds from UNDP or donor countries and organizations will be used exclusively for the purpose of implementing the Programme and will remain the property of UNDP or donor countries and organizations until transferred.

6. WMO manages the financial resources allocated to the Programme in accordance with the Regulations contained in Annex III to the present agreement.

E. Transfer of responsibilities

1. The parties agree to a transfer of responsibilities from the World Meteorological Organization, the Executing Agency of the Programme, to CILSS, the beneficiary of the Programme, within reasonable time limits.

2. This transfer will take place according to a plan and schedule established by common agreement.

3. Before assistance to the Programme comes to an end, the Member States, CILSS, UNDP, the donor countries and organizations and WMO will consult each other in order to decide what is to happen to the buildings and all the equipment supplied for the implementation of the Programme. The titles to property of buildings and of this equipment will normally be transferred to the Member States or to CILSS or bodies designated by them, should this material be essential in order to continue to implement the Programme, or for activities directly resulting from it. However, UNDP as well as the donor countries and organizations may, at their discretion, retain the ownership of part or the whole of this equipment.

F. Co-ordination of the Programme

1. The scientific and technical co-ordination of the Programme is undertaken by the Director of the Centre, who is assisted by an advisor provided by CILSS and, as required, experts provided by WMO.

2. The Executive Committee of the Programme undertakes the supervision and control of this co-ordination.

G. Director of the Centre

1. Nomination and recruitment of the Director

The CILSS Council of Ministers nominates the Director of the Centre and places him at the disposal of WMO. The Secretary-General proceeds with the recruitment formalities and concludes a contract with him in accordance with the statutory provisions applicable to project personnel. The procedure applicable to this nomination is laid down in the Protocol of Execution annexed to the present agreement.

2. Statutory provisions applicable to the conditions of service of the Director of the Centre

The statutory provisions applicable to the conditions of service of the Director are those laid down in the WMO Staff Regulations but with the following additions -

- (a) In accordance with the terms of this agreement and the Protocol of Execution, the Director of the Centre also receives and carries out the directives of the CILSS Minister Co-ordinator or, by delegation of power, of the CILSS Executive Secretary. He may ask for such directives. However, when these directives involve expenditure for which there is no provision in the approved budget, the Director of the Centre will only carry them out if the appropriate financial resources are available.
- (b) In all matters concerning the technical and pedagogical aspects of the Centre, the Director is subject to the authority of the Executive Committee of the Programme.
- (c) At the formal request of the CILSS Council of Ministers, the Secretary-General of WMO relieves the Director of the Centre of his duties.

3. Responsibilities of the Director of the Centre

3.1 The Director is responsible for the good operation of the Centre, whether at the pedagogical, administrative, technical or financial levels.

3.2 He supervises all activities of the Centre.

3.3 In accordance with the relevant regulatory and contractual provisions -

- (a) He administers and manages all staff employed in the Centre.
- (b) He manages the material and financial resources made available to the Centre. The financial provisions appear as an annex to the present agreement.
- (c) He prepares half-yearly reports provided for under Chapter V, paragraph 3 of the present agreement.

3.4 The Director conducts the activities of the Centre in accordance with CILSS strategies.

3.5 The Director ensures co-ordination of the Programme as stipulated in paragraph f. above.

3.6 The Director is the Secretary of the Administrative Council, of the Executive Committee of the Programme and of the Council of Pedagogical and Scientific Improvement. In this capacity, he prepares for the meetings of these bodies and implements their decisions.

H. Facilities, privileges and immunities

1. Personnel from UNDP, donor countries and organizations and WMO

In accordance with the agreement concluded between UNDP and the CILSS Member States, as regards providing assistance, the personnel from UNDP and the other organizations of the United Nations system associated with the Programme will enjoy the facilities, privileges and immunities specified in the afore-mentioned agreement. These same facilities, privileges and immunities will be extended to personnel made available to WMO for the implementation of the Programme by the donor countries and organizations

2. Subcontractors and their staff

Subcontractors of WMO and their staff (except nationals of beneficiary countries, employed locally) -

- (a) Will be immune from legal process in respect of all acts performed by them in their official capacity for the implementation of the Programme.
- (b) Will be exempt from the obligations of National Service.
- (c) Will be immune, together with their spouses and relatives dependent upon them, from immigration restrictions.
- (d) Will be able to bring into the country reasonable amounts of foreign currency for the needs of the Programme or for personal use, and take out all amounts brought into the country, or, in accordance with the regulations relating to exchange, any amounts of money they may have earned in carrying out the Programme.
- (e) Will be given, together with their spouses and relatives dependent upon them, the same repatriation facilities, in times of international crises, as diplomatic envoys.

All staff of WMO subcontractor will enjoy inviolability for all papers and documents relating to the Programme.

The CILSS Member States will grant to any foreign firm or organization which may be employed by WMO, and to the staff of any such firm or organization, exemption from, or re-imbusement of, all dues, taxes or deductions which might be levied on -

- (a) Pay or salary earned by this staff during execution of the Programme.
- (b) All equipment and supplies imported into the country for the purpose of implementing the Programme or which, after having been imported, may subsequently be taken out of the country.

- (c) Any large quantities of equipment or supplies, purchased on the local market for the purpose of implementing the Programme, such as petrol and spare parts necessary for the operation and maintenance of the equipment mentioned in sub-paragraph (b) above, on the understanding that the categories and approximate quantities of goods which should be exempted from dues, and also the formalities which have to be followed, will be the subject of an agreement with the CILSS Member States.
- (d) As in the case of concessions granted at the same time to UNDP and WMO staff, all goods imported (including one car per employee) by the firm or organization or by their staff for their private consumption or use, or which, after having been imported into the country may then be taken out of the country when the staff leave.

WMO may waive the privileges and immunities to which these firms and organizations and their staff may be entitled, as set out in the foregoing paragraphs when, in its opinion, the immunity would impede the course of justice, and can be waived without prejudice to the satisfactory implementation of the Programme or to the interests of WMO.

WMO, through the UNDP Resident Representatives, will provide the CILSS Member States with a list of the staff to which the afore-mentioned privileges and immunities apply.

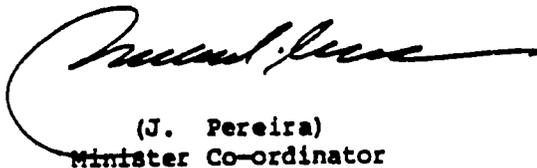
VII. FINAL PROVISIONS

1. The present agreement will come into force as soon as it has been signed by the CILSS Minister Co-ordinator and the Secretary-General of WMO.
2. As soon as the present agreement comes into force, the Secretary-General of WMO will communicate the text to the Secretary-General of the United Nations for registration in accordance with Article 1 of the Regulations adopted by the United Nations General Assembly on 14 December 1946, for the purpose of putting into effect Article 102 of the United Nations Charter.
3. Any divergence of opinion between CILSS and WMO concerning the interpretation or application of the present agreement, its Protocol of Execution or any additional agreement or arrangement, which has not been settled by negotiation is referred to a Body of Arbitrators composed of three members. The first of these arbitrators is nominated by the CILSS Minister Co-ordinator, the second by the Secretary-General of WMO and the third, who will be the Chairman of the Body of Arbitrators, will be nominated by the President of the International Court of Justice, unless, in any specific case it is agreed by the parties to this agreement, to have recourse to another mode of settlement. A written request will be made by one or other of the parties to the Body of Arbitrators, which will determine its own procedure.
4. The present agreement may be revised at the request of one or other of the parties.
5. Each of the contracting parties may inform the other of its intention to denounce the present agreement, provided that at least six months' notice is given. Denunciation of this agreement -
 - (i) Relieves both parties of any obligation to continue to apply the present agreement.
 - (ii) Does not affect any right, obligation or legal position of the parties resulting from the execution of the present agreement prior to denunciation.
6. The terms of the present agreement are supplemented by the Protocol of Execution.

Done at Geneva, in English and French languages,
on this sixteenth day of March 1981

For the Permanent Inter-State Committee
for Drought Control in the Sahel

For the World Meteorological
Organization


(J. Pereira)
Minister Co-ordinator


(A.C. Wiin-Nielsen)
Secretary-General

REGULATIONS OF THE
EXECUTIVE COMMITTEE OF THE PROGRAMME

CHAPTER I - PURPOSE

Article 1 - The purpose of the present Regulations is to define the organization of the Committee, to state its functions and the rôle of the Secretary of the Committee and to settle any other questions relating to the Committee.

CHAPTER II - ORGANIZATION

Article 2 -

Members

- (i) The Committee shall be composed of two representatives of each CILSS Member State chosen from among the Directors of the Meteorological, Hydrological and Agricultural Services.
- (ii) A representative of CILSS, a representative of the Executive Secretariat of CILSS, a representative of WMO, the Chairman of the Co-ordinating and Advisory Committee and the Director-General of the Sahel Institute shall be ex-officio members of the Executive Committee of the Programme.
- (iii) The Executive Committee shall be empowered to invite any other person to attend meetings, as necessary.

Article 3 -

Chairman

The chairmanship of the Executive Committee shall be held by the Member States in rotation, and for a period extending from one ordinary session to the next.

Article 4 -

Secretary

The Director of the Centre shall be the Secretary of the Executive Committee.

Article 5 -

Sessions

- (i) The Executive Committee shall meet at least once per year, and at any other time at the request of at least a third of the members.
- (ii) The meetings shall normally be held at the headquarters of the Programme, or in any other place in the Member States as agreed by the Executive Committee.

- (iii) The agenda prepared by the Secretary in consultation with the Chairman shall be submitted to each member at least one month before the meeting.
- (iv) The reports of each session, approved by the Chairman, shall be distributed to members as soon as possible after the session has ended.

CHAPTER III - FUNCTIONS

Article 6 - The Executive Committee -

- (i) Shall be responsible for the overall participation of the Member States in the implementation of the Programme as defined in the project documents.
- (ii) Shall monitor the implementation of the Programme as a whole, and supervise the co-ordination of the Programme.
- (iii) Shall study the technical proposals of the Member States and formulate recommendations concerning the objectives, courses of action to be adopted and extensions of the Programme.
- (iv) Shall ensure that the contributions of Member States are made as planned and that the buildings, equipment and facilities and installations mentioned in the project documents as counterpart contributions in kind are available as required.
- (v) Shall state requirements as regards additional resources considered necessary for the implementation of the Programme and refer the matter to WMO and the Co-ordinating and Advisory Committee.

Article 7 - In addition, the Executive Committee -

- (i) Shall examine the progress reports submitted by WMO and give advice on the future conduct of the Programme's operations.
- (ii) Shall submit the contributions of CILSS Member States to the annual budget of the Centre to the CILSS Council of Ministers, for approval.
- (iii) Shall propose modifications to the financial arrangements, relating to the management of resources allocated to the Programme, which it may consider necessary.
- (iv) Shall give its opinion on any other questions considered relevant to the Programme.

Article 8 - (i) The Executive Committee shall also act as the Administrative Council of the Centre. As such, its terms of reference shall be those laid down by the Statutes of the Centre.

- (ii) The Administrative Council shall approve the budget and accounts of the Centre. However, the portion corresponding to the CILSS contribution shall be submitted for approval to the Council of Ministers of this Organization.
- (iii) At the suggestion of the Director of the Centre, the Administrative Council shall authorize the transfer of credits from one item of expenditure to another, within the limits and subject to the conditions applicable to each contribution.
- (iv) The remaining terms of reference of the Administrative Council shall be as laid down in the Statutes of the Centre.
- (v) The meetings of the Executive Committee, when acting as the Administrative Council of the Centre, shall be chaired, on a permanent basis, by the Minister responsible for Rural Development in Niger. The meetings shall be held immediately following the meetings of the Executive Committee.

CHAPTER IV - ROLE OF THE SECRETARY OF THE EXECUTIVE COMMITTEE

Article 9 - In fulfilling his tasks, the Secretary -

- (i) Shall report to the Executive Committee on the administrative, financial and technical aspects of the Programme.
- (ii) Shall submit proposals to the Executive Committee concerning the implementation of the Programme.
- (iii) Shall be designated, as necessary, by the Executive Committee to represent that Committee, when questions relating to the Programme are being studied.
- (iv) Shall undertake any other work relating to the Programme which the Executive Committee may consider appropriate to entrust to him.

CHAPTER V - REPORTS

- Article 10 -
- (i) The periodic reports prepared by the Secretary shall be submitted to each meeting of the Executive Committee.
 - (ii) The annual reports of the Executive Committee shall be submitted to the CILSS Member States, WMO and the Co-ordinating and Advisory Committee, at the latest three months after the end of the year to which they refer.
 - (iii) The Executive Committee may, if necessary, publish special technical reports.

CHAPTER VI - COST OF MEETINGS

Article 11 - The Centre shall bear the cost of organizing meetings of the Executive Committee and of the Administrative Council and also the cost of the participation of the Member States and CILSS in these meetings.

CHAPTER VII - GENERAL PROVISIONS

Article 12 - The Executive Committee may submit proposals for modifications or additions to the present Regulations, for approval to the CILSS and WMO.

REGULATIONS OF THE
CO-ORDINATING AND ADVISORY COMMITTEE

CHAPTER I - PURPOSE

Article 1 - The purpose of the present Regulations is to define the organization of the Co-ordinating and Advisory Committee, to state its functions and to settle any other questions relating to the Committee.

CHAPTER II - ORGANIZATION

Article 2 - (i) The Committee shall be composed of a representative of the United Nations Development Programme, a representative of the United Nations Sudano-Sahelian Office, a representative of the Permanent Inter-State Committee for Drought Control in the Sahel, a representative of the World Meteorological Organization as well as a representative of any donor country or organization. The specialized agencies whose advice might be found to be useful for the Programme may also be invited to attend meetings of the Committee.

(ii) The Chairman of the Executive Committee of the Programme shall be an ex-officio member of the Co-ordinating and Advisory Committee.

(iii) The Committee may, on its own initiative or at the suggestion of one or more of the other members, invite any other person to attend its meetings, as necessary.

Article 3 -

Chairman At the conclusion of its last annual meeting, the Co-ordinating and Advisory Committee shall elect one of its members as Chairman for the following year.

Article 4 -

Secretariat WMO shall act as secretariat of the Committee.

Article 5 -

Sessions (i) The Co-ordinating and Advisory Committee shall, in principle, meet at least once per year, on a date which it shall decide itself or at any other time during the year, if invited by WMO or at least three of the members, to do so.

(ii) The meetings shall be held at the headquarters of the Organization, at the headquarters of the Programme, or at some other location.

- (iii) The agenda shall be prepared by the secretariat in consultation with the Chairman and submitted to each member of the Committee at least one month before the meeting is due to be held.
- (iv) The reports of each session, approved by the Chairman, shall be distributed to members of the Committee, at the latest 30 days after the end of the session.

CHAPTER III - FUNCTIONS

Article 6 The Co-ordinating and Advisory Committee -

- (i) Shall act as the advisory and co-ordinating agency as regards international contributions, financial and other, necessary for the implementation of the Programme.
- (ii) Shall give advice concerning financial and other procedures necessary for the management of contributions and funds made available to the Programme by donor countries and organizations.
- (iii) Shall examine the reports on the contributions to the Programme submitted to it by the Executive Committee of the Programme.
- (iv) Shall examine the financial repercussions of the recommendations made to it by the Executive Committee of the Programme.
- (v) Shall examine the reports submitted by WMO on the implementation of the Programme and the use made of the various financial and other contributions.
- (vi) Shall examine the proposed plan of action and the draft budgets prepared by WMO for the implementation of the Programme.
- (vii) Shall consider any other questions relating to the implementation and financing of the Programme.
- (viii) Shall examine the proposed plans for obtaining additional donations to the Programme.

CHAPTER IV - COST OF MEETINGS

Article 7 - Each donor country or organization shall bear the cost of the attendance of its representative on the Co-ordinating and Advisory Committee, at the meetings of the said Committee. In the case of other bodies, these costs shall be financed in accordance with the procedures which have been established between WMO and the said bodies.

CHAPTER V - GENERAL PROVISIONS

Article 8 - The Co-ordinating and Advisory Committee may propose to CILSS or WMO any additions or modifications which it considers should be made to the present Regulations.

PROVISIONS CONCERNING THE MANAGEMENT
OF FINANCIAL RESOURCES ALLOCATED TO THE AGRHYMET CENTRE (NIAMEY)

INTRODUCTION

In accordance with the provisions of Chapter VI.A.1 and VI.A.2 of the agreement between CILSS and WMO, it is agreed that the Secretary-General of the World Meteorological Organization shall be responsible for the financial management connected with the application of the procedures described below.

As far as possible, the Secretary-General shall delegate responsibility for the management of financial resources to the Director of the Centre.

1. ANNUAL ESTIMATED BUDGET OF THE CENTRE

1.1 Preparation and approval

On the authority of the Secretary-General of WMO, the annual estimated budget of the AGRHYMET Centre shall be prepared by the Director of the Centre. After the agreement of the Secretary-General of WMO has been obtained, the Director of the Centre shall submit the estimated budget for approval to the Administrative Council of the Centre, at the latest 60 days before the beginning of the financial year. The part relating to the CILSS contribution shall be submitted for approval to the Council of Ministers of this Organization.

A report on the commitments to expenditure and the contributions received during the current financial year shall be submitted at the time that this budget is submitted by the Director of the Centre.

1.2 Lay-out

The lay-out of the estimated budget shall be such that the amounts allocated and the corresponding sources of financing can be clearly identified. The resources allocated cannot be used for purposes other than those indicated in the budget.

For the record, contributions in kind are shown, as far as possible, in an annex to the budget.

1.3 Modification of the budget during the financial year

At the proposal of the Director of the Centre, transfers of sums from one item of expenditure to another may be authorized by the Administrative Council of the Centre, within the limits and under the conditions applying to each contribution.

1.4 Payment officer

On the authority of the Secretary-General of WMO, the Director of the Centre shall be the payment officer for expenditure except that which, due to its nature, has to be dealt with at other levels.

2. RECEIPTS

2.1 Ordinary receipts

The ordinary receipts of the AGRHYMET Centre consist of the cash contributions allocated to the Centre by the donor countries and organizations and CILSS.

2.2 Secondary receipts

The Administrative Council of the Centre may accept grants or secondary contributions, provided these grants or contributions are offered for purposes compatible with the common objectives of WMO and CILSS. However these grants and contributions cannot be accepted if they entail either directly or indirectly, expenditure which would be additional to that contained in the approved budget, unless these grants and contributions are accompanied by additional resources enabling the expenditure in question to be covered.

3. EXPENDITURE

The financial resources shall be managed in accordance with the WMO Financial Regulations. However, funds made available to the Centre by UNDP, shall be managed in accordance with the financial procedures of this Organization. Likewise, funds made available by CILSS, or a CILSS Member State, shall be managed in accordance with the CILSS Financial Regulations or those of the Member State concerned. Except as regards the designation of the Auditor, the reference to the Executive Committee in the WMO Financial Regulations applies to the Administrative Council of the Centre in the present provisions.

4. COMMON FUND OF THE AGRHYMET CENTRE AND MISCELLANEOUS FUNDS

4.1 Common fund of the Centre

A Common Fund for the AGRHYMET Centre has been set up, receiving funds from the receipts mentioned in paragraph 2 above. Payment of contributions into this Fund shall take place in accordance with the agreements with the donor countries and organizations. These agreements shall lay down the dates for settlement of contributions and the currency for payment.

4.2 Miscellaneous funds

At the proposal of the Director of the Centre, the Administrative Council may set up miscellaneous funds, receiving money from special resources intended to cover specific operations. The conditions for setting up these miscellaneous funds shall be laid down by the Administrative Council of the Centre.

Protocol of Execution of the Agreement between
the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS)
and the World Meteorological Organization

INTRODUCTION

The present Protocol of Execution specifies the procedure for application of the provisions of the agreement concluded between the CILSS and WMO on the sixteenth day of March 1981.

Section 1 - Origin and objective of the Programme (Chapter II)

The objectives mentioned in the project documents and in the financial agreements or exchange of correspondence between the donor countries and organizations, CILSS, WMO and the UNDP define the stages of the Programme's implementation in relation to the resources allocated for this purpose.

Section 2 - Management of the Programme (Chapter III)

2.1 Executive Committee of the Programme

The functions of the Executive Committee of the Programme acting as Administrative Council of the Centre are those defined in the Statutes of the Centre. The ordinary session of the Administrative Council of the Centre shall be held immediately after the session of the Executive Committee of the Programme.

2.2 Executive Committee and Co-ordinating and Advisory Committee

Subject to the application of the provisions of paragraph A.2 of Chapter VI of the agreement, the Executive Committee of the Programme and the Co-ordinating and Advisory Committee may propose amendments to their respective Regulations. They may establish their own internal regulations.

Section 3 - Responsibilities (Chapter VI)

3.1 Fellowships

The Centre may accept, subject to payment and within the limits of available places, students from non CILSS Member States. Such students shall be admitted by the Director of the Centre within the framework of the directives given by the Executive Committee. The Director of the Centre shall be responsible for invoicing and receipt of these students' tuition fees.

3.2 Transfer of ownership

Transfer of ownership of the buildings, equipment and supplied shall take place in accordance with the provisions contained in the corresponding financial agreements.

3.3 Nomination of the Director of the Centre

The Minister Co-ordinator of CILSS and the Secretary-General of WMO shall co-operate with a view to establishing a list of Sahelian candidates, high-level senior officers capable of fulfilling the duties of Director of the Centre. This list shall be submitted by the Minister Co-ordinator to the CILSS Council of Ministers which shall choose the candidate with the highest qualifications. The decision of the Council of Ministers shall be communicated to the Secretary-General of WMO who shall proceed with the recruitment of the Director for an initial period of three years. Possible renewal of the Director's contract shall be carried out after prior agreement by the CILSS Council of Ministers notified in writing to the Secretary-General of WMO.

3.4 Termination of service of the Director of the Centre

After receipt of a request giving reasons from the Council of Ministers as mentioned in Chapter VI, paragraph G.2(c) of the Agreement, the decision to relieve the Director of the Centre of his duties shall be effective within 30 days.

Section 4 - Final provisions (Chapter VII)

4.1 Without prejudice to the provisions of the agreement, the present Protocol of Execution may be revised upon the request of one or other of the parties.

Done and signed in Geneva, in English and French languages,
on this sixteenth day of March 1981

For the Permanent Inter-State Committee
for Drought Control in the Sahel

For the World Meteorological
Organization



(J. Pereira)
Minister Co-ordinator



(A.C. Wiin-Nielsen)
Secretary-General

SAHEL WATER DATA NETWORK AND MANAGEMENT PROJECT (AGRHYMET) - PHASE IIUNITED STATES INPUTS
(US \$000)By Operational Calendar

<u>OBJECT</u>		<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>TOTALS</u>
<u>Technical Advisory Assistance</u>							
	(Pers. Yrs.)						
Adv. to Reg. Program	(5)	50	50	50	50	50	250
ADP Software Spec.	(2.5)	135	135	25	25	25	345
Consultants	(3)	30	30	30	--	--	90
NOAA Backstop	(10)	70	70	70	70	70	350
Housing for Advisor ^{a/}		50	0	25	25	25	125
Travel ^{a/}		50	50	50	50	50	250
S/T		360	360	250	220	220	1410
Infla.		55	40	70	60	75	300
S/T		440	375	320	280	295	1710
<u>Training in U.S.</u>							
National Services	(25)	30	255	110	80	25	500
Regional Center	(15)	15	165	60	50	10	300
Trainee Travel		15	15	15	15	15	75
S/T		60	435	185	145	50	875
Infla.		5	85	55	45	10	200
S/T		65	520	240	190	60	1075
<u>Equipment and Commodities</u>							
For National Services		317.5	333.2	163.1	128.2	144.9	1086.9
For Regional Center		29.5	68.5	47	54	58.5	257.5
S/T		247	501.7	210.1	182.2	203.4	1344.4
Infla.		30	88.3	62.9	69.8	79.6	330.6
S/T		377	490	273	252	283	1675

^{a/}To be allotted to USAID/Niger as PASA Support Costs.

SAHEL WATER DATA MANAGEMENT AND NETWORK (AGRHYMET) PHASE II (625-0940)
AID CONTRIBUTION

ITEM	TOTAL	S/T	INFLA.	82	83	84	85	86
I. Technical Advisory Assistance	1710	1410	300	360 30	360 65	250 70	220 60	220 75
A. Advisor to Regional Program	305	250	55	50 5	50 10	50 10	50 15	50 15
B. ADP Software Specialist	402.5	345	57.5	135 7.5	135 20	25 10	25 7.5	25 12.5
C. Consultants	108	90	18	30 3	30 6	30 9	-- --	-- --
D. NOAA Backstop	442	350	92	70 7	70 14	70 23.5	70 22.5	70 25
E. Housing for Advisor	157.5	125	32.5	25 2.5	25 5	25 7.5	25 5	25 12.5
F. Travel	295	250	45	50 5	50 10	50 10	50 10	50 10
II. Training in the United States	1075	875	200	60 5	435 85	185 55	145 45	50 10
A. National Services	613	500	113	30 3	255 50	110 30	80 25	25 5
B. Regional Center	363	300	63	15 1	165 30	60 18	50 12	10 2
C. Trainee Travel	99	75	24	15 1	15 5	15 7	15 8	15 3

ITEM	TOTAL	S/T	INFLA.	82	83	84	85	86
III. Equipment and Commodities	1675	1344.4	330.6	247 30	506.5 88.3	212.6 62.9	179.2 7	191.4 79.6
A. For National Centers	1339	1086.9	252.1	217.5 26.9	438 72.5	165.6 48	125.2 50.8	132.9 59
B. For Regional Center	336	257.5	78.5	29.5 3.1	68.5 13	47 15	54 21.6	58.5 25.8
IV. Other Inputs	2540	2029	511	349 19	589 106	369 108	361 127	361 151
A. Reg. Ctr. Oprns and Maint.	200	150	50	30 3	30 6	30 9	30 12	30 20
B. Development of Ag Applications	200	150	50	30 3	30 6	30 9	30 12	30 20
C. Workshops.Seminars	400	300	100	-- --	120 24	60 18	60 24	60 34
D. Integrated Systems Study	50	50	--	50 --	-- --	-- --	-- --	-- --
E. ADP Special Costs	150	135	15	27 3	27 3	27 3	27 3	27 3
F. Construction	125	125	--	125 --	-- --	-- --	-- --	-- --
G. NOAA Administration	250	194	56	42 5	42 10	42 12	34 13	34 16
H. WMO Administration	215	175	40	45 5	40 7	30 7	30 13	30 12
I. Contingencies	950	750	200	-- --	300 50	150 50	150 50	150 50

COUNTRY: MAURITANIA

ITEM	TOTAL	S/T	INFLA.	82	83	84	85	86
Equipment, Commodities, Services	148	118.4	29.6	--	64.2	17.3	17.9	19
				--	9.7	5.3	6.6	8
A. Uninterrupted Power System	50	45	5	--	45	--	--	--
				--	5	--	--	--
B. SPSS Lease	6	4.5	.15	--	--	1.5	1.5	1.5
				--	--	.5	.5	.5
C. Software and Data	4	3	1	--	--	1	1	1
				--	--	.2	.3	.5
D. Product Dissemination System	5.5	5	.5	--	5	--	--	--
				--	.5	--	--	--
E. Replacement Parts and Tools	6	4.4	1.6	--	.2	1.3	1.4	1.5
				--	--	.4	.5	.7
F. Maintenance Services	54	40	14	--	10	10	10	10
				--	2	3	4	5
G. Shipping and Receiving	22.5	16.5	6	--	4	3.5	4	5
				--	2.2	1.2	1.3	1.3
SUB-TOTAL (Per Year)				--	73.9	22.6	24.5	27

Procurement List for Phase II
(US \$ 000, Including Inflation)

Items*	Reg. Center	Cape Verde	Gambia	Senegal	Maurit.	Mali	Upper Volta	Niger
Pencil & tablet digitizer	11	--	--	--	--	--	--	--
Uninterrupted power system	--	50	--	--	50	--	--	50
SPSS lease	10	7	10	10	6	10	10	10
Softwear & data	13	5	6	6	4	6	6	6
Train. materials	17	--	--	--	--	--	--	--
Product dissemina- tion System	6	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Nat. Serv. data comms. network	--	408	--	--	--	--	--	--
Replacement parts & tools	--	5	8	8	6	8	8	8
Maintenance (equip.) services	205	54	65	65	54	65	65	65
Shipping, handling	74	22.5	22.5	22	22.5	22.5	22	22.5
S/T	336	557	117	116.5	148	117	116.5	167

Total Equipment and Commodities = 1675

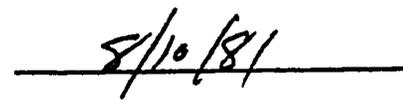
* Procurement of these commodities is by NOAA, under PASA with AID. NOAA utilizes its own procurement and shipping procedures as they relate to its overseas operations. All purchases are of US source and origin. Shipping costs are included.

INITIAL ENVIRONMENTAL EXAMINATION

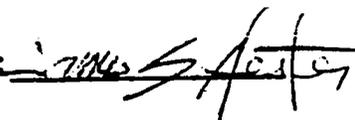
PROJECT LOCATION : Sahel Regional
PROJECT TITLE : AGRHYMET II (625-0940)
FUNDING : \$ 7,000,000
LIFE OF PROJECT : September 1981- September 1986 (proposed)
IEE PREPARED BY : Sidney Bliss, Assistant Program Officer, USAID/Niger
THRESHOLD DECISION : Negative Determination


John Lovaas, Acting Director

USAID/Niger


August 10, 1981

Bureau Environmental Officer's Decision:

APPROVED: 

DISAPPROVED: _____

DATE: 12/30/81

Clearance:
GC/AFR:LDeSoto 

IX. Initial Environmental Examination

Examination of Nature, Scope and Magnitude of Environmental Impacts

1. Description of Project

A. Environmental Setting: Climate and Land Forms

The extent of territory covered by the AGRHYMET Program is coincident with the eight member states of the CILSS (Interstate Committee Against the Effects of Drought in the Sahel), and runs from approximately 10-25° N latitude and from 24°W - 24° E longitude. Activities are focused primarily on the pastoral zone, the sahel (12-16°N) and the cultivated zone, the savanna (10-14°N).

The sahel-savanna zone is typified by dry and subhumid tropical climates. The precipitation tends to be in the form of high intensity storms of short duration over a relatively small area or strip as frontal systems move about the region. In the pasture zone the precipitation is low in total amount, about 200-400 millimeters per year, and the annual distribution is poor, concentrated in a short season between July and September. The intensity of storms can be erosive for unprotected soils. Spotty rainfall patterns result in a continually shifting vegetative pattern from year to year. Surface water is limited to shallow depressions where it collects for varying durations during the rainy period and may last from one to four months.

The geological formulation of the pastoral zone dates from the oldest pre-cambrian era. It is a vast platform consisting of peneplained ranges. The terrain is generally gently rolling with meandering drainage. Daytime temperature is warm to hot all year long, accompanied by intense tropical solaration and a high evaporation rate. The harmattan, a high, searing wind, blows down from the Sahara desert during the long dry season, further eroding the soil.

The cultivable zone is characterized by a succession of basins and low lateritic plateaus with sandy deposits over limestone and sandstone layers. Average elevation is 300 meters, ranging from sea level to 500 meters, occurring in lateritic outcroppings and weathered volcanic remnants. Slopes generally are less than 10 percent. Total annual rainfall can average from 400-800 millimeters, though a small portion of the zone enjoys a mean rainfall of over 800 millimeters. The summer monsoon season, when rains are most regular and abundant, runs from June to October, with maximum accumulations generally recorded in August.

Climatic conditions in the Cape Verde Islands correspond to those of the northern global inter-tropical zones of the African continent, while the general atmospheric circulation is influenced by local physiographic conditions. The islands have a two season climate: a dry season from November to July characterized by sea breezes and cooler temperatures; a rainy season from August to October during which weather conditions are humid and hot. The archipelago in the greater part of the island chain is of volcanic origins.

In the most arid northern regions of the member states, rainfall is limited to one or two showers per year, accompanied by turbulence and lasting only a few minutes, with an accumulation of 25-100 millimeters, which is either rapidly absorbed into the sand (some is evaporated before it ever hits the ground) or forms temporary washes which strike as flash floods. These phenomenon occur in August, when the Inter-Tropical Discontinuity (ITD), having journeyed north of the equator since March, reaches its northernmost point prior to a rapid southern descent.

3. Soils

Roughly 20% of the Sahel's total land is more or less arable, although large areas of this land are marginal for farming and have been cleared and cultivated only in recent years. The subhumid zone is dominated by ferruginous soils (alfisols) with some shallow soils of alluvial and colluvial origin (entisols), often over layers of cemented laterite (plinthite). The ferruginous soils are characterized by kaolinitic clays, low CEC, moderate base saturation and stable aggregate structure. Principal limitations on use are shallow depth, droughtiness, and erodibility of fertile surface horizons. The drier zones are dominated by arid brown soils (aridisols). These soils are characterized by non-kaolinitic cracking clays with higher CEC, high base saturation and poor structure (loose, light, sandy). Agricultural use is limited by aridity and susceptibility to erosion and compaction.

C. Vegetation

The typical vegetative type in the pastoral zone is open grasslands consisting of a sparse cover of annual grasses and woody shrubs that are the sources of feed for the indigenous species of wildlife and breeds of livestock. It is commonly characterized as thorn shrub and grass steppe sahel-savanna type, with principal genera being Acacia, Camiphora, Balanites, Aristida, Cenchrus and Schoenfeldia.

The southern agricultural zone is open woodland and sudan-savanna type, with principal genera being Adansonia, Sclerocaraya, Cambretum and Terminalia.

D. Land-Use

In the pastoral zone, there is extensive grazing of cattle, sheep, goats, camels and donkeys. In the cultivated zone, the crops are millet, sorghum, cowpeas, peanuts, with some cotton, corn and rice.

Woodlands and pasture are subjected to over-cutting, over-grazing and clearing for cultivation. Cultivated land is subject to irregular but intense, concentrated rainfall and erosion.

E. Socio-economic Characteristics

The overwhelming majority of the population of the eight Sahelian countries lives in rural areas, a regional average of 85-90 percent in 1977. These rural inhabitants include two principal occupational groupings: small scale land-holding farmers and migratory and semi-sedentary herders.

Across the region, approximately 65 percent (17 million) of the population works in agriculture. They are mostly small-scale farm families who typically work plots of three to five hectares on land held in usufruct by their descendants over the centuries. Most of these farmers inhabit the savanna belt, comprising 27 percent of the Sahelian land area and sheltering 67 percent of the inhabitants. The three major water systems of the Sahel are located in this sub-region. the Senegal and upper Niger river systems and the Lake Chad Basin, plus the smaller Gambia and Upper Volta river systems.

Unreliability of rainfall in the savanna-sahel has enormous implications for the economic status of farmers and for the improvement of agriculture. Uneven rainfall distribution prohibits double-cropping and farmers plant with a rain-deficit year in mind. The desire to avoid risk can discourage investments in improved, but perhaps untried, crop technologies. These investments can be suddenly wiped out by an unpredictable drought.

Herders are the second major rural group, accounting for one-fourth the regional population. Pastoral people share the savanna belt with farmers. They occupy, for the most part, the northernmost sahel zone of the savanna belt during the rainy season, moving southwards with their animals in pursuit of water and grass as the rains recede. Herders tend livestock, cattle, sheep, goats, camels and donkeys, in various mixes of herd composition, depending on ethnic groups and available pasturelands. Within the group of herders is a smaller number of nomads who inhabit the northern subdesert. These nomads tend mainly camels and goats, do not farm and are virtually unreachable by government services.

Most herders are engaged in transhumance involving cyclical migrations with their animals. They generally have rights to land and are thus linked to the history and tradition of a specific region. Like farmers, herders often raise crops on their recognized land in between periods of migration. However, their main economic activity consists of subsistence dairying and meat production in an ecological zone that has few alternative uses. Their linkages with crop producers and other sectors of the Sahelian economies occur during the dry season when they migrate into higher rainfall areas. Farmers who own cattle entrust them during the agricultural season to traditional herders who take the animals in search of forage. Farmers usually reciprocate by allowing herders to pasture their own animals in harvested fields. Cattle eat crop stalks and other residue and the farmers receive manure as fertilizer in return.

During the two decades preceding the last drought, livestock production increased rapidly due to above average rainfall, the development of permanent groundwater sources and better veterinary services. Herders rapidly increased the size of their herds during this period and, pushed by farmers onto previously marginal farmlands, took their animals northward into yet more fragile ecological regions. As the rains failed, the land failed because herds had already exceeded rangeland carrying capacity.

2. Project Proposal

This project will assist the AGRHYMET Regional Center and eight CILSS member state national centers in the implementation of a Program to improve agriculture production and planning in the Sahel by upgrading the scope, quality and timeliness of hydrological and agrometeorological data collection, interpretation and dissemination. The Program was begun in 1976 and has constructed an operating regional training and applied research center and strengthened the hydrological and agrometeorological services in the member states. Sahelians have, and are still being trained to man observation stations, to operate equipment and to participate in the analysis and distribution of helpful climatological information to potential users. A network of telecommunications and data processing is in the process of being installed across the Sahel. Due to an uneven development of activities begun in the first five-year period, occasioned principally by some weak national services, the Program is being extended into a second five-year funding period, 1982-86.

The proposed AID contribution towards the Program in its second funding period is as follows:

(a) Approximately forty (40) long-term and ten (10) short term academic and technical training programs in the U.S. for Sahelian students/technicians will be provided to ensure the capability of the Regional Center and national centers of the member states to operate equipment that will permit the Program to realize its objectives.

(b) Supplemental equipment for the Sahel telecommunications and data processing network will be supplied under this project, This will complete the network, and provide spare and replacement parts as the case warrants. Solar power units are to replace diesel generators at remotely situated radio transceivers. Software items are also in the package and includes microfiche systems, publications and data acquisition. Finally, a continuous weather broadcast system will be installed in priority areas across the Sahel.

(c) The National Oceanic and Atmospheric Administration (NOAA) is proposed as the prime contractor for furnishing those technical services that are called for under the Program which are related to telecommunications and data processing. In view of NOAA's long experience in climatology, their expertise is essential to the installation, operation and practical applications of this equipment.

3. Potential Environmental Impact

Successful completion of the AGRHYMET Program will result in the emplacement and operation of an improved water data collection and dissemination network for the Sahel plus a growing cadre of experts trained in the operation, maintenance, and utilization of the network. This, in turn, will be reflected in a better understanding of the water potential of the region, both as to quality and quantity, and thereby more efficient use and stewardship of this critical natural resource. The improved knowledge of water availability will assist in preventing misuse of the land through over-grazing and inefficient irrigation practices, mitigating the economic and social impact of drought (e.g. loss of seed and livestock, sudden displacement of populations), and also increase the efficiency of water use (e.g. better forecasting and regulation of river flows).

The environmental "costs" of the total AGRHYMET Program appear to be minimal. There is the possibility that over the long range, improved knowledge of the water resources base may attract populations (particularly nomads and livestock herders) to localized areas which could then overtax both the land and associated water. It is more reasonable to assume however, that improved knowledge of water availability plus the concurrent increase in trained managers will affect a wiser utilization than presently exists. Without knowing exactly what the water supply and distribution is at this time (a fundamental purpose of this Program), it is impossible to speculate what the response to an improved knowledge of location and quality will be.

Other environmental costs may be associated with the installation of the data collection and dissemination network, the continued existence of the regional training center, and the construction of buildings to house new and expanded national meteorological and hydrological services. These are judged to be of a very minor nature, however. AID is only one of many contributors to the entire Program, and it is probable that the regional training center and data stations would be constructed over time with or without AID support. However, by virtue of the AID contribution coupled with the sensitivity of AID and the

NOAA experts team to the need for better management and conservation of the region's water resources, an opportunity exists to influence the Program during its on-going design and implementation phases in a manner that mitigates any potential short and long-term undesirable environmental effects.

None of the AGRHYMET activities as proposed for AID funding under the second five year period will have a significant immediate environmental impact. To the extent that the Program will identify information that will ultimately enable farmers and herders to increase crop and livestock production, the environmental impact will be positive. Better information so as to permit a better utilization of water resources per unit area of production will greatly assist Sahelians to attain and maintain self-sufficiency in food production without further extending cultivation and herding practices to exert pressure on marginal lands. This will work towards less soil erosion and less range and woodland destruction than would otherwise occur if increasing population pressures force the local population to extend the use of limited water resources beyond its optimum capacity.

Impact Areas and Sub-Areas

(1) Land Use

a. Changing the character of the land through

a) Increasing the population N

b) Extracting natural resources L

c) Land clearing N

d) Changing soil character L

b. Altering natural defenses L

c. Foreclosing important uses N

d. Jeopardizing man or his works N

(2) Water Quality

a. Physical state of water N

b. Chemical and biological states N

c. Ecological balance L

(3) Atmospheric

a. Air additives N

b. Air pollution	L
c. Noise pollution	L
(4) Natural Resources	
a. Diversion, altered use of water	L
b. Irreversible, inefficient commitments	N
(5) Cultural	
a. Altering physical symbols	N
b. Dilution of cultural traditions	N
(6) Socioeconomic	
a. Changes in economic/employment patterns	N
b. Changes in population	N
c. Changes in cultural patterns	L
(7) Health	
a. Changing a natural environment	L
b. Eliminating an ecosystem element	N
(8) General	
a. International impacts	L
b. Controversial impacts	N
c. Larger program impacts	M
d. Other factors	L

LEGEND:

N - No environmental impact
 L - Little environmental impact

M - Moderate environmental impact
 H - High environmental impact
 U - Unknown environmental impact

**Programme for strengthening the
Agrometeorological and Hydrological Services
of the Sahelian countries.**

**Centre for training and applications of agrometeorology/
operational hydrology**

DEVELOPMENT PHASE : 1982-1986

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1. ORIGIN, HISTORY AND OBJECTIVES OF THE PROGRAMME

1.1 Origin and History

The Programme for the strengthening of the Agrometeorological and Hydrological Services of the Sahelian countries was created after the adoption of a resolution in September 1973 by the first ministerial meeting of the CILSS Member States. This resolution required the national Meteorological and Hydrological Services in the CILSS countries to be strengthened and developed, and a Regional Centre to be created for training and applications in agrometeorology and operational hydrology.

The United Nations Economic and Social Council had previously adopted a similar resolution (LIV) 1959, May 1973 on the drought in the Sahel.

In response to these two resolutions, WMO, together with UNDP, organized a joint WMO/FAO mission which took place from May to August 1974 in the CILSS countries.

On the basis of this mission's recommendations, the UNDP approved the AGRHYMET Programme in 1976 comprising a regional project and seven national projects, to which the Cape Verde project was added in 1978. Initially planned for two and five years respectively, all the national projects and the Centre project were extended so that the initial phase would end in 1981.

1.2. Programme objectives

The overall objectives of the AGRHYMET Programme may be grouped in two main areas : strengthening national Services and activities and developing a regional AGRHYMET Centre. A third objective is to integrate the facilities, equipment and operation of the AGRHYMET Programme into the national Meteorological and Hydrological Services, and into the WMO World Weather Watch (WWW).

1.2.1 National projects

Strengthening the national Meteorological and Hydrological Services with qualified personnel, stations and equipment and means of data collection, processing and dissemination, in order to enable them to fulfil their role in development is a fundamental objective of the Programme. This objective was to cover especially the supply of information to farmers and agricultural planners and Services, making it possible for them to increase farm production, reduce this production's cost and vulnerability to atmospheric and hydrological hazards as well as to make rational use of the scarce water resources, whether in rainfall or rivers.

1.2.2 Regional Centre

The second fundamental objective is to establish and operate the "Regional Centre for training and applications of agrometeorology/operational hydrology", which was given the following tasks :

- training of engineers and technicians in agrometeorology and technicians in instruments and hydrology;
- specialized training for personnel already trained in the different fields : radiometry, data processing, etc.;
- collection, analysis, processing and synthesis at regional level of data observed daily in the national networks;
- dissemination of relevant warnings on the meteorological and hydrological situation in the Sahel to the national Services especially concerned with agriculture;
- evaluation of applied technology.

1.2.3 System integration

The third objective envisaged the AGRHYMET Programme being integrated into the national Services and into the WMO World Weather Watch once the infrastructure and installations were established. It was also envisaged that the AGRHYMET Centre would play a key role in developing and co-ordinating regional programmes in agrometeorology and hydrometeorology in the Sahel, using existing observation and telecommunications networks where possible, using a space based observing system, and integrating the system into the regional and global telecommunications systems.

1.3. Evaluation missions

The first Programme evaluation mission, which took place from 17 March to 14 April 1978, examined the progress of the Programme's work during the period from 1 June 1975 to 31 March 1978. It revealed certain weak spots or delays in the implementation of the national projects and of the regional project, referring to the project documents and the work programmes established for these projects.

The second evaluation mission, which took place from 24 February to 24 March 1980, was expected not only to study the progress made since the first mission and to draw up recommendations to overcome the problems encountered, but also to examine the structures in which the current action was to be developed, and to determine future requirements. The general conclusion of the second evaluation mission was that the present expansion phase of the Programme would not be completed within the time planned, and that in some countries this phase leading to the initial operating level might be prolonged by three or four years (see Section 2).

1.4 Multidisciplinary mission to prepare the integrated Programme plan 1982-1986

A multidisciplinary mission to prepare the integrated AGRHYMET Programme plan for this phase was organized for April 1981. The international team of experts developed the material upon which this present integrated Programme plan is based using principally the detailed questionnaire completed

by the national Services. The questionnaire was designed to define the status that the national Services should have at the end of 1986 in order to be fully operational. It covered the necessary staffing, equipment and financial support as well as the links to be established between Meteorological and Hydrological Services on the one hand, and data users on the other, in order for the AGRHYMET Programme to achieve its aims. The team also used consultations with the Regional Centre staff to develop the regional part of the integrated Programme plan.

2. IMPLEMENTATION PHASES OF THE PROGRAMME

The implementation phases of the Programme are defined in Annex 13. The phases are :

- the starting situation;
- the expansion phase that is now being implemented (leading to initial operating level);
- the phase of development (leading to full operating level);
- the phase of operation thereafter (leading to optimum operating level).

Although the expansion phase had been prolonged for a year (until 1981) it was very quickly apparent that the objectives assigned to this phase as regards infrastructure would not be achieved in all countries, and that it was necessary in those countries to prolong the phase for several years before being able to begin the development phase. The training programme as set out in the 1975 project document was changed. Fewer Class I personnel and vastly more Classe III personnel were trained, following changed requests by the countries. Also, estimates of numbers of Class III personnel required have been revised upwards.

A consensus was reached by the fifth session of the Executive Committee and the sixth session of the Co-ordinating and Advisory Committee that the development phase 1982-1986 leading to the full operating level, and coinciding with the 3rd UNDP programming cycle, should also include the activities programmed but not executed in the initial expansion phase. It was observed that full operating level might not be reached in all countries by 1986, given the general economic and constitutional difficulties that some countries have experienced.

The objectives of this 1982-1986 phase will be described after a summary of the results obtained at the end of the expansion phase 1975-1981.

2.I. Present status of the AGRHYMET Programme

2.I.1 Administration of the Programme

A CILSS/WMO agreement, signed in March 1981 by the CILSS Minister Co-ordinator and the Secretary-General of WMO, modified some of the provisions of the basic Agreement. The Director of the Centre is nominated by the CILSS Council of Ministers and placed at the disposal of WMO which recruits him; he is responsible for the Centre's proper functioning on the teaching, administrative, technical and financial levels and he ensures scientific and technical co-ordination of the Programme. WMO, in its capacity as Executing Agency for the Programme, manages the external financial resources allotted to the Programme and provides the technical and administrative support for the Centre and country projects which comprise the Programme. Annex 1 provides the over-all organizational framework of the AGRHYMET Programme and includes an organigram of the AGRHYMET Centre as agreed at the extraordinary session of the Executive Committee in March 1981.

2.1.2 Infrastructure

2.1.2.1 Regional Centre

The Regional Centre is installed in Niamey on a 70-ha plot placed at the disposal of the Programme by the Government of Niger. The buildings being used comprise :

- (a) 5 blocks (800 m²) for student lodging;
- (b) 1 general building (2,200 m²) comprising : classrooms, administrative sector, data-processing and telecommunication centre, laboratories, workshops and offices, amphitheatre and library.

To these buildings are added various satellite buildings and installations for meteorological, hydrological and phenological observations, a botanical garden, a garden for the students, orchards, experimental plots for irrigated and rain-fed crops and pastures.

2.1.2.2 National Services

The national Services have various buildings and facilities which house the AGRHYMET national activities and which have been placed at the disposal of the Services by their governments. In some cases, new or expanded facilities are needed to support AGRHYMET activities and this has been the responsibility of each government separately. Progress in the realization of adequate facilities varies a great deal between the different states.

2.1.3 Training

The Niamey Centre is very well organized for training senior technicians (Class III) in agrometeorology (47 students), hydrology (49 students) and instruments (13 students), and engineers (Class II) in agrometeorology (22 students). Within the total of 131, 36 are still under training and 83 received their diploma.

The training of Class IV observers in meteorology is carried out at the Regional School in Dakar. In each country, the complementary training in agrometeorology is undertaken with the help of roving instructors sent from the Niamey Centre.

The training of hydrometrists is also undertaken within the countries. Provision of a roving instructor is made in the 1981 budget.

A programme of special education and training at institutions outside the region for professional grade meteorologists and hydrologists is included in the fellowship activities of the Programme. An external training programme for technicians in computer maintenance and professionals in data processing and computer science has also been implemented.

2.1.4 Agroclimatology and applied agricultural research in the experimental plots at the Niamey Centre

The Centre has completed observations on its experimental plots in 1978, 1979 and 1980, in collaboration with the various agricultural research stations throughout the Sahel, checking water requirements, anti-erosion devices, crop performance as a function of weather, variation on pasture vegetation, etc..

2.1.5 Data collection, processing and dissemination

2.1.5.1 Telecommunications

The single-side-band radio network installation is complete in Gambia. It is under way in Mali, Niger, Senegal and Upper Volta and it is planned to begin in the rest of the countries in 1981-1982. An agreement with ASECNA to utilize the operational World Weather Watch data acquisition facilities at Niamey airport is being implemented.

2.1.5.2 Data processing system

Ten computers have been supplied, five of which are installed and operational, four in the Regional Centre in Niamey and one in Gambia. The five remaining computers are to be installed in the various national centres as soon as the required facilities are ready and personnel are trained to maintain, operate and programme the systems.

2.1.5.3 Data bank

The creation of the meteorological data bank for the Sahelian countries is being undertaken in the Belgian Royal Meteorological Institute. The work involves microfilming, recording on computer-compatible media, quality control and archiving. The data set will form the basis of the data archive at the AGRHYMET Centre and for the national Services.

2.1.6 Meteorological and hydrological stations

One of the main objectives of the AGRHYMET Programme is the reinforcement of the national Meteorological and Hydrological Services by strengthening of the national data collection networks, whether by adding equipment in the existing stations or by creating new stations and by developing a dependable data collection and communication system.

The national Services and networks were planned to be operational by the end of the expansion phase. However, deficiencies as regards the availability of technical personnel and facilities have delayed the networks becoming completely operational.

The current state of implementation achieved by the national projects in developing the station networks is given in tabular form in Annex 2 for both meteorological and hydrological stations. This information is based on the study of questionnaire replies from national projects and from discussions during the extraordinary session of the Executive Committee at the end of March in Dakar.

2.1.7 Instrument maintenance and calibration

The Regional Centre is now equipped for maintenance, repair and calibration of instruments; it also provides technical support for the national projects in these fields, especially for certain delicate and sophisticated instrument systems.

2.2. Overall evaluation of the results achieved

2.2.1 First expansion phase objectives

The expansion phase 1975-1981 had the following aims :

- (a) to train the national personnel to undertake the development of agrometeorological and hydrological activities at the national level and later at the regional level;
- (b) to set out the necessary infrastructure at both regional and national levels for each of the CILSS states for data collection, transmission and processing.

2.2.2 Principal Programme initiatives still required to meet the objectives

Although good progress has been made to date, there still remains a great deal to be done in order to completely reach the aims of the expansion phase (see Section 2.2.1). The following specific areas are of particular concern :

- (a) a great deal of personnel training still remains to be done in all the specializations (agrometeorology, hydrology, instruments, data processing and telecommunications) and at all levels (from Class IV to Class I), because countries became more aware of the need for trained personnel;
- (b) the planned national facilities have only been partially realized, with regard to the station networks themselves, to the associated communications systems, and to the data processing centres; also, some assistance needs to be given to the operational maintenance of synoptic stations, including necessary instrument replacement, not earlier foreseen;
- (c) the mechanisms for disseminating information to potential users are still at the early stage of implementation and require development;
- (d) many statistical and agroclimatic studies still remain to be done in order to provide the basis for further development and, perhaps, expansion of the networks, in procurement of facilities, definition of data products, and to establish methodologies for the application of the data to the problems of food production. A study is required to determine the optimum distribution of surface observation stations when satellite data is used to supplement the network.

Finally, it must be noted that, in accordance with the principles agreed to during the development of the AGRHYMET Programme, the governments should cover costs for their respective national centres, the salaries, operations, maintenance and construction costs. This rule has been followed very irregularly in the different states. Initiatives to use satellite data to complement the surface data network should be investigated in order to minimize or eliminate the need to increase the number of stations. Also the use of automatic surface observing systems should be investigated.

3. INTEGRATED PROGRAMME PLAN 1982-1986 : THE DEVELOPMENT PHASE LEADING TO FULL OPERATIONAL ACTIVITIES

3.1 Objectives of the 1982-1986 phase

The objectives of this 1982-1986 phase derive in part from the 1977 conceptual and implementation plans and in part from the points raised in the preceding sections. Section 1 listed the long-term objectives of the AGRHYMET

Programme. Section 2 reported on the significant results which have been obtained by the end of the expansion phase 1975-1981, both as regards the AGRHYMET Programme as a whole and the Niamey Centre in particular. It also highlighted the causes which prevented the full attainment of the objectives set for the end of 1981.

The 1982-1986 phase will be a period where the objectives of the expansion phase will be completed while, at the same time, the steps toward achieving the operational activities of the AGRHYMET Programme will be undertaken. Specific objectives are therefore given in two parallel, and in many aspects, complementary streams of activity; expansion activity and operational activity.

3.1.1 Completion of the current expansion phase of the Programme

The two principal objectives of this phase are given in Section 2.2.1. These two areas - training and infrastructure development - will be the central themes in the first years of the 1982-1986 period. The following specific objectives are noted.

3.1.1.1 Training : Objectives

- (a) Training programmes for technicians and professionals in the fields of agrometeorology and hydrology will continue so that the cadre of personnel available to carry out the national projects becomes sufficient. The Programme includes all levels of training, from Class IV through Class I, in both hydrology and meteorology-agrometeorology;
- (b) Specialized training activities are foreseen to reinforce technical personnel of the national projects and the user community in various aspects of the Programme - particularly in the area of applications to agriculture production and the use of new technology in the national projects.
- (c) Training of professionals and technicians in the field of computer science, computer maintenance and computer operations will continue in order to develop the technical manpower required to operate the data processing facilities being installed in the national centres and in the Regional Centre;
- (d) Training of personnel to operate and maintain the telecommunication facilities for each national project and the regional Centre will continue. This training in both equipment and procedures will complement the national Services' activities in telecommunication and will be designed to adequately meet the operational requirements for the AGRHYMET telecommunication plan which is under development (see Section 3.2.2.2);

3.1.1.2 Facilities and networks : Objectives

- (a) The installation of the planned national meteorological, agrometeorological and hydrological networks and their associated centralized data acquisition systems will be completed;
- (b) The completion of the facilities to house the national data processing and data collection and processing equipment; installation of the remaining system;
- (c) Statistical and agroclimatic studies are to be undertaken in the Regional Centre and national projects. The climatological data sets developed in the expansion phase as well as data obtained in real time by the national projects and by the Centre from its telecommunication facility will be used. These studies will focus on the development of products for application by the national Services;
- (d) A study of the use of communications satellites and meteorological satellites needs to be completed early during the period to determine how these technologies can be used effectively to help AGRHYMET to meet its objectives.

3.1.1.3 Monitoring of the national projects : Objectives

- (a) The AGRHYMET Centre should continue to monitor the development of the national projects and seek to assist them in solving problems. Periodic meetings will have to be continued between experts and the Directors of the national Services in order to draw up plans of action, co-ordinate the work and plan and organize the assistance to data users. A management information system is needed to assist national Directors in monitoring both national and regional projects. Computers that have been provided can be used effectively for this work;
- (b) In order for the AGRHYMET Programme's results to be as well adapted as possible to the users' needs and disseminated in the best possible conditions, it is indispensable for the Centre and the national Services to ensure permanent co-ordination and co-operation with the different governmental Services. (e.g. the planning services concerned with economy, farming and water resources; the agricultural administrations, agronomic research groups, services concerned with stock raising, plant protection, hydroelectric and other water resource development, agricultural engineering, forestry and fishing services, etc.). It will be implicit that all countries create liaison and co-ordination committees grouping together the data producers, the meteorological and hydrological Services, and the users of these data. It is especially through these liaison committees that the applied research programmes should be prepared at the national level. Such committees now exist in Cape Verde, Gambia, Senegal, Mauritania and Mali;
- (c) Similar liaison activities are also needed to co-ordinate operational aspects of the Programme.

3.1.2 Beginning of operational phase of the Programme : Objectives

The AGRHYMET Programme objectives stated in Section 1.2 above provide a concise statement of the final evolution of the Programme which is as valid today as it was when originally perceived in the mid 1970's. During 1982-1986, a gradual evolution toward the operational concept articulated in Section 1.2 is anticipated with the following specific objectives within the two main Programme elements - national projects and Regional Centre.

3.1.2.1 National projects : Operational objectives 1982-1986

- (a) A programme of training will be undertaken so that the technician and professional requirements of the national Services are maintained after the initial training programme of the expansion phase has satisfied the immediate needs. The training programme during the period 1982-1986 will begin to emphasize special training activities which are directed at the further preparation of technical personnel (e.g. to utilize new technology such as satellite data) and to inform users of the methodology of application of the products of the national Services and the regional Centre to the national food production problems;
- (b) The dependable operation of the national networks will be confirmed. Further development and testing of the telecommunications from the networks to each national Service and the system of data control, archiving and exchange with the Regional Centre will be implemented;
- (c) Programmes for the dissemination of information to users will be developed during 1982-1986. Continuous broadcasting systems will be implemented in all countries following tests in The Gambia. This system will provide information directly to farmers, public officials and other users in real time;
- (d) At the national level, studies and applied research activities directly focused on national problems in hydro-agro-meteorology and the rational use of water resources will be undertaken (see Section 3.2.3.2). These will be done jointly with applied research activities being undertaken on a regional level at the AGRHYMET Centre (see Section 3.2.3.1).

3.1.2.2 Regional AGRHYMET Centre : Operational objectives 1982-1986

- (a) In co-ordination with the national project objectives (see 3.1.2.1 (a) above), the Regional Centre will develop a programme of training involving :
 - (i) technical training for meteorologists, agrometeorologists, hydrologists and special programmes for training in data processing and specialized fields (instruments, radiation, energy potential, etc.);

- (ii) Special seminars, workshops and training courses will be developed for the purpose of informing users (e.g. government agronomists and planners) of the methodology and applications of AGRHYMET data, services and information products, and economic benefits to be derived. At least one seminar should be aimed at the ministerial level to gain support for financing and national programme integration;
 - (iii) Continue a programme of education and training at institutions outside the Sahel for professional personnel of the Centre and national projects (continuation of 3.1.1.1 (a)).
- (b) Implement the programme of data collection at the Centre (both real time and delayed time) upon which the operational activities of the Centre will be based. Initially, the objective will be to utilize the existing international telecommunication system of the World Weather Watch operated by ASECNA over much of the Sahel and develop plans to upgrade the communications system utilizing additional facilities (e.g. satellite links) if and when such new facilities become necessary and practical;
 - (c) Utilizing the historical data sets at the Centre to undertake analysis and studies of the climate and applications of the data to the problems of agricultural production, optimal use of water resources and analyses of energy potential (solar and wind energy);
 - (d) To develop methodologies for and to implement operational national information services including the dissemination of warning and alerts of weather and climate related hazards to the user population in the region; to prepare bulletins and climatological summaries of data for the region as a whole; and to provide interpretation, guidance and assistance to national Services in the area of information dissemination as required;
 - (e) To provide co-ordination and advice for the national Services in the areas of agrometeorology and operational hydrology, through a programme of applied research and studies. These activities will include liaison with users of the AGRHYMET products as well as the development of co-operative programmes with other international or regional institutions in the Sahel working in related areas (e.g. satellite analysis, hydrology, agronomy, etc.);
 - (f) Through the experimental farms and agrometeorological and hydrological laboratories, to develop and test concepts and theories regarding the application of knowledge of meteorology and hydrology to agriculture, energy problems, etc.;
 - (g) To utilize products from the World Meteorological Centres and other international centres (such as the European Centre for Medium-Range Weather Forecasting (ECMWF)) with the regional data and analysis to support studies :
 - (i) to develop the methodologies necessary for application of the data to the problems in sectors such as food production, water resources and energy potential;

- (ii) to understanding the dynamics of weather and climate over the Sahel; (e.g. the West African monsoon);
 - (iii) to develop methods for weather analysis and forecasting aimed at supporting national Services in their objectives of applications to national needs;
 - (iv) to promote activities of crop protection;
- (h) To develop techniques for utilizing satellite data, combined with in situ measurements, in observing the atmosphere, water resources, radiation balance, and land use, especially as related to yield prediction.

3.2 Programme activities : 1982-1986 phase

This section summarises the Programme activities of the 1982-1986 phase leading to full operational level, for both the national projects and the Regional Centre, as developed by the team of experts charged with preparing the AGRHYMET Programme plan for 1982-1986 (see Section 1.4). The team carried out its work during April 1981 and utilized the questionnaire completed by each national project as well as the Programme activities proposed by the Regional Centre. The discussion follows an outline which corresponds to the Programme and Regional Centre organization as given in Annex 1.

3.2.1 Training

3.2.1.1 Training at the Regional Centre

The over-all needs for fellowships are summarized in Annex 3. The detailed summaries for national training requirements for training at the AGRHYMET Centre of Class II and Class III agrometeorologists, Class III hydrologists and instrument technicians and computer operators (Class III and Class IV) are given in Annex 4. In addition, requests for training at the Centre for students in these courses from neighbouring non-CILSS countries and from regional programmes (e.g. HYDRONIGER) must be anticipated. Organization of a course for engineer hydrologists (corresponding in level with Class II meteorologist) has also been envisaged and should be programmed into the over-all scheme (see Section 3.2.1.3).

A provisional training calendar for 1982-1986 is proposed in Annex 5. Such a calendar is subject to periodic approval and revision by the Executive Committee and is offered as a preliminary indication of what is required for planning purposes. The timetable provides a training schedule sufficient to complete the required training as foreseen and modified during the current phase of the Programme. From 1985 the Centre's activities will shift somewhat to begin to accommodate new or special training activities and the rescheduling of certain courses to meet the needs of CILSS and non-CILSS countries is foreseen but not explicitly included in the timetable.

It should be noted that the training timetable has been adjusted as far as possible to the Centre's present lodging capacity (50 students). This is an obvious lack of flexibility which can be very limiting as regards the priorities, provision of additional courses (e.g. hydrology Class II training), admission of former students for refresher courses, organization of small information seminars, etc. It is therefore proposed to construct two additional residential blocks (for 20 students) for which the linkages to the public utilities have already been installed.

3.2.1.2 Training in the national projects

The AGRHYMET training programme also includes training provided in the countries themselves or in certain sub-regional schools for Class IV personnel (observer level). The Regional Centre co-ordinates the programme of roving instructors which is essential to this training programme. This activity is foreseen to continue in 1982-1986. The roving instructors will also monitor the observers' activities, this monitoring being essential to ensure the good quality of the data observed and transmitted. The national Services also participate in the training of computer technicians by the use of self-teaching aids which are provided through the Programme.

3.2.1.3 Training outside the AGRHYMET Centre

The detailed lists of the national training requirements, which are principally Class I and Class II personnel in meteorology, agrometeorology, hydrology and electronics and data processing to be done outside of the AGRHYMET Centre, are given in Annex 6. It should be noted that if a course for engineer hydrologists is organized within the Centre, this training indicated in Annex 6 (Hydro. Class II) would be shifted to the Centre programme. It is anticipated that such a change would be possible if 10 to 12 candidates were nominated within the same year (i.e. implying acceptance of students from outside the CILSS countries) and if the student housing were expanded.

The training courses for specialization in electronics and data processing (computers) for Class I and Class II personnel will be given in the United States (see Annex 6). Included in the training proposal is a programme for upgrading and improvement of AGRHYMET Centre staff. It is planned that certain personnel filling posts at the Centre will be sent to institutions outside the Centre to participate in short-term specialized training courses, and, in certain instances, to undertake long-term academic programmes (see Annex 7).

3.2.2 Operational activities

One of the main objectives of the AGRHYMET Programme is to supply information to the national agricultural Services, that will permit an increase in agricultural productivity and reduce its vulnerability to atmospheric and hydrological hazards. To reach this objective, the Programme must continue to strengthen the national Hydrological and Meteorological

Services so that they can provide daily information on hydrological cycles, on the variations of the meteorological conditions and on the state of development of natural vegetation and crops. This will enable rational use to be made of the scarce water resources. In addition, the activities of the AGRHYMET Centre and of the national Services during the period ahead should be focused on the preparation and supply of the information which can be given in deferred time as well as in quasi-real time. The deferred time information includes :

- (a) water balance and its effect on :
 - (i) water requirements and availability,
 - (ii) choice of crops and of the varieties,
 - (iii) choice of cultural techniques and of an agricultural operations calendar,
 - (iv) opportunity to set up alternative crops;
- (b) air and soil temperature and humidity regimes and wind regimes and their influence on :
 - (i) plant physiology,
 - (ii) evapotranspiration,
 - (iii) use of peak energy and wind energy,
 - (iv) schedule of farming operations taking into account climatic variations;
- (c) radiometry and its energy application (solar pump);
- (d) soil characteristics and their influence on :
 - (i) water requirement analysis,
 - (ii) fertilizer spreading utility,
 - (iii) opportunity of an erosion control;
- (e) hydrography of watercourses (drought and flood) and their influence on the use of hydro-power, agricultural or sanitary water resources;
- (f) rainfall data and its influence on :
 - (i) water resources evaluation,
 - (ii) dynamic recharge of ground water tables,
 - (iii) schedule of sowings and harvest and agricultural operations,
 - (iv) the opportunity for cultivation of rain-fed crops.

Quasi real-time information may concern :

- (a) the water regime experienced by the natural vegetation and main food crops on the most important types of soils in a region, the likelihood of its evolution and the impact on outside production;
- (b) the characteristics of droughts recorded in a region (local or general drought) and their impact on crops sown on different dates or on crops which are more or less resistant to drought;
- (c) estimation of farm production before the end of the season, rather than at the time of commercialization, in order to permit inter-zone transport planning and product storage;
- (d) daily irrigation needs and water regimes as concerns both replenishment of village or other reservoirs and the water supply to urban or village networks;
- (e) meteorological conditions which influence weather and therefore the preparation of the ground for sowing, the efficiency of weeding, fertilizer application, thinning, insect and disease control and their efficiency, and particularly meteorological conditions related to specific rainfall (isolated storms, monsoon, etc.);
- (f) harvesting conditions and probable post-harvesting conditions and the need to adopt appropriate harvesting and crop storage methods;
- (g) state of development of natural pasture land and its effect on the movement of livestock, means of commercialization to be adopted and possible interference with prices;
- (h) the need for international action to control insect attacks.

For the national projects, the operational activities of the AGRHYMET Programme include the management of the observing networks, data acquisition, processing and exchange, and the dissemination of information to the user community within each country. For the Regional Centre, the operational activities include the data acquisition from the national projects and other sources such as the World Weather Watch system. The Centre's operational activities also include data processing and analysis, the organization, maintenance and updating of the data bank, and the production and diffusion of information and data products.

The plan for 1982-1986 discussed below covers both the national projects and the Regional Centre with the objective of providing a comprehensive view of the proposed Programme. The plan is based on the concept that a gradual implementation of operational activities should be undertaken, utilizing wherever possible the existing telecommunication and data networks. The expansion of networks and the installation of new telecommunications systems (e.g. satellite links) may be deemed necessary but plans for these should be developed after careful analysis and should be integrated into the international World Weather Watch system.

3.2.2.1 Networks, data acquisition and transmission

The AGRHYMET operational activities concept is based upon a mutually supportive programme involving national Services as well as the Regional Centre. Exchange of information in real-time via telecommunication links is required, complemented with a system for delayed-time collection via mail or other means.

The AGRHYMET national projects include the existing and planned networks of meteorological, agrometeorological and hydrological stations as given in Annex 2. The programme envisaged for 1982-1986 is to bring these networks to a fully operational status including the real-time and delayed time acquisition of data and their transmission to the national centres and subsequently the transmission of validated data from the national centres to the Regional Centre. The equipment requirements (meteorological, hydrological and agrometeorological) for each country's network and operation are contained in detailed lists given in the composite national project proposals in Appendix II of this document.

At the AGRHYMET Centre, four types of data are required by AGRHYMET to perform its functions. These are surface based observations including hydrological data, upper-air observations, remotely sensed data, and products of data processing centres outside of the AGRHYMET system.

- (a) Surface observations : This type of observation consists of conventional meteorological, climatological, aviation, agrometeorological and hydrological data. These data are received from outlying stations at the national centres by mail and/or by single-side band radio. During the initial phases of the operation at least, these data will be transmitted on the ASECNA low speed telecommunications system from the national centres to the AGRHYMET Centre and will be exchanged internationally through the WWW system;
- (b) Upper-air observations : This type of observation consists of conventional radiosonde and pilot balloon operations. Additional data are available from aircraft reports. These data are also transmitted on the ASECNA telecommunications system;
- (c) Satellite data : Remotely sensed observations are taken by meteorological satellites (TIROS-N, METEOR, METEOSAT) and by land satellites (LANDSAT):

LANDSAT data will be received and processed at the CRTO in Ouagadougou, Upper Volta. These data will be ready for distribution from CRTO to AGRHYMET via special courier arrangements in 10-15 days following the satellite pass;

Meteorological satellites provide data in analogue and digital formats. The analogue or APT (automatic picture transmission) format can be received on equipment already provided to AGRHYMET and to some national meteorological centres. Imagery produced from the equipment are in paper form and are low to medium resolution. The imagery produced are useful for general forecasting and applications but are not suitable for computer processing.

The proposal has been put forward that the Regional Centre and the national Services should eventually have access to digital processed data from meteorological satellites. This proposal involves the installation of an appropriate satellite receiving terminal. Before developing final plans and proposals in this regard, a study should be made in 1982 to evaluate the specific needs and specifications for such an installation.

The digital data received by the Regional Centre would be used in conjunction with surface observations to produce quantitative rainfall analyses. A joint 3-year study involving AGRHYMET and the University of Reading on the applicability of this technique was started in 1981. There have also been tentative discussions regarding a joint FAO-AGRHYMET programme to develop this quantitative rainfall analysis which would utilize the AGRHYMET computer for real-time analysis;

- (d) Centrally produced products outside of AGRHYMET system : The purpose of the WWW Global Data Processing System (GDPS) is to make available to all Members of the World Meteorological Organization processed information which they require for both real-time and deferred time applications. It is proposed that, in support of the AGRHYMET operational activities, the Centre will receive centrally produced products from either the European Centre for Medium-Range Weather Forecasting (ECMRWF) or from the World Meteorological Centres, or both. It is foreseen that initially, the products will be obtained in delayed mode (mail) and, depending on their applicability, reception in real time (e.g. via satellite communication) will be considered..

3.2.2.2 Data processing

Minicomputers were purchased for the eight national Meteorological Services and for the Regional Centre during 1980. Five are installed and operating. The minicomputer installed in the Gambia is the only one currently installed outside of the Regional Centre. The four installed in the Regional Centre are being used for training and software development as is the Gambia computer. The remaining five minicomputers will continue to be held in storage until the national Services are prepared to receive and use them. Preparation requirements, as stated in the 1977 plan for data processing, include properly constructed facilities, installation of uninterrupted power systems, environmental control systems, at least two people trained as computer maintenance technicians, and at least two people of Class II level trained in programming and in the use of the computers.

- (a) National projects :

The computers for the national Services are designed to provide basic automatic data processing capability for training purposes, for preparing a variety of climatological, agricultural and hydrological data analyses, summaries, and reports, for quality controlling and

archiving observations, for automatically preparing and transmitting observational messages and for transmission directly to teletypewriters and other data communications systems. It is foreseen that the computers will be linked together for AGRHYMET operations but this will depend on the telecommunications system available.

In the 1982-1986 period the following additions to the national computer system are proposed to meet the Programme demands (see itemized lists in the Appendix II to this document and the budget summary in Annexes 13, 14) :

- (i) self study training materials
 - (ii) pencil and tablet digitizers
 - (iii) hard disk units
 - (iv) printer/plotter units
 - (v) increased memory
 - (vi) back-up power systems to ensure operational capability and continuous power
- (ii) operating system upgrade.

Software packages will be provided during this phase which will allow the national Services to utilize the computer for accounting and finance logistics and station management applications.

A complementary system which will allow the national Services to read, print and duplicate microfiche are included in the proposal. This equipment will provide the national Services the capability to utilize the data archive being developed under the Belgian programme (see Section 3.2.2.3).

(b) Regional Centre :

Expansion of the larger computers at the AGRHYMET Regional Centre is scheduled mostly for 1984 to coincide with the expected increases in the number of users together with the beginning of AGRHYMET operations. Special computer applications such as satellite data processing may also be anticipated toward the end of the period. The list of equipment items under 3.2.2.2 (a) above is also foreseen for the Regional Centre (see also Appendix 1 for detailed lists of equipment and the summary budget in Annex 8).

3.2.2.3 Data archiving

The "Institut Royal Météorologique" in Brussels has an on-going project to archive meteorological observations for CILSS. The archiving includes microfilming original documents, converting the data to computer magnetic tape, merging observational files from

other organizations such as ASECNA, performing data quality control, eliminating duplicates, and preparing archive quality microfiche and digital storage of the final product. A set of magnetic tapes for the computer containing ASECNA data is now in the tape vault at AGRHYMET.

The work programme for 1982-1986 will include the design of the AGRHYMET data archive system, the transfer of the archive to AGRHYMET, and the training of AGRHYMET personnel in the operation and maintenance of the archive. Assistance from outside the "Institut" will be used during the design to ensure that the system conforms to WMO and other international standards.

This project must be completed in order to provide the data base for climatological assessment and for applications development.

3.2.2.4 Information dissemination

The dissemination of AGRHYMET products to the user community will consist of two levels of activity : first the distribution of information and products from the Regional Centre to the national Services and secondly the dissemination of information by the national Services to the user community in each country. The activities for 1982-1986 will consist of the developing and testing of methods of information distribution and dissemination and the beginning of actual operations in this field.

(a) Distribution of information from the Regional AGRHYMET Centre to the national Services

Outputs from the Regional Centre will take two forms during the 1982-86 period :

- (i) alpha-numeric messages (bulletins) distributed over the existing telecommunications system;
- (ii) production of material in the form of written reports and analyses mailed from the Centre.

Further study will be made regarding a future system of high-speed telecommunications which would allow for the distribution of more elaborate graphical material via satellite links. It is foreseen that this advanced system will not be in place before 1986.

(b) Dissemination of information to the user community

The final link to get information to the end users is the responsibility of the national Services. During the 1982-1986 period, specific tests of various ways of accomplishing this information service will be undertaken by the AGRHYMET Programme. A combination of methods will be evaluated and probably implemented, including :

- (i) direct mailing of bulletins and information :
mail is an already established means for providing users with published information such as weather and climate summaries, literature of an educational nature, as well as informative pamphlets. These materials are not particularly time critical and therefore dissemination via mail is satisfactory;
- (ii) use of public media through prepared announcements :
the development of bulletins and reports to be carried by the public broadcast media will complement the existing weather reporting services of the media;
- (iii) a dedicated continuous broadcast radio system :
a continuous broadcast system is proposed which would transmit on standard 88-108 MHz frequencies to get information to the end user (routine information, alert and warning, education).

During 1982-1986, a test installation of the continuous broadcast systems will be made in The Gambia where a maintenance staff is trained and the national Meteorological Service is staffed sufficiently to operate the continuous broadcast system.

The test in Gambia will allow the AGRHYMET Programme to move ahead in the field of data dissemination and the experiences learned in The Gambia can be used in developing a CILSS wide programme.

3.2.3 Studies and applied research

Agricultural development of the Sahelian region necessitate the use of specific technology adapted to the geographical and climatical conditions in each region. One of the most important activities of the AGRHYMET Programme therefore consists in developing this technology with a view to transferring it to the various users as soon as possible. Transfer of technology implies prior study and applied research and the development of methods capable of further increasing the farming production of any given zone. These studies and research should be undertaken both at the Regional Centre and under the various national projects.

3.2.3.1 Applied research at the Regional Centre

In the first years, some research in applied hydrology is programmed, but the AGRHYMET Centre should undertake and continue applied research especially in the field of agrometeorology. It should begin provisionally by extending tests over the experimental zone within the limit of the 50 ha of arable areas. Analysis and synthesis studies will be carried out in association with research in the field under the national projects and in the experimental plots.

The Centre has made certain installations on the experimental plots for pasture and irrigated and rain-fed crops. It should subsequently develop these installations, especially for the irrigation, whilst adapting the size of crop plots to avoid undue influence of soil heterogeneity.

Work should be continued or started on the following :

- (a) rain-fed crops (millet, sorghum, niebe, peanuts, maize, wheat, cotton and rice) in order to study yields and the possibilities of improving them when transferring from traditional (manual) methods to the use of animals or machinery;
- (b) irrigated crops in order to determine the yields and water requirements and to test the various irrigation systems while trying to define irrigation standards;
- (c) pasture land in order to assess the impact of grazing density on the composition and production of natural or improved pasture land;
- (d) market gardening to determine which varieties best suit the Sahelian region depending on the conditions of protection against the sun and on water application systems;
- (e) installation of wind breaks to study their effect on the crops, whether rain-fed or irrigated;
- (f) agroclimatic and microclimatic aspects of the problem of crop preservation;
- (g) optimal timing of sowing and harvesting and other agricultural operations.

3.2.3.2 Applied research under the national projects

Some applied research in agrometeorological subjects, similar to those at the Centre, will be considered in co-operation with national Agricultural and Meteorological Services. The applied research in hydrology can only be efficient if done in close collaboration with the national projects and thus linked to the conditions prevailing in each country. Activities should be undertaken, promoted and/or continued in this field with the following objectives :

- (a) maximum use of hydrological observations in correlation with meteorological data in order to establish hydrometeorological prediction models;
- (b) reclamation of soils capable of supporting irrigated crops and the measurement of the effects of irrigation (water loss, erosion, water balance, etc.);
- (c) installation of hydrological basins representing a regional hydrological regime;
- (d) studies of deep storage of water causing greater replenishment of the water table and re-use of this water either for agriculture or for village hydraulic powers.

As regards renewable energy, applied research needs to be promoted on the use of wind and solar pumps in certain countries where it is applicable and to measure their reliability and impact on development of the villages' activities. It is also possible to envisage applications in the field of composting and rational production of bio-gas.

3.2.3.3 Applied research at regional level.

This is research set in motion by the AGRHYMET Programme in order to study and use the data and potential resources of the different regions with a view to :

- (a) analysing the role of climate in crop growth and yield;
- (b) development and/or testing of simple yield prediction models;
- (c) understanding better the evolutionary process of the Sahelian hydrometeorological cycle;
- (d) establishing well defined practical standards for calculating water requirements;
- (e) analysing the phenology of Sahelian vegetation;
- (f) studying the physics and pedology of the more extensive types of Sahelian soil in relation to their water regime;
- (g) rationalising hydrometeorological observations by striving for an optimal measurement network.

In parallel to these applied research activities, the AGRHYMET Centre should undertake more basic studies in collaboration with certain national Services or organizations on synoptic and dynamic meteorology, climatology, hydrology and agrometeorology. The subjects for these studies will be chosen in view of the current research in each specialization. The following is a list of possible subjects relating to meteorology and climatology :

- (i) studies of the GATE and WAMEX experiment results;
- (ii) synoptic and dynamic studies on the genesis, onset and withdrawal of the monsoon, from all types of observations : networks, satellites, sea currents etc.,;
- (iii) study of mathematical models of tropical atmospheric circulation from six exact equations of atmospheric thermodynamics;
- (iv) study of the inter-seasonal and inter-annual variability of climatic elements in relation to the prior synoptic data;
- (v) study of dynamic climatology; establishment of mean wind charts at various altitudes and for different periods (months, seasons);

- (vi) studies of radiation and cloudiness; establishment of semi-empirical formulae to estimate global radiation from insolation observation and thus benefit from the prior data from the heliograph network.

3.2.3.4 Implementation of the envisaged studies and research - scientific and technical co-operation.

The ambitious programme of studies and applied research cannot be implemented by using the AGRHYMET Programme's forces alone. The AGRHYMET Programme therefore envisages collaborating in this field with organizations and institutions which play a role in the economic development of the Sahel countries as well as with foreign governmental or private bodies interested in the same objectives. A few institutions are mentioned which are likely to collaborate in these different programmes :

- (a) Permanent agrometeorological and hydrological operations :
 - (i) WMO World Weather Watch (WWW)
 - (ii) ASECNA (Agency for the safety of air traffic in Africa)
 - (iii) Niger Basin Authority (ABN), Organization for the development of the River Senegal (OMVS), Lake Chad Commission (CBLT), Organization for the development of the River Gambia (OMVG)
 - (iv) Regional Centre for remote sensing in Ouagadougou (CRTO)
 - (v) Joint Organization for the struggle against acrididae and bird pests (OCLALAV) and inter-state office for the struggle against migrating crickets in Africa (OICMA)
 - (vi) the FAO EWS group (Early Warning System)
 - (vii) the FAO Remote Sensing Centre
- (b) Applied research activities :
 - (i) Global programmes of specialized U.N. agencies - WMO World Climate Programme (WCP), United Nations Sahelian Office (UNSO), UNESCO Man and the Biosphere Programme (MAB), United Nations Environment Programme (UNEP), etc.,
 - (ii) Tropical Agronomic Research Institutions such as the Advisory Group for International Agronomic Research (GGIAR), the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), the West Africa Rice Development Association (WARDA), the International Institute for Tropical Agriculture (IITA)
 - (iii) International bodies concerned with hydrological and hydraulic studies such as the Office for Scientific and Technical Research Overseas (ORSTOM) and the Inter-State Committee for Hydraulic Studies (CIEH),

- (iv) National and regional agronomic research Services (INRA, IRAT, ISRA),
- (v) University institutions such as the University Corporation for Atmospheric Research (UCAR).

A special relationship has already been established, is in the process of being strengthened or should be established with :

- (a) the EAMAC (Ecole Africaine et Malgache pour l'aviation civile) for joint training of technical personnel;
- (b) the CILSS project for integrated pest control;
- (c) the project "Hydrological Forecasting System for the River Niger Basin" ("HYDRONIGER" Project), in particular for :
 - (i) training of technical personnel at the AGRHYMET Centre
 - (ii) use of the Centre's data-processing means and data banks (use of personnel and equipment)
 - (iii) sharing of telecommunication facilities
 - (iv) enrichment of the Centre's data bank

Installation of the HYDRONIGER's offices at or near the Centre's land has been discussed including co-ordination for financing certain operations concerning, for example, reinforcing the joint national projects (with equipment and logistic means) or equipping maintenance and calibration workshops (at the Niamey Centre and in the national projects).

- (d) the International Crop Research Institute for the Semi-Tropics (ICRISAT)

It is planned for ICRISAT to install temporary experimental fields on the Centre's land but subsequently only to keep a small area. Clearly, the Centre can greatly benefit from such an entourage whether for practical student training or, especially, for using the experimental results.

- (e) Specialized departments of foreign and national universities as well as international centres for hydro-agrometeorological research and application. Special relationships have already been established with the Universities of Reading, Nottingham and Wageningen

The AGRHYMET Programme should give very special attention to collaborating with certain departments of foreign universities and research institutes. These institutions are often looking for land for experimentation, observed data in the hydro-agrometeorological field and local scientific personnel to ensure the follow-up of research undertaken. In exchange, they offer their partners

high-level scientific and technical inputs, direct participation in the analysis and elaboration of the results as well as an appreciable contribution to on-the-spot training of local technical staff. The Regional Training Centre in Niamey should also benefit from this scientific input through periodic consultations planned within the framework of travel by a foreign collaborator to a Sahelian experimentation centre.

4. INTEGRATED PROGRAMME BUDGET 1982-1986

This section presents the proposed budget for both the Regional AGRHYMET Centre in Niamey, and the eight country projects which together comprise the AGRHYMET Programme. The proposed budget follows the analysis of the questionnaire done by the multi-disciplinary team of experts (see Section 1.4) which simply transformed the stated needs of the national and regional components into quantitative budgetary requirements. The budget presented here must be viewed as a first preliminary statement of requirements for the integrated Programme and subsequent adjustments and clarifications will be required following a series of co-ordination activities to be undertaken by the national governments, the regional Centre, the CILSS and the WMO as executing agency for the Programme. The final budget must support a well conceived and technically sound integrated Programme which can meet the stated objectives of the 1982-1986 phase while at the same time being entirely realistic with regard to the economic and development realities of the region.

The following general strategies were used in developing the budget :

- Costs of international experts, consultants and fellowships are based on the WMO pro-forma costs as of 1 April 1981;
- CILSS personnel costs are presented without using an inflation factor.
- using the 1981 costs as a base an annual inflation rate of 10 percent was used for non-personnel items.
- the budget is prepared using the exchange rate of 1 US \$ = 250 CFA

4.1 Regional AGRHYMET Centre budget

The summary of the budget requirements for the AGRHYMET Centre is contained in Annex 8. Detailed listings and breakdowns for the Centre are contained in Appendix I.

The following comments concerning the budget are grouped according to the organization framework of the AGRHYMET Centre (see Annex 1). The comments are made to highlight certain aspects of the programme and budget which need further clarification.

4.1.1 Administration and general service (see Annex 9 and Appendix I.C., p. 1)

- (a) Personnel : the budgetary request for personnel for the Centre reflects the discussion on this subject held during the extraordinary session of the Executive Committee. The phasing of the personnel list (see Appendix I.B.) is designed to bring the Centre into full operation by 1986 and to satisfy the urgent needs to complete the expansion phase of the Programme. The following special issues are of note :

- (i) The budget does not include funding for the post of Principal Technical Adviser (Post 021). The CILSS/WMO Agreement states that this post is to be a CILSS post but special consideration should be given to providing funds for this post from additional international sources for at least 1982-1983.
- (ii) There is an urgent need for all personnel dealing with financial affairs in the Administrative and Financial Directorate to be fully qualified to implement financial procedures in accordance with UNDP and WMO regulations. If necessary, adequate training must be provided.

- (b) Personnel housing and additional student housing :

The budget foresees a programme of construction of housing for senior staff and the construction of two additional student blocks so that twenty additional students may be housed. These needs were re-emphasised at the extraordinary session of the Executive Committee and construction should be started soon.

4.1.2 Training (see Annex 9 and Appendix I.C., p. 2)

- (a) The training programme envisaged for the Centre is such that a special effort to construct two additional student housing blocks will be required;
- (b) The programme and budget foresees the need to institute a Class II course in hydrology, which should be done in co-operation with other projects such as HYDRONIGER; however, two additional teaching posts in hydrology necessary to provide this must be obtained from separate sources;
- (c) The programme also provides for training at the Centre of Class III and IV computer specialists.

4.1.3 Operational activities (see Annex 9 and Appendix I.C., p. 3)

The proposed budget in this area is designed to undertake a programme which relies on presently available telecommunication facilities. The data processing and telecommunication expert on the multi-disciplinary team noted that there may be a requirement for a special satellite based telecommunications facility to inter-connect the national Services with the

Regional Centre, and the Regional Centre and the national Services with the Global Telecommunication Centre of the World Weather Watch. The expert also foresaw the need to obtain data from aircraft automatically on an operational basis and for digital satellite receiving stations for high resolution digital satellite data readout at each national Service. These proposals should be studied early in the phase. An in-depth evaluation should be made with regard to the needs of the Programme and the national Services, the appropriate technology available and the co-ordination with the World Weather Watch system development in the region. Special budget requests may then be developed should the requirements for such advanced technology systems be justified (see Section 4.3).

The data bank and data archive activities of the Centre are closely linked with the Belgian data processing programme and with the beginning of the West African Data Bank concept as discussed in the Report of the Informal Planning Meeting on West African Data Bank, Geneva 25-27 February 1981. This is an essential element in developing the agricultural applications and for support of the applied research programmes.

The operational activities of the Regional Centre are foreseen to be closely co-ordinated with and complemented by other operational programmes of the region (see 3.2.3.4 (a)). The financial implications of these activities are not clear at the present time and no cost-sharing is assumed in the present budget, an assumption that may need to be modified subject to negotiations with the various co-operation projects. Cost-sharing through contribution in funds or "in kind" for the use of the Centre's facilities for non-AGRHYMET work must be assumed in all arrangements.

4.1.4 Studies and applied research (see Annex 12)

A specific programme concerning the studies and applied research to be undertaken at the Regional Centre and in the different national projects is not yet defined. It is therefore difficult to estimate exactly the total equipment and running costs which will be necessary for these studies, as well as the cost for counterpart and international personnel involved in this programme. It is nevertheless necessary to provide a budget allocation so that these studies and applied research can be fully undertaken, and a provisional estimate has therefore been made. It must be noted that this estimate, which is included in the budget for the Regional Centre, will be utilized also for the studies undertaken within the national projects. In regard to the personnel which are involved in this research, it should be noted that the post of Director of Applied Research is combined with the post of senior hydrologist for the first 3 years of the 1982-1986 phase.

It is expected that the Director of Applied Research will ensure that each study and each research project will be undertaken only after a project design paper has been prepared and approved which outlines the project, defines the inputs required, defines expected outputs, discusses the purpose, applicability and benefits to be derived, and lists the resources required in terms of personnel, money, equipment, and facilities.

4.1.5 Summary

The 1982-1986 budget for the AGRHYMET Centre has a total of 5461.5 million FCFA (\$ 21.85 million).

In order to present a summary analysis of this budget, it has been provisionally assumed that the contribution of the Member States of CILSS would be limited to counterpart personnel costs. Further discussion is necessary before this assumption can be confirmed.

Accepting this provisional assumption, the total budgetary cost is allocated 86% to international contributions and 14% to counterpart contribution, the latter being equivalent to 16.2% of the international contribution.

On this same basis, the allocation of the international contribution can be summarized as follows (% total contribution) :

International Personnel	50,1%
Training fellowships	6,3%
Regional activities	5,5%
Regional Centre	14,5%
Computer centre	8,3%
Construction (new buildings)	13,9%
Miscellaneous and contingency	1,4%

Appendix I presents budget summaries by sector activities of the Centre, according to the organigram given in Annex 1. A breakdown of allocations to sector activities is given below in terms of international and CILSS (personnel) contributions. International allocations are expressed as percent of total international contribution with the CILSS contribution represented as a percentage addition to the international contribution :

	<u>International contributions</u>	<u>CILSS contributions</u>
Administration and general services	25,5	6,0
Training	41,3	3,6
Operational activities	18,0	4,3
Studies and applied research	11,4	2,4
Miscellaneous and contingency	3,8	-

Additional needs have been listed above and in Section 4.3 below. The WMO foresees a potentially large deficit between the proposed budget and the resources available. The following actions will be required to reduce this deficiency :

- (a) Additional donors will need to be brought into the programme;
- (b) A continued refinement of the Programme will be necessary with the possible eventual delay or discard of some low priority Programme elements and their associated budgetary requirements. The impact of such adjustments will be highest in personnel costs.

4.2 National project budgets (see Annexes 10, 11 and Appendix II.)

The national project budgets are presented in two parts, the international contribution and the government contribution. The summary of the preliminary budget requirements for the national AGRHYMET projects is contained in Annexes 10 and 11. Detailed listings and breakdowns for each country are contained in Appendix II. The budgets presented are simply compilations of the answers given to the AGRHYMET Programme questionnaires with the requirements divided between Government contribution (personnel costs, buildings and facilities and one half of the operational costs) and the international contribution (Experts, fellowships, equipment, one half of the operational costs).

As noted in paragraph 2.2.2 the commitments by the CILSS governments are critical elements in the success of the AGRHYMET programme development since these commitments have not been co-ordinated at the time of the preparation of this budget. This budget proposal must be considered tentative and preliminary.

4.2.1 International contribution budget (see Annex 10)

- (a) **Experts** : The requirements as expressed in Annex 12 represent the stated requests of the governments. These preliminary proposals require further co-ordination and evaluation which takes into account the increasing availability of trained national personnel and the potential changing role of the experts as the national projects evolve toward operational status. It is foreseen that fewer experts should be necessary in the future, and that the advisory function performed by experts could be accomplished by more experts from the Regional Centre or by assigning one expert to cover more than one national project. These concepts are included in the present budget request for data processing and telecommunications.
- (b) **Fellowships** : The number of fellowships (see Annex 3) proposed in the budget are designed to bring and maintain the national projects to operational manpower levels. The continuing requirements for re-training and supplementary training and special seminars and courses are foreseen but difficult to quantitatively express in budgetary terms. This special education aspect will evolve progressively as the phase progresses.
- (c) **Equipment** : The requirements for completion of the networks according to Annex 2, the implementation of the telecommunications system, the upgrading of the capabilities of the national Services (e.g. computer systems) and the necessary vehicles and expendables to begin to undertake operations during 1982-1986 are budgeted here. As with the Regional Centre there may be a need to develop facilities for satellite data readout and communications. Section 4.3 addresses this potential additional requirement.
- (d) **Operational Costs** : See Section 4.2.2 (c).

4.2.2 Government contribution budgets (see Annex 11) :

The budgets presented here are preliminary budget requirements based upon the analysis of the questionnaires completed by the national Services. It must be emphasised that these budgets are to be considered as preliminary indications and have not been fully co-ordinated within each government.

- (a) Personnel : The personnel listed are members of each national Meteorological and Hydrological Service. The manpower levels are to be viewed as the requirement of ultimate operational implementation of the Programme. Salaries for students participating in the regional training programmes are also included.
- (b) Buildings and facilities : The urgent completion of the buildings and facilities for housing the national Services computers and telecommunications, and the network of observing stations and telecommunications facilities, are included in the budget. This is a high-priority item which controls the ultimate implementation of the over-all AGRHYMET operation.
- (c) Operational Costs : Ultimately the total cost for the national operation is foreseen as a government responsibility. For the 1982-1986 development phase and in accordance with a recommendation of the multi-disciplinary team, these operational costs are proposed to be shared evenly between the government and international parts of the budget. This arbitrary division requires co-ordination and acceptance by all parties and therefore must be considered as a tentative proposal.

4.3 Potential major additional requirements

Certain additional dimensions to the 1982-1986 integrated Programme and budget have been brought forward but not included in the budget. The following sections summarize the proposals and where possible the financial implementations are shown. These ideas should be studied and evaluated, and it is proposed that in 1982 further technical evaluation is undertaken and special projects developed as necessary for those activities deemed valuable (see Section 4.4). Except for Section 4.3.1, estimated costs in Section 4.3 are 1981 prices.

4.3.1 Hydrology II course

It is foreseen that two additional teachers will be required at the Regional Centre to undertake the Class II hydrological engineers course (see Section 4.1.2).

Two international experts for two years

\$ 360,000

4.3.2 Telecommunication

As pointed out in Sections 3.2.2, 4.1.3, and 4.2.1, the multi-disciplinary team foresaw that a special effort may be required to upgrade and improve the telecommunications capability of the Programme to ensure that the required data and products are available and exchanged between the national centres, the Regional Centre and with other international centres such as the World Meteorological Centres. It was proposed by the telecommunication and data processing expert on the multi-disciplinary team that the use of satellite communication facilities would be the best way to upgrade and improve this capability. The satellite communications would be integrated with the existing computer facilities. The expert also proposed that data from aircraft could be obtained from the air to ground data relay systems currently being developed. The first estimate of unit costs are :

Communications Satellite Ground Stations (digital)	\$ 25,000
PTT Fibre Optic Interface	\$ 25,000
Printer-plotter	\$ 10,000
Satellite Clock System	\$ 5,000
Air to ground data relay	\$ 15,000
Expendables, spares, etc.	\$ 25,000
	<hr/>
	\$105,000
	=====

The expert foresaw the over-all system as being an integrated network of nine such telecommunications systems (eight national centres and the Regional Centre) giving a total start-up equipment cost of \$ 945,000 at 1981 prices. Additional information regarding the operating costs required (e.g. satellite communications channel rental) to implement such a system need to be clarified and included in the proposal. It should be noted that the facilities and personnel provided under the expansion phase can be utilized to a large extent in this expansion. The future system must be integrated with the existing WWW Global Telecommunications System and used to support the total Meteorological Service of each country not just the AGRHYMET Programme.

4.3.3 Meteorological satellite data

Currently only Automatic Picture Transmission and WEAFAX capability for meteorological satellite data reception exists at the Regional Centre and at some of the national Services. The proposal has been put forward that at each national Centre and at the Regional Centre digital meteorological satellite data reception systems should be installed (receive only at national centres and a send and receive system at the Regional Centre). Such systems would allow for the reception of data from geostationary and orbiting meteorological satellites which are computer compatible and would be valuable additions to the data base used for analysis and products (e.g. area precipitation estimates). It would also allow for distribution of products from the Regional Centre to the national Services. A preliminary estimate of a unit cost for such a system is :

Meteorological satellite ground station (send and receive)	\$ 125,000
Meteorological satellite ground station (receive only)	\$ 25,000
Expendables, power, spare parts etc.	\$ 10,000

As with the Telecommunications proposal in 4.3.2 above, operational, personnel and training costs are not included, and these as well as the eventual channel rental must be evaluated.

4.3.4 Continuous broadcast systems

A continuous broadcast system will be installed in The Gambia to test and demonstrate the feasibility of providing a variety of national meteorological and hydrological products directly to users. Procedures and products of similar operational broadcast systems will be modified to take account of the Sahel users needs and their environment. Results from this operational system will be used by the Regional Centre to develop a standards and procedures manual which can be used by other countries in implementing their own continuous broadcast systems. Those systems will be purchased early on to accommodate those Services which develop the capability to produce products.

Estimated unit price	\$ 45,000
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4.3.5 Other equipment - Regional Centre

Proposals for specialized equipment have also been put forward but not included in the present request until further study and evaluation is undertaken. These include :

Closed circuit television system (Regional Centre only)	\$ 10,000
Solar panels to feed the un-interrupted power supply (Regional Centre only to reduce power costs)	\$ 40,000
Equipment for electronics laboratories (Regional Centre only)	\$ 50,000

4.4 Further Programme evaluation and review

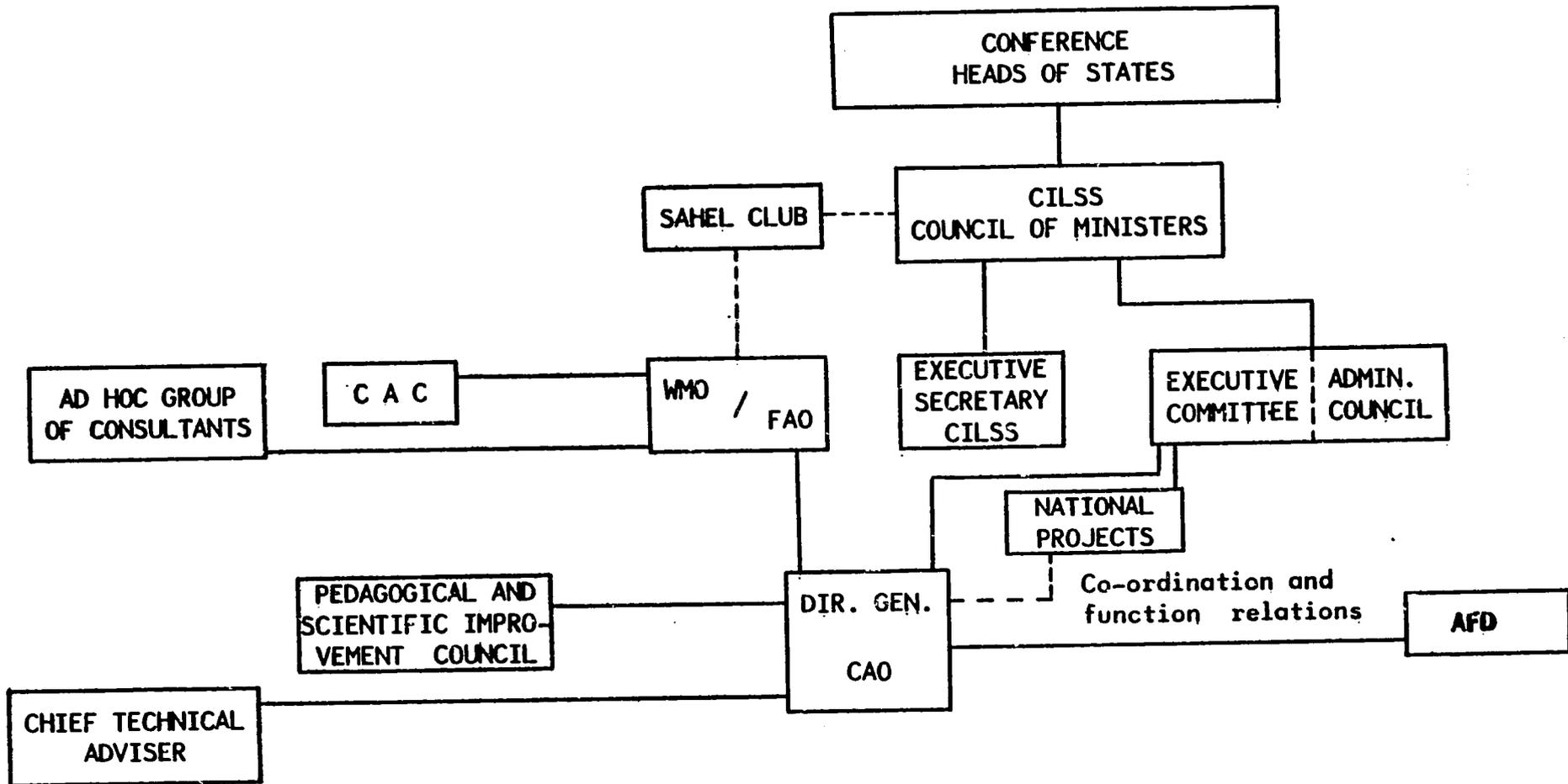
In order to continue the process of evaluation of the AGRHYMET Programme and to systematically plan and prepare for the operational phase of the Programme, it is proposed that funds be allocated for the following and other relevant activities to be undertaken from 1982 :

- (a) A group of experts, or one multi-purpose expert would go into each country for a sufficient amount of time to :

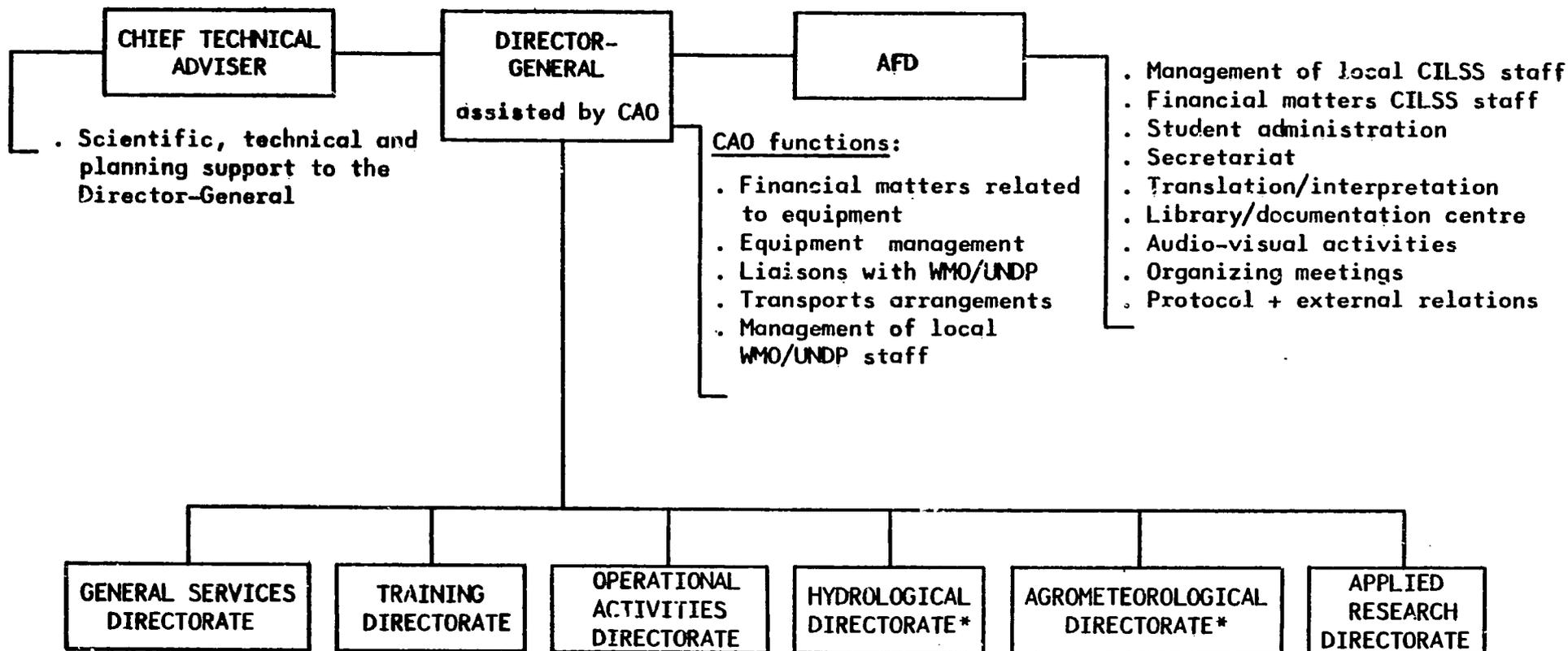
- (i) check the list of existing stations

- (ii) evaluate the personnel attached to the existing Meteorological and Hydrological Services
 - (iii) evaluate the station equipment and the status of its operation
 - (iv) analyse the available logistic means
 - (v) evaluate the existing buildings and facilities
- (b) A joint CILSS/executing agencies working group would evaluate each country project and review :
- (i) the number of meteorological and hydrological stations which is necessary and sufficient as well as their siting, in order that the AGRHYMET Programme may achieve its objectives;
 - (ii) the personnel and logistic means (telecommunications, vehicles, workshops, etc.) which are indispensable for proper operation of the network, data collection and processing and liaison with the AGRHYMET Centre.
- (c) WMO would develop standards and procedures for use in evaluating all aspects of national projects before the Programme evaluation and review take place.
- (d) A management information and reporting system would be designed to aid evaluation and review. This should be maintained on a continuing basis and should be integrated into the operational systems. The reporting part of the system should provide national and regional managers with data and information on all facets of operations - administrative and technical. Exception reporting techniques should be used extensively. Ideally, the system should be established before the evaluation to aid the evaluation process. The inventories and information connected with (a) and (b) above, together with other information required for the management information and reporting system are to be processed at the Niamey Data Processing Centre and would be maintained on a continuous basis.

Organigram of the AGRHYMET Centre

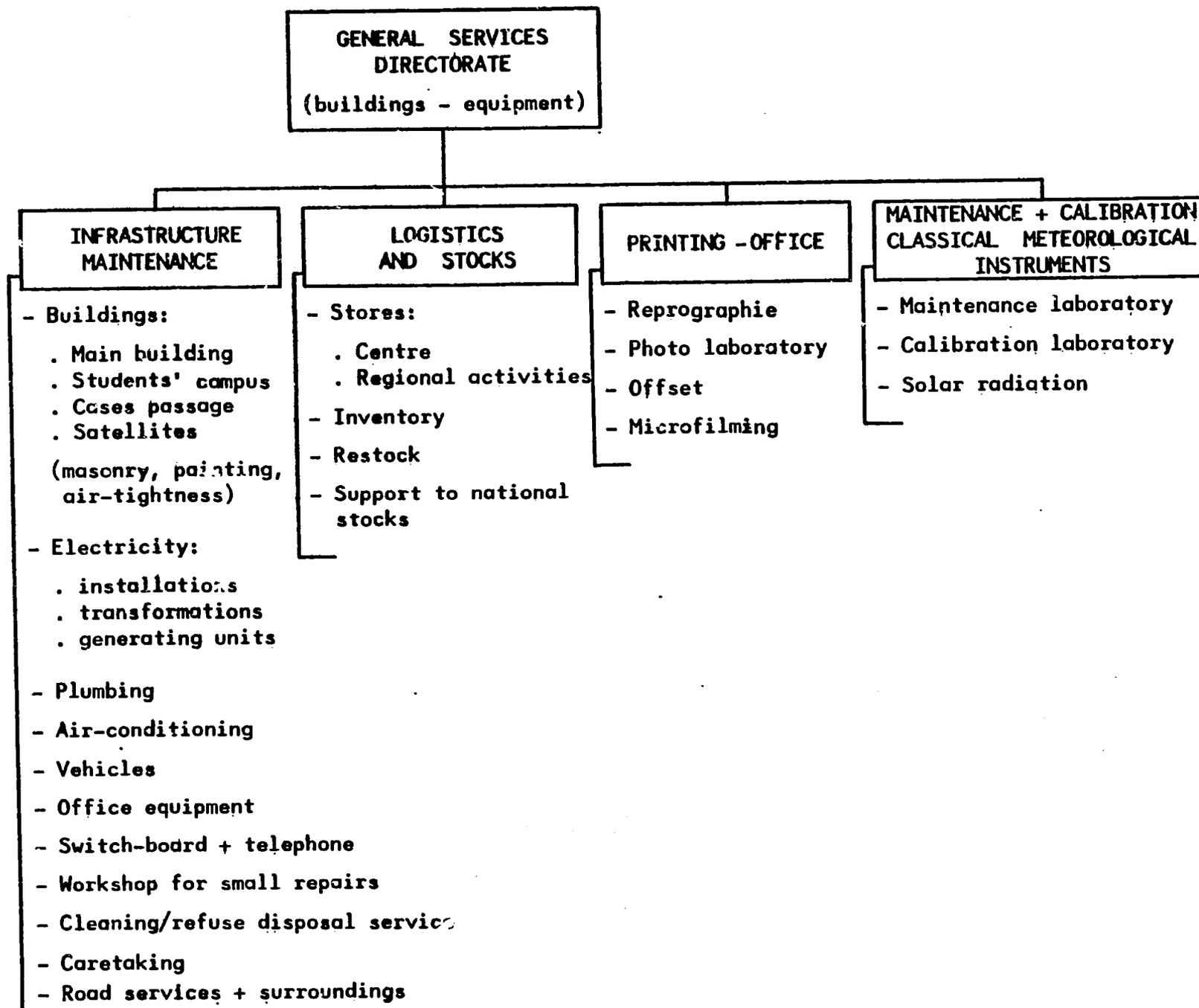


G 34



*functions undertaken, during first years, by Applied Research Directorate

G 35



Q 36

**TRAINING
DIRECTORATE**

Training:

- Class II agrometeorologists
- Class III agrometeorologists
- Class II hydrologists
- Class III hydrologists
- Class III instruments specialists
- Class III computer specialists
- Class IV computer specialists

- Formulation of training programme
- Follow-up and implementation of training programme
- Pedagogical reports
- Practical work
- Students' scholastic administration
- Meteorological training observatory

EXPERIMENTAL FARM

Farming operations at Centre

- rainfed crops
- irrigated crops
- grazing and stock breeding
- rice growing
- orchards
- market gardens

Botanical garden

Students' garden

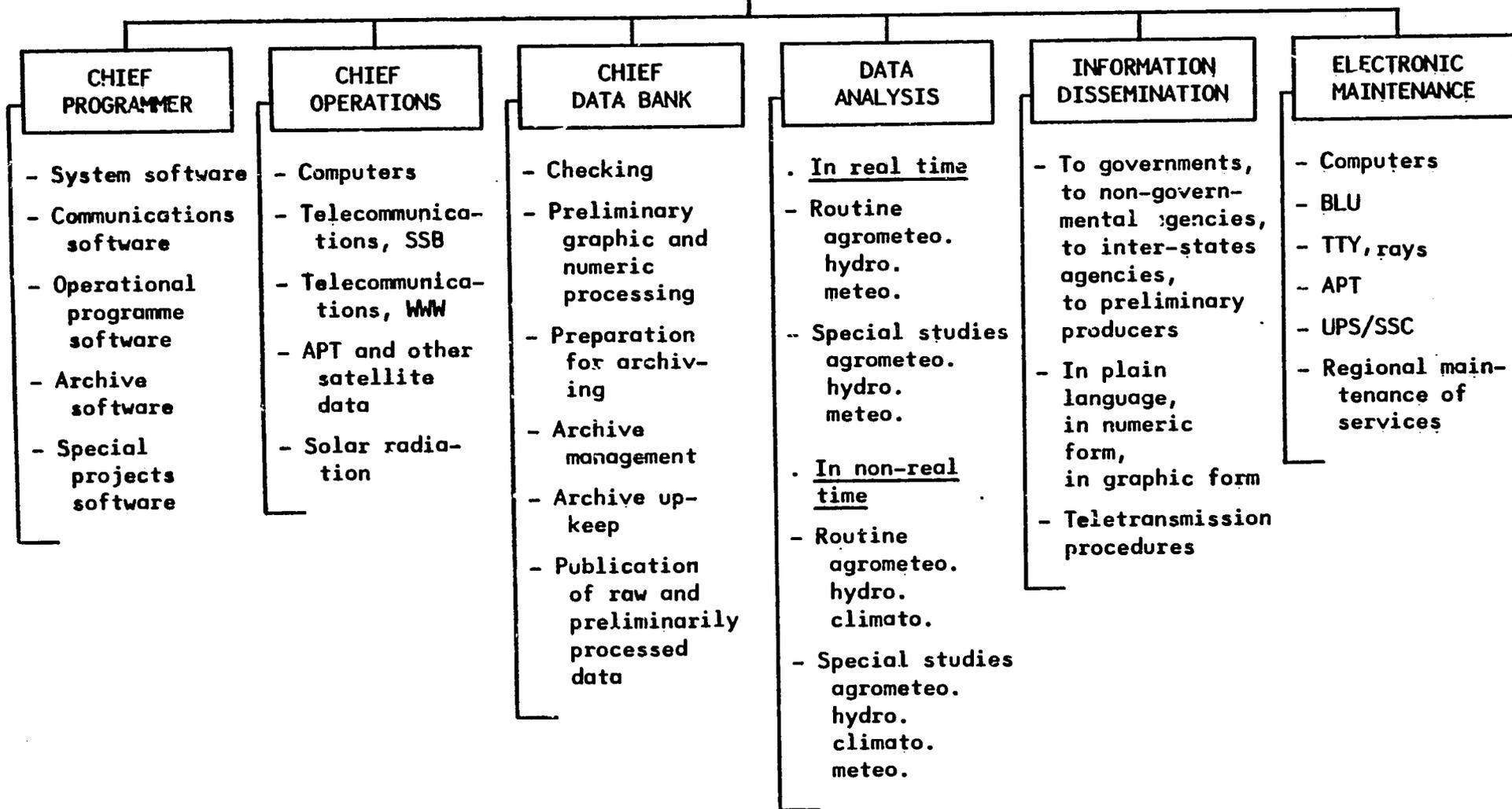
Meteorological reference observatory

In co-operation with EAMAC

- Class II meteorologists
- Class III meteorologists

Short-term courses, refresher courses

OPERATIONAL
ACTIVITIES
DIRECTORATE



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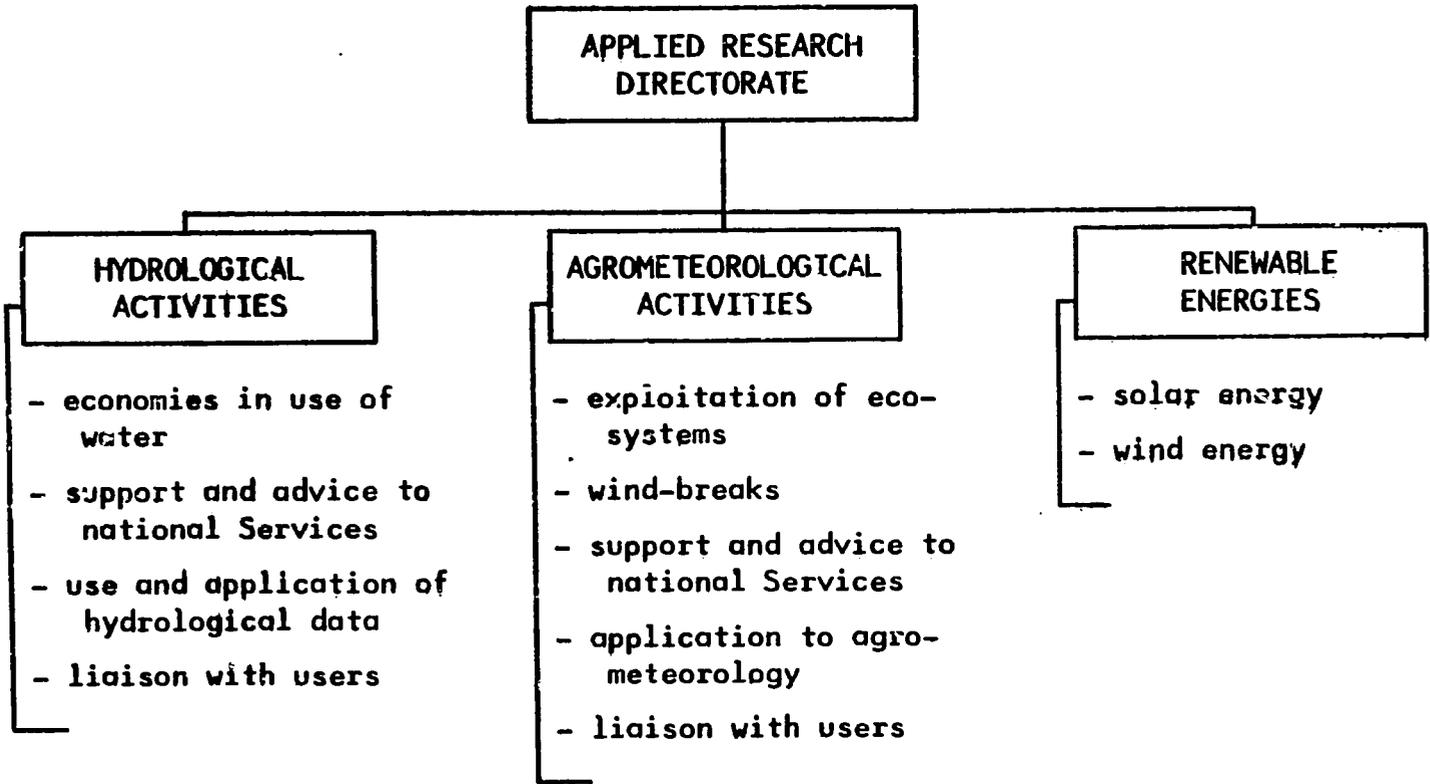
**HYDROLOGICAL
DIRECTORATE**

- support and advice to national Services
- use and application of hydrological data
- liaison with users

**AGROMETEOROLOGICAL
DIRECTORATE**

- support and advice to national Services
- application to operational agrometeorology
- liaison with users

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AGROMETEOROLOGICAL AND HYDROLOGICAL STATIONSStatus at beginning of 1981 and strengthening of the network planned during the period 1982-1986

Stations Countries*	SYNOPTIC			CLIMATOLOGICAL			AGROMETEOROLOGICAL			RAIN ALL			HYDROLOGICAL		
	Exist.	Planned	Total	Exist.	Planned	Total	Exist.	Planned	Total	Exist.	Planned	Total	Exist.	Planned	Total
CAPE VERDE	3	6	9	-	9	9	10	9	19	100	100	200	9	11	20
GAMBIA	7	2	9	-	-	-	7	2	9	33	16	49	25	6	31
UPPER VOLTA	9	-	9	11	-	11	9	-	9	107	-	107	68	6	74
MALI	19	2	21	27	10	37	12	-	12	156	94	250	93	-	93
MAURITANIA	11	-	11	2	-	2	7	-	7	44	-	44	10	2	12
NIGER	11	-	11	16	-	16	4	7	11	177	-	177	50	10	60
SENEGAL	13	-	13	3	-	3	5	-	5	223	-	223	69	-	69
CHAD	12	-	12	16	-	16	4	-	4	100	-	100	61	-	61
TOTAL	85	10	95	75	19	94	56	18	76	940	210	1150	385	35	420

* given in French alphabetical order

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Summary of requests for fellowships
submitted by the governments for the period 1982-1986

Field of training	Total	1982	1983	1984	1985
<u>AGRHYMET Centre</u>					
Class II agrometeorology	13	13	-	-	-
Class III agrometeorology	35	12	12	-	11
Class III hydrology	26	19	-	7	-
Instruments engineer	12	12	-	-	-
Class III computer specialist	38	16	8	14	-
Class IV computer specialist	24	16	8	-	-
Sub-total	148	88	28	21	11
<u>Training outside of the Sahel</u>					
Class I agrometeorology	4	2	2	-	-
Class I meteorology	6	6	-	-	-
Class II meteorology	9	9	-	-	-
Class III meteorology	27	12	9	3	3
Class I hydrological engineer	15	11	4	-	-
Class II hydrological engineer	7	3	4	-	-
Class III hydrological engineer	1	1	-	-	-
Class III chemical engineer	5	4	1	-	-
Class I computer specialist	8	8	-	-	-
Class II computer specialist	13	11	1	1	-
Class II computer maintenance technician	8	6	1	1	-
Sub-total	117	79	23	6	4
Total	265	171	52	27	15

* no request has been submitted for 1986

Details of requests for fellowships submitted by the governments for the period 1982-1986*

TRAINING AT AGRHYMET CENTRE

Countries **	CAPE VERDE				GAMBIA				UPPER VOLTA				MALI				MAURITANIA				NIGER				SENEGAL				CHAD			
	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985
Class II agrometeo- rology	1	-	-	-	-	-	-	-	3	-	-	-	5	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Class III agrometeo- rology	2	2	-	2	-	-	-	-	1	1	-	-	2	2	-	2	2	2	-	2	2	2	-	2	1	1	-	1	2	2	-	2
Class III hydrology	3	-	3	-	-	-	1	-	2	-	-	-	2	-	2	-	3	-	1	-	2	-	-	-	6	-	-	-	1	-	-	-
Instruments technician	3	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	2	-	-	-	3	-	-	-	-	-	-	-	2	-	-	-
Class III computer specialist	-	2	1	2	-	2	1	-	-	2	1	2	-	2	1	2	-	2	1	2	-	2	1	2	-	2	1	2	-	2	1	2
Class IV computer specialist	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-	-	2	1	-
Total	9	6	5	-	-	4	3	-	7	5	2	2	10	6	4	4	10	6	3	4	8	6	2	4	7	5	2	3	5	6	2	4

* no request has been submitted for 1986

**given in French alphabetical order

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Training calendar
at AGRHYMET Centre

Training courses	1981	1982	1983	1984	1985	1986
Class II agrometeorology	11*	5				
Class III agrometeorology	11	12	12		11	
Class III hydrology	14	19		7		
Class III instruments technician	11	12				
Class III computer specialist			16	8	14	
Class IV computer specialist			16	8		
Total	47 à 49	48 - 49	64	32 à 44	18 à 38	18

*of which 3 students from non-Sahelian countries

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Details of requests for fellowships submitted by the governments for the period 1982-1986*

Annex 6

TRAINING OUTSIDE THE AGRHYMET CENTRE

Countries Field of training	CÂPE VERDE				GAMBIA				UPPER VOLTA				MALI				MAURITANIA				NIGER				SENEGAL				CHAD			
	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985	1982	1983	1984	1985
Class I meteo.	-	-	-	-	2 EU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 EU,F	-	-	-	-	-	-	-	1	-	-	-
Class II meteo.	-	-	-	-	2 GB	-	-	-	2 B	-	-	-	2 F	-	-	-	-	-	-	-	3 AI, F,EMC	-	-	-	-	-	-	-	-	-	-	-
Class III meteo.	-	1 AI	-	-	3 No	3 No	3 No	3 No	4 EMC	2 F	-	-	2 EMC	1 EMC	-	-	-	-	-	-	4 AI, NI,EMC	-	-	-	-	-	-	-	-	2 AI	-	-
Class I agrometeo.	-	1 F	-	-	1 GB	1 GB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 F	-	-	-	-	-	-	-
Class I hydro.	1 F,S	-	-	-	1 EU	1 EU	-	-	2 AI,S	F	-	-	2 F,S	3 F,S	-	-	-	-	-	-	3 F,S	-	-	-	1	-	-	-	1	-	-	-
Class II hydro.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3 F,S	-	-	2 F	1 F	-	-	1	-	-	-
Class III hydro.	-	-	-	-	1 No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others	1 NI	-	-	-	2 PB,GB	1 GB	1 GB	-	1 B	-	-	-	1 B	-	-	-	-	-	-	-	1 NI	-	-	-	-	-	-	-	-	-	-	-
Chemist (Class III)	-	-	-	-	1 GB	1 GB	-	-	-	-	-	-	3 F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Class I computer	1 EU	-	-	-	1 EU	-	-	-	1 EU	-	-	-	2 EU	-	-	-	-	-	-	-	1 EU	-	-	-	1 EU	-	-	-	1	-	-	-
Class II computer	1 EU	-	-	-	3 EU	-	-	-	1 EU	1	-	-	1 EU	-	-	-	1 EU	-	1 EU	-	2 EU	-	-	-	1 EU	-	-	-	1	-	-	-
Class II computer maintenance technician	1 EU	1 EU	-	-	2 EU	-	-	-	2 EU	-	-	-	1 EU	-	-	-	1 EU	-	1 EU	-	1 EU	1 EU	-	-	1 EU	-	-	-	1	-	-	-
Total	5	3	-	-	19	7	4	3	13	3	-	-	14	4	-	-	2	-	2	-	18	4	-	-	7	1	-	-	6	2	-	-

* no request has been submitted for 1986

** given in French alphabetical order

AI = Algérie (Oran)

No = Nairobi

EMC = EAMAC, Niamey

F = France

S = Suisse

B = Belgique

EU = Etats-Unis

GB = Grande-Bretagne

PB = Pays-Bos

EUR = Europe

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Proposals for fellowships
for the AGRHYMET Centre staff

Post	Total		1982		1983		1984		1985		1986	
	m/h	\$	m/h	\$	m/h	\$	m/h	\$	m/h	\$	m/h	\$
Director General	6	12.000	2	4.000			2	4.000			2	4.000
Administrative and Financial Director	6	8.400			6	8.400						
Documentalist	18	19.800	12	13.200	6	6.600						
Librarian	12	13.200	12	13.200								
Mechanic/repairs technician	12	13.200	12	13.200								
Chief printer	2	4.000			2	4.000						
Reprograph assistant	2	4.000					2	4.000				
Photo laboratory technician	2	4.000					2	4.000				
Designer	2	4.000							2	4.000		
Chief maintenance and calibration laboratory	24	33.600	12	16.800	12	16.800						
Senior maintenance technician	24	33.600	12	16.800	12	16.800						
Senior calibration technician	24	33.600	12	16.800	12	16.800						
Instructor in maths/sta./data	2	4.000					2	4.000				
Instructor in physics/electro.	2	4.000							2	4.000		
Senior technician in agrometeorology	3	6.000							3	6.000		
Senior technician in instruments	3	6.000					3	6.000				
Senior technician in hydrology	3	6.000					3	6.000				
Senior technician in agronomy	3	6.000					3	6.000				
Senior technician in agrometeorology	3	6.000									3	6.000
Data processing Director	48	67.200	12	16.800	12	16.800	12	16.800	12	16.800		
Chief programmer	12	16.800	12	16.800								
Chief operations	6	8.400			6	8.400						
Data-bank engineer	36	50.400	12	16.800	12	16.800	12	16.800				
Senior technician in preliminary data processing and data-bank	36	50.400	12	16.800	12	16.800	12	16.800				
Analyst	12	16.800	12	16.800								
Senior technician	24	33.600			12	16.800	12	16.800				
Senior technician	24	33.600			12	16.800	12	16.800				
Senior technician	24	33.600			12	16.800	12	16.800				
Senior technician	24	33.600			12	16.800	12	16.800	12	16.800		
Chief engineer in electronic maintenance	12	16.800	12	16.800								
Senior electronics technician	18	25.200	12	16.800	6	8.400						
Senior electronics technician for regional maintenance	18	25.200	12	16.800	6	8.400						
Senior electronics technician for regional maintenance	30	42.000			6	8.400	12	16.800		16.800		
Hydrologist	3	6.000					3	6.000				
Engineering hydrologist	3	6.000										
Senior technician in hydrology	3	6.000							3	6.000		
Agrometeorologist cultivation	3	6.000							3	6.000		
Agrometeorologist agrostologist/stock breeder	3	6.000									3	6.000
Senior technician in agrometeorology	3	6.000							3	6.000		
Senior technician in agrometeorology	3	6.000									3	6.000
Total	498	713.000	170	224.400	146	203.800	116	174.400	55	88.400	11	22.000

AGRYMET Centre

Summary of the proposed budget for the period 1982-1986

(in US \$)

Ref.		<u>1 9 8 2</u>	<u>1 9 8 3</u>	<u>1 9 8 4</u>	<u>1 9 8 5</u>	<u>1 9 8 6</u>	<u>Total</u>
		\$	\$	\$	\$	\$	\$
1.	Programme meetings	30.000	32.800	35.600	38.400	41.200	178.000
2.	Personnel :						
	- international staff	1.870.480	1.780.080	1.781.280	1.852.480	1.925.280	9.209.600
	- CILSS staff	373.200	535.840	660.040	730.480	754.240	3.053.800
	Sub-total 2.	2.243.680	2.315.920	2.441.320	2.582.960	2.679.520	12.263.400
3.	Expenses for missions	34.800	37.400	40.000	42.600	45.200	200.000
4.	Sub-contracts	-	-	-	-	-	-
5.	Training	318.000	297.600	268.000	182.000	115.600	1,181.200
6.	Regional activities :						
6.1	- data bank and data processing	98.000	108.000	119.600	130.400	120.000	576.000
6.3	- regional telecommunications (to be defined by CAC)						
6.4	- applied research	50.000	55.000	60.800	66.600	73.200	305.600
6.2/6.5	- solar radiation and miscellaneous	25.600	28.600	31.600	34.800	38.000	158.600
	Sub-total 6.	173.600	191.600	212.000	231.800	231.200	1,040.200
7.	Regional Centre :						
7.1.1	- equipping and maintenance of the main building, satellite buildings and adjoining plots of land	108.600	69.400	76.200	38.600	91.400	429.200
7.1.2	- construction of buildings	2.610.000	4.000	-	-	-	2.614.000
7.2/7.3	- development of agriculture plots and irrigation works	156.000	60.000	60.000	60.000	60.000	396.000
7.4	- equipping laboratories	56.000	109.600	71.000	35.200	41.800	313.600
7.5	- running costs of the Centre (technical part)	83.800	89.600	99.400	93.000	101.200	467.000
7.6	- running costs of the Centre (administrative part)	185.000	167.600	191.200	189.800	227.400	961.000
7.7	- library, documentation, reproduction, audio-visual material	56.800	22.000	23.200	24.400	25.600	152.000
7.8	- Computer service, telecommuni- cations :						
	7.8.1/7.8.2 equipment	69.000	85.000	105.600	22.600	39.600	321.800
	7.8.3 (part)- installations						
	7.8.6/7.8.8-) and maintenance	129.000	107.800	110.800	123.000	140.800	611.400
	7.8.10) costs						
	7.8.3 (part)/						
	7.8.7 electrical power	107.000	115.000	123.000	138.000	149.000	632.000
	Sub-total 7.8	905.000	307.800	339.400	283.600	329.400	1,565.200
	Sub-total 7.	3.561.200	830.000	860.400	769.600	876.800	6.898.000
8.	Miscellaneous and contingency expenditure on operational costs	14.000	15.400	17.000	18.600	20.400	85.400
	GRAND TOTAL	6.375.280	3.720.720	3.874.320	3.865.960	4.009.920	21.846.200
	of which:						
	- international contribution	6.002.080	3.184.880	3.214.280	3.135.480	3.255.680	18.792.400
	- CILSS contribution	373.200	535.840	660.040	730.480	754.240	3,053.800

Allocation of the AGRHYMET Centre budget
according to support activities for the period 1982-1986

Item	Administration and general services		Training		Operational activities		Studies and applied research		Total	
	10 ³ CFA	%	10 ³ CFA	%	10 ³ CFA	%	10 ³ CFA	%	10 ³ CFA	%
1. Personnel* :										
- international	225.700	4,8	1.373.400	29,3	315.500	6,7	387.800	8,3	2.302.400	49,1
- CILSS	283.740		166.670		200.450		112.590		763.450	
2. Fellowships + training seminars			295.300	6,3					295.300	6,3
3. Lodging (construction)	550.000	11,7	80.000	1,7					630.000	13,4
4. Equipping buildings	130.800	2,8							130.800	2,8
5. Development of plots**			49.500	1,0			49.500	1,0	99.000	2,0
6. Equipment			84.650	1,8	74.200	1,6	76.400***	1,6	235.250	5,0
7. Solar radiation							25.000	0,5	25.000	0,5
8. Data bank and data processing					144.000	3,1			144.000	3,1
9. Vehicles (town and field)	74.000	1,6							74.000	1,6
10. Library + documentation	38.000	0,8							38.000	0,8
11. Running costs (technical part)			116.750	2,5	310.850	6,6			427.600	9,1
12. Running costs (administration part)	180.900	3,9							180.900	3,9
Total	1.483.140		2.166.270		1.045.000		651.290		5.345.700	
International contribution	1.199.400	25,6	1.999.600	42,6	844.550	18,0	538.700	11,4	4.582.250	97,6
CILSS contribution	283.740	6,0	166.670		200.450	4,3	112.590	2,4	763.450	16,3

* The post of "Special Adviser" has not been taken into account.

** The amount shown under this item comprises also the "running" part (cf. Appendix I.)

*** The budget "development of plots" is equally divided into "training" and "applied research"

Note: The amounts relating to Programme meetings (item 1.), mission costs (item 3) and miscellaneous and contingency costs (item 8) are not included in this table.

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Proposed budget for national projects for the period 1982-1986

Summary of the international contribution

(in US \$)

	Cape Verde		Gambia		Upper Volta		Mali		Mauritania		Niger		Senegal		Chad		Total	
	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$	m/m	\$
10. PROJECT PERSONNEL																		
11. Experts + consult.	224	1.347.000	192	1.287.600	43	298.000	59	383.600	76	525.400	119	813.500	180	1.106.200	134	918.500	1027	6.679.800
15. Official travel		25.000		23.000		13.000		11.000		20.000		17.000		25.000		25.000		159.000
19. Component total		1.372.000		1.310.600		311.000		394.600		545.400		830.500		1.131.200		943.500		6.838.800
30. TRAINING																		
31. Individual fellowships		632.300		1.152.800		537.600		732.500		621.000		1.074.400		478.400		643.600		5.872.600
40. EQUIPMENT																		
41. Meteorological stations		630.100		90.800		664.700		687.400		173.400		353.300		447.200		464.300		3.511.200
42. Hydrological stations + brigades		196.600		120.200		80.600		225.000		37.400		147.800		189.600		119.900		1.157.100
43. Telecommunications and data processing		865.900		546.900		774.800		1.210.800		538.900		522.400		713.800		685.300		5.858.800
44. Laboratory/workshop		-		10.000		-		-		-		5.500		-		-		15.500
45. Vehicles		85.300		188.800		91.500		151.100		73.600		142.000		114.400		70.800		919.500
49. Component total		1.777.900		956.700		1.611.600		2.276.300		823.300		1.211.000		1.465.000		1.340.300		11.462.100
50. MISCELLANEOUS																		
51. Running cost and maintenance																		
-Meteorological station network		) 23.500		) 9.500		40.100		116.000		) 70.200		17.700		20.800		55.300		635.900
-Hydrological station network		)		)		90.400		56.400		)		29.900		50.800		55.300		
-Telecommunications, data processing		40.600		43.300		4.400		64.000		40.600		40.600		43.300		11.300		288.100
-Laboratory/workshop		5.600		32.500		45.200		10.700		6.500		5.200		19.500		7.800		133.000
-Vehicles		35.300		147.600		217.800		117.000		162.500		103.800		161.200		240.500		1.185.700
Sub-total		105.000		232.900		397.900		364.100		279.800		197.200		295.600		370.200		2.242.700
52. Evaluation mission		6.000		6.000		6.000		6.000		6.000		6.000		6.000		6.000		48.000
53. Reports		8.000		8.000		8.000		8.000		8.000		8.000		8.000		8.000		64.000
59. Component total		119.000		246.900		411.900		378.100		293.800		211.200		309.600		384.200		2.554.700
99. GRAND TOTAL	LE	3.901.200		3.667.000		2.872.100		3.781.500		2.283.500		3.327.100		3.384.200		3.311.600		26.528.200

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Annex 10

*The budgetary estimates have been established by the multi-disciplinary mission jointly with the experts in Niamey who worked for that project.
 Note: The "running costs and maintenance" (line 51) shown in this table represent only half of the total costs, the other one being charged to the governments (cf. Annex 11)

Proposed budget for national projects for the period 1982-1986

Annexe 11

Summary of national contributions

	Cape Verde		Gambia		Upper Volta		Mali		Mauritania		Niger		Senegal		Chad		Total	
	m/m	10 ³ Esc.	m/m	Dalasis	m/m	10 ³ CFA	m/m	10 ³ ML	m/m	10 ³ UM	m/m	10 ³ CFA	m/m	10 ³ CFA	m/m	10 ³ CFA	m/m	US \$
10. PROJECT PERSONNEL																		
11. Class I meteorologist	51	752	300		84	9.900	420	62.009	36	990	249	20.666	114	14.760	147	18.828	1401	
12. Class II meteorologist	74	1.139	678		858	73.152	649	57.606	402	8.644	142	9.688	624	55.785	219	18.696	3646	
13. Class III meteorologist	433	5.845	1488		1638	114.799	2352	184.594	420	7.340	904	50.447	830	57.317	480	33.456	8545	
14. Class IV meteorologist	1512	13.017	2400		4800	209.518	8112	405.459	1032	8.307	924	33.745	2448	117.450	1104	47.232	22332	
15. Hydrological engineer	36	542	360		188	22.033	360	53.816	9	248	171	18.480	177	22.932	30	3.300	1331	
16. Hydrological technician	204	2.752	900		660	46.215	900	129.473	128	2.243	309	21.035	1080	74.646	470	32.278	4651	
17. Hydrometrist	600	5.088	1704		960	41.519	300	21.654	720	5.625	2547	107.511	600	33.072	-	-	7431	
18. Support personnel	180	1.582	300		3096	90.471	3360	89.040	348	2.034	2100	64.134	840	24.930	660	34.980	10884	
19. Component total	3090	30.717	8130		12284	607.607	16453	1.003.651	3095	35.431	7346	325.706	6713	400.892	3110	188.770	60221	
30. TRAINING COMPONENT (fellows' salaries)	753	8.926	1398		1005	47.434	1083	75.160	732	11.054	861	57.083	567	15.593	637	46.882	7046	
Total 10 + 30 local currency US \$	3853	39.643	9528		13289	655.041	17536	1.078.811	3827	46.485	8207	382.789	7280	416.485	3747	235.654	67267	*10.748.180
		900.980				2.620.160		2.157.620		929.700		1.531.160		1.665.940		942.620		
40. EQUIPMENT COMPONENT																		
41. Hqs + stations build.		372.200		581.000		859.800		1.116.400		194.500		196.800		-		788.500		
42. Office equipment		21.400		27.300		25.700		54.300		31.100		25.800		72.300		84.900		
49. Component total (US \$) in local currency		393.600		608.300		885.500		1.170.700		225.600		222.600		72.300		873.400		4.451.700
		17.320		1.094.940		221.375		585.350		11.280		55.650		18.075		218.350		
50. MISCELLANEOUS																		
51. Running and maintenance costs																		
- met. network		23.500		9.500		40.100		116.000		70.200		17.700		20.800		55.300		
- hydro. network						90.400		56.400				29.900		50.800		55.300		
- telecom. + data proces.**		40.600		43.300		4.400		64.000		40.600		40.600		43.300		11.300		
- laboratory/workshop		5.600		32.500		45.200		10.700		6.500		5.200		19.500		7.800		
- vehicles		35.300		147.600		217.800		117.000		62.500		103.800		161.200		240.500		
- buildings		69.200		173.900		2.600		11.300		13.000		-		106.600		26.000		
- office equipment		6.500		8.600		32.500		128.100		19.500		27.300		52.000		65.000		
59. Component total (US \$) in local currency		180.700		415.400		433.000		503.500		312.300		224.500		454.200		461.200		2.984.800
		7.950		747.720		108.250		251.750		15.615		56.125		113.550		115.300		
Total 40 + 50: US \$		574.300		1.023.700		1.318.500		1.674.200		537.900		447.100		526.500		1.334.600		7.436.800
local currency		25.270		1.842.660		329.625		837.100		26.895		111.775		131.625		333.650		
GRAND TOTAL : US \$		1.475.280		1.023.700		3.938.660		3.831.820		1.467.600		1.978.260		2.192.440		2.277.220		*18.184.980
local currency		64.913		1.842.660		984.666		1.915.911		73.380		494.564		548.110		569.302		

*The Gambia has not indicated its own contribution as regards "personnel"

- Notes:**
- The personnel requirements (posted and under training) are given in local currency for each country concerned, as well as the component totals and Grand total, to the rate of : Cape Verde : 44 Escudos = 1 US \$; Gambia : 1.8 Dalasis = 1 US \$; Upper Volta, Niger, Senegal and Chad : 250 CFA = 1 US \$; Mali : 500 Malian francs = 1 US \$; Mauritania : 50 Ouguiyas = 1 US \$.
 - For Chad, the budgetary estimates have been established by the multi-disciplinary mission jointly with the experts in Niamey who worked for that project.
 - The "running costs and maintenance" (line 51) shown in this table represent only half of the total costs, the other one being charged to international contributions (cf. Annex 10).

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Needs in terms of experts and consultants for each country
expressed by the national Services

	<u>Countries</u>	<u>1982</u> m/m	<u>1983</u> m/m	<u>1984</u> m/m	<u>1985</u> m/m
1. <u>Experts</u>					
1.1 <u>Meteorologist</u>	CVI	12	12	12	12
	<u>NER</u>	<u>12</u>	<u>12</u>	<u>-</u>	<u>-</u>
Sub-total		24	24	12	12
1.2 <u>Agrometeorologist</u>	CVI	12	12	12	12
	GAM	12	12	12	12
	MAU	12	6	-	-
	SEN	12	12	12	12
	<u>CHD</u>	<u>12</u>	<u>12</u>	<u>12</u>	<u>12</u>
Sub-total		60	54	48	48
1.3 <u>Hydrologist</u>	CVI	12	12	12	12
	GAM	12	12	12	12
	UPV	12	12	-	-
	MLI	12	12	6	-
	MAU	12	12	12	12
	NER	12	12	12	-
	SEN	12	12	12	12
	<u>CHD</u>	<u>12</u>	<u>12</u>	<u>12</u>	<u>12</u>
Sub-total		96	96	78	60
1.4 <u>Computer and system analyst</u>	GAM	24	24	12	12
	<u>NER</u>	<u>12</u>	<u>12</u>	<u>12</u>	<u>-</u>
Sub-total		36	36	24	12
Total 1.		216	210	162	132

2. Associate experts

2.1 <u>Hydrologist</u>	CVI	12	12	-	-	-	24
	SEN	-	12	12	12	12	48
2.2 <u>Agrometeorologist</u>	CVI	12	12	-	-	-	24
Total 2.		24	36	12	12	12	96

3. Consultants

3. <u>Consultants</u>	CVI	4	4	4	4	4	20
	OPV	2	2	5	5	5	19
	MAL	14	15	-	-	-	29
	MAU	2	2	2	2	2	10
	NER	6	5	5	4	3	23
	SEN	6	6	-	-	-	12
	CHD	3	3	4	4	-	14
Total 3.		37	37	20	19	14	127
GRAND TOTAL		277	283	194	163	134	1051

Notes:

1. Para. 3 (consultants) comprises the following fields :

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>Total</u>
	m/m	m/m	m/m	m/m	m/m	m/m
Computer system specialist	-	6	-	-	-	6
Data processing and archiving	16	10	2	2	2	32
Electronic	2	-	-	-	-	2
Hydrologists	3	2	2	1	-	8
Agroclimatologistes	2	2	-	-	-	4
Pollution measurement	-	3	-	-	-	3
Precipitation enhancement	2	2	-	-	-	4
To be defined	12	12	16	16	12	68
Total	37	37	20	19	14	127

2. Niger has planned 36 m/m for a hydrogeologist, which have not been included in the budget.

Operating levels - AGRHYMET ProgrammeInitial operating level

This level encompasses observing and collection quality control, archiving, processing and transmission of data and results in real time to the Regional Centre and to the GTS. Publication of data summaries, and the quality control and maintenance of the observation networks is a most important part of the initial operating level.

Full operating level

This level includes all aspects of the basic operating level plus the preparation, distribution and dissemination of tailored products for use by farmers, planners, economists, herdsman, hydrologists, etc. A single daytime-only work shift, 7 days per week is envisaged.

A balance among responsible agencies for various aspects of the AGRHYMET Programme is achieved despite infrastructure problems. Equipment systems are shared among functions such as agrometeorology, hydrology, climatology and general meteorology. Applications development* contributes to producing user-tailored products.

Optimum operating level

This level includes fully integrated systems and Services, both national and international. The Regional and national Meteorological Centres are operational 24 hours a day and shift personnel provide general forecast and warning services for 0 - 72 hours. They also prepare selected user-tailored products for dissemination including outlooks beyond 72 hours. Functions of the initial and full operating levels are also included.

Processed data and products from the World Meteorological Centres (WMC) and the European Centre for Medium-Range Weather Forecasting (ECMWF) are used extensively in deriving regional and national products. The national and regional telecommunications systems become integrated into the Global Telecommunications System via satellite, and processed data from weather satellites become an important part of the Services' monitoring and forecast operations.

Division of responsibility between national, regional and World Centres becomes well defined and co-ordinated. Needs of the Services and Centre are balanced with their ability to meet the needs. Applications development is broadened to take account of the integrated operation while applied research** focuses on mesoscale and synoptic scale activities.

* Applications development : the adoption of known techniques and procedures to produce an operation user tailored product.

** Applied research : the development of new techniques and procedures based on systematic scientific study directed at solving specific user problems.

ANNEX H

5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FIA funds, and then criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights?

This project aims to set up an agro-hydro-meteorological system both at the national level of the Sahel countries and connected through a regional center. This inter-connected system will provide information to help rural farmers better organize their production plans.

2. FAA Sec. 431. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully?

No

3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?

Yes

4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?

Grantee is the World Meteorological Organization, an agency of the United Nations.

5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?

Same as number 4, above

BEST AVAILABLE DOCUMENT

A.

6. FAA Sec. 620(a), 620(f); FY 79 App. Act, Sec. 103, 113 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Uganda, Mozambique, or Angola? No

7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? No

8. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? No

9. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, convertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? No

10. FAA Sec. 620(o); Fishermen's Protective Act of 1957, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters: No

a. has any deduction required by the Fishermen's Protective Act been made?

b. has complete denial of assistance been considered by AID Administrator?

11. FAA Sec. 620; FY 79 App. Act, Sec. 603.
 (a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country?
 (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds?

None of the recipient states is presently in default of an AID loan.

12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the

Varies widely among the recipient states, but there is no sophisticated weaponry.

A.12.

amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

No

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget?

Varies widely among the recipient states, but all are in good standing in the U.N.

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism?

No

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA?

No

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty?

No

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy?

This assistance is being provided to the WMO for the benefit of the eight Sahelian countries of West Africa. Measurement of development progress by the Sahelian countries is assured by the comprehensive Sahel Development Program, to which the Sahel states adhere through the Inter-State Committee for Drought Control in the Sahel (CILSS).

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B.1.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor?

The ultimate beneficiaries of this project are the rural farmers, to whom up-to-date weather information will be made available so that their cropping practices become improved as a result conformity to the known weather conditions.

2. Economic Support Fund Country Criteria

N.A.

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights?

b. FAA Sec. 533(b). Will assistance under the Southern Africa program be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests?

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

d. FY 79 App. Act, Sec. 113. Will assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

e. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina after September 30, 1979?

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 534A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure)?

] This project is contained in the
] FY 1982 Congressional Presentation,
(Africa Programs, page 140. Any
] changes in this information will
(be brought to the attention of
:] the Congress through the normal
] Congressional notification process

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

] No legislative action is required.

4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?

] No water-related land construction is included in this project.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?

N.A.

6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.

The project is regional in scope, assisting the development of each Sahel national meteorological service and establishing a regional center for processing and dissemination of the data.

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A.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

The project contributes to farmers more efficient and, thus, more productive, practices.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

All procurement utilizing AID funds for this project will be from U.S. sources.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

Specific country-by-country budget commitments are a condition precedent to disbursement of AID funds under this project. Sahel countries will provide personnel, land and government facilities.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

There is no U.S.-owned excess foreign currency in any of the countries.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes

12. FY 73 Cong. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

No

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained

The objective of this project is to provide accurate, timely weather information to poor farmers to enable them to plan their cropping schedule with greater promise of agricultural returns.

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B.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107.
Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

N.A.

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

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B.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] Is appropriate effort placed on use of appropriate technology?

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?

2. Development Assistance Project Criteria
(Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

This is a multi-donor project to regional organizations under Section 121 and thus the 25% requirement is not applicable.

N.A.

This project will build upon and utilize the Sahelian capabilities to plan, coordinate and manage development projects in the Sahel effectively.

Yes, to the agricultural sector.

N.A.

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8.

3. Project Criteria Solely for Economic Support Fund

N.A.

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102?

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities?

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5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed? Equipment procurement will be done in accordance with AID regulations
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him? Yes
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the United States on commodities financed? Yes
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? N.A.
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items? Yes
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates. Yes
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the

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A.7.

facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

Yes

9. FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States?

Yes

B. Construction

1. FAA Sec. 501(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?

N.A.

2. FAA Sec. 511(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

Yes

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the United States not exceed \$100 million?

N.A.

C. Other Restrictions

1. FAA Sec. 122 (e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

N.A.

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

Yes

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the United States?

Yes

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle, manufactured outside the United States, or guaranty of such transaction?

No vehicles will be procured under this project.

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C.

5. Will arrangements preclude use of financing: Yes to all of Section 5.

a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization?

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?

c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs?

d. FAA Sec. 662. For CIA activities?

e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel?

f. FY 79 App. Act Sec. 106. To pay U.N. assessments?

g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.)

h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields?

i. FY 79 App. Act Sec. 601. To be used for publicity on propaganda purposes within United States not authorized by the Congress?

Certification of Section

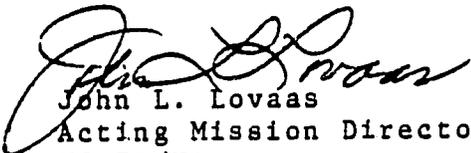
611 (e)

of the FAA of 1961

as amended

I, John L. Lovaas, the Acting Director of the Agency for International Development in Niger, do herewith certify that in my judgement, the Regional AGRHYMET Program has both the financial capability and access to the human resources to maintain and utilize effectively the construction proposed under this project entitled Sahel Water Data II.

This judgement is based upon a thorough review of the first phase of the project, the extensive consultations with the AGRHYMET Representatives during the preparation of Phase II of this project, and the past good record of implementation support of the Phase I AGRHYMET project.


John L. Lovaas
Acting Mission Director
USAID/Niger

November 18, 1981