

Proj. No. 6250917-2
 P-PPD-AAB-731-B1
 183p

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT PAPER FACESHEET TO BE COMPLETED BY ORIGINATING OFFICE		1. TRANSACTION CODE ("X" appropriate box) <input checked="" type="checkbox"/> Original <input type="checkbox"/> Change <input type="checkbox"/> Add <input type="checkbox"/> Delete	PP DOCUMENT CODE 3
2. COUNTRY/ENTITY <u>Sahel and Central and West Africa Programs</u>		3. DOCUMENT REVISION NUMBER	
4. PROJECT NUMBER <u>625-1-120-477</u>	5. BUREAU a. Symbol <u>AFR</u>	6. ESTIMATED FY OF PROJECT COMPLETION FY <u>81</u>	
7. PROJECT TITLE - SHORT (stay within brackets) <u>Sahel Water Data Network & Management</u>		8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION a. INITIAL <u>576</u> b. FINAL FY <u>810</u>	

a. FUNDING SOURCE	FIRST YEAR FY _____			ALL YEARS		
	b. FX	c. L/C	d. Total	e. FX	f. L/C	g. Total
AID APPROPRIATED TOTAL						
(Grant)	(202)	(58)	(260)	(3,510)	(750)	(4,260)
(Loan)	()	()	()	()	()	()
Other						
1.						
U.S.						
2.						
HOST GOVERNMENT	--	2,449	2,449	--	13,959	13,959
OTHER DONOR(S)	1,473	2,264	3,737	5,233	4,237	9,470
TOTALS	1,675	4,771	6,446	8,743	18,946	27,689

a. Appropriation (PID# Code)	b. Primary Purpose Code	c. Primary Tech. Code	FY <u>76</u>		FY <u>77</u>		FY <u>78</u>		ALL YEARS	
			d. Grant	e. Loan	f. Grant	g. Loan	h. Grant	i. Loan	j. Grant	k. Loan
FN			260		1,830		990			4,260
TOTALS										

11. ESTIMATED EXPENDITURES 75 1,000 1,500

12. PROJECT PURPOSE(S) (stay within brackets) Check if different from PID/PRP

To provide the CILSS countries with a capacity for gathering, processing and disseminating hydrologic and agrometeorologic data, both nationally and at the regional level, as a means of increasing agricultural productivity and providing an early warning system against future droughts and floods.

13. WERE CHANGES MADE IN BLOCKS 12, 13, 14, or 15 OF THE PID FACESHEET? IF YES, ATTACH CHANGED PID FACESHEET.

Yes No

14. ORIGINATING OFFICE CLEARANCE Signature <u>John D. Blumgart</u> Title <u>Chief, Selected Development Problems</u> <u>Division, Office of Development Resources,</u> <u>Bureau for Africa</u> AID 1330-4 (7-75)		15. Date Received in AID/W, or For AID/W Documents, Date of Distribution Date Signed mo. day yr. <u>4</u> <u>29</u> <u>76</u>
--	--	--

Reference Center
 Room 1330-4B

Reference Center
 Room 1330-4B

TABLE OF CONTENTS

	<u>Page</u>
<u>Glossary of Terms</u>	4
<u>Part I - Project Summary and Recommendations</u>	5
A. Recommendations	5
B. Description of the Project	5
C. Summary Findings	11
D. Project Issues	12
<u>Part II - Project Background and Detailed Description</u>	14
A. <u>Background</u>	14
1. Relationship to the Project and African/ UN Response	14
2. A.I.D.'s Decision to Participate	18
3. The NOAA Study	20
4. Organizing a Multi-Donor Program	23
B. <u>Detailed Description</u>	26
1. The WMO/UNDP/CILSS Program	26
2. Program Progress to Date	29
3. The U.S. Contribution to the Program..	32
(a) FY 1976 Contribution	32
(b) FY 1977 Contribution	36
(c) Subsequent Year Contributions ...	38
(d) Table of U.S. Contributions, FY 1976-1980	40
<u>Part III - Project Analysis</u>	41
A. <u>Technical Analysis</u>	41
1. The WMO/FAO Analysis	41
2. The NOAA Analysis	44
3. Agricultural Implications of the Program	45
4. The Role of Hydrology and Meteorology for River Basin Planning in the Sahel.	47
5. Relationship to Niger River Commission.	50
6. Relationship to CIEH Project	51
7. Environmental Assessment	52
8. Planning and Cost Estimates	56

A.I.D.
Reference Center
Room 1653 AS

	<u>Page</u>
9. Financial Analysis	56
a. CILSS Contributions	57
b. The UNDP Contribution	58
c. Other Donor Contributions	59
10. Social Analysis	60
11. Economic Analysis	63
Part IV - <u>Implementation Arrangements</u>	66
A. <u>Analysis of the Recipients', Other Donors'</u> <u>and A.I.D.'s Administrative Arrangements</u> .	66
1. Recipient	66
a. The Regional Project	66
b. The National Projects	67
c. Regional Coordinating Arrangements	67
2. Other Donor	68
3. A.I.D.	70
B. <u>Implementation Plan</u>	72
C. <u>Evaluation Arrangements for the Project</u> .	74

TABLES

Table 1 - National Inputs for Program 1975-80 by Activity	77
Table 2 - Summary of National Inputs for Program, 1975-1980 by Country	79
Table 3 - UNDP Inputs Committed to Date	80
Table 4 - Requirements for other Donor Inputs 1975 - 1980	81
Table 5 - Total Annual Financial Requirements by Source	82
Table 6 - Total Financial Requirements 1975-1980, by Program Components	83
Table 7 - U.S. Contribution, FY 1975-1980, by Fiscal Year and Components	84

ANNEXES

	<u>Page</u>
Annex I - The NOAA Report (December 1975)	85
Annex II - The CILSS Request for Assistance (September 1973)	86
Annex III - Draft A.I.D./WMO Grant Agreement and Annexes ..	87
Annex IV - Letter from AFR to WMO Regarding U.S. Support for Program (September 5, 1975)	88
Annex V - Project Review Paper, Approved by Project Committee 1/14/75	89
Annex VI - NOAA Technical Assessment of Programs and U.S. Contribution for FY 1976 (3/12/76)	90
Annex VII - Statement by U.S. Delegation to Donors' Meeting for the WMO Programme in the Sahel (1/8/76) ..	91
Annex VIII - Summary Report by WMO Donors' Meeting for the WMO Programme in the Sahel (Geneva January 8 and 9, 1976)	92
Annex IX - PPT Network	93
Annex X - Logical Framework	94
Annex XI - NOAA Technical Assessment of Plans for the Regional Center (3/12/76)	95
Annex XII - REDSO Technical Assessment of Plans for The Regional Center	96

A.I.D.
Reference Center
Room 1658 NS

Glossary of Terms

APT - Automatic Picture Transmission is a unit that receives images directly from Meteorological Satellites and prints out a weather picture.

ASECNA - Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar. A Franco-African agency concerned with air navigation including aerorautical meteorology; its regional headquarters is in Dakar.

CGAR - Consultative Group on International Agricultural Research is the donor consortium, coordinated by IBRD, which finances and coordinates the various international agricultural research centers such as IRRI, IITA, ICRISAT, etc.

BRGM - Bureau de Recherches Geologique et Minières, is the French equivalent of the U.S. Geologic Survey and the Bureau of Mines and is the leading source of information on groundwater and minerals in Francophone Africa.

CIEH - Comite Inter-African d'Etudes Hydraulique is a 13-nation regional organization with headquarters at Ouagadougou which serves as an information and documentation center on water resources and carries out research and planning services.

CILSS - Comite Permanent Inter-Etat pour la Lutte Contre la Secheresse au Sahel (Permanent Committee for the Control of the Drought in the Sahel) is the African sub-regional grouping of drought affected countries of West Africa. With headquarters at Ouagadougou, it includes Mauritania, Mali, Upper Volta, Niger, Senegal and Chad. The Gambia was admitted in 1974 and the Cape Verde Islands in 1975.

ESA - European Space Agency, is a regional organization of the Western European countries devoted to civil applications of space technology.

NOAA - The National Oceanic and Atmospheric Administration, an agency of the U.S. Department of Commerce concerned with all matters relating to meteorology, hydrology, and oceanography operations and research, including the National Weather Service.

ORSTOM - Office de la Recherches Scientifique et Technique d'Outre Mer, is a Paris-based multi-disciplinary quasi-governmental organization supported by the French government and devoted to field research in the countries formerly comprising the French Empire. It is the leading source of data and expertise on hydrologic information in Francophone Africa.

UNSO - United Nations Sahel Office, was set up in 1973 to coordinate U.N. drought-related activities and maintains an office at U.N. headquarters and a liaison office with CILSS at Ouagadougou.

WMO - World Meteorological Organization, one of the Specialized Agencies of the United Nations, with headquarters in Geneva.

Part I. Project Summary and Recommendations

A. Recommendations

1. That the Administrator approve U.S. contributions up to a total of \$4.26 million, over the five year period FY 1976-80, to the multi-donor regional program formulated by WMO, UNDP and CILSS for strengthening the agrometeorological and hydrological services of the Sahelian countries, including a Regional Training and Applications Center at Niamey. It is understood that the greater part of this total amount will finance in-kind contributions (equipment, experts, fellowships, etc.) but that a certain portion, will be in the form of cash in cases in which such contributions are needed to mesh with those of other donors (the major example being a \$500,000 contribution to the construction cost of the Regional Center). The management of in-kind and cash contributions will be governed by the grant agreement that A.I.D. will conclude with the Executing Agency for the project, namely, the World Meteorological Organization.

2. That the Assistant Administrator, Bureau for Africa, obligate in FY 1976 A.I.D.'s planned initial contribution to the program in the amount of \$260,000.

3. That contributions to the program in subsequent fiscal years will be authorized by the Assistant Administrator, Bureau for Africa, on the basis of established Agency programming and funding procedures and in accordance with the objectives and implementation arrangements set forth in this Project Paper. It is understood that any major changes in the scope and objectives of the program will involve the preparation and approval of a revised Project Paper.

B. Description of the Project

The WMO/UNDP/CILSS program in agrometeorology and operational hydrology represents a long-range, broad scale effort to upgrade the scope, quality and timeliness of meteorological and hydrological data acquisition in and among the seven CILSS countries. It seeks to develop and strengthen African capabilities in the collection, interpretation and dissemination of such data for increasing agricultural and livestock productivity and for improving agricultural planning. The program consists of seven "national projects" designed to develop and strengthen national water data networks and services, and a complementary "regional project"

through which a Regional Training and Application Center at Niamey will be established for training national technical personnel and later, for serving as a regional data processing, dissemination and technical research institution as well.

The national projects are the "building blocks" of the program. They have in common (a) the rehabilitation and selective expansion of existing national hydrological and meteorological data measuring networks, (b) establishing (or filling in the gaps of) a communications network so that data can be reported, recorded and interpreted in "real time" (rather than after a month or more's delay, as at present), (c) developing, strengthening and expanding national agrometeorological and hydrological services to operate and maintain the networks and to staff the national headquarters, (d) establishing or strengthening the coordination of climatological and hydrological data at the national level, ("national headquarters") and installing a capability to process and interpret the data in agriculturally meaningful terms, (e) involving the "user" agricultural production agencies (livestock, agriculture, water and forests) in the processing, interpreting, and disseminating of the data so that it can directly benefit agriculturally planners and the herders and farmers themselves.

The regional project involves the construction of a Regional Training and Applications Center at Niamey with communications linkage with the seven national headquarters. As its name implies, the Center will have a dual function. It will provide agriculturally-oriented training to expand and to strengthen the technical capabilities of the national meteorological and hydrological services, at both the professional and para-professionals levels. Subsequently, when the communications linkages and data processing equipment have been installed, the Center will provide data interpretation, forecasting and "early warning" services for the region as a whole, and will undertake, in cooperation with the appropriate international agricultural research institutes, longer range studies (crop/climate correlations, crop/weather relationships, etc.) aimed at improving agricultural and livestock productivity.

The program is summarized in the WMO/UNDP/CILSS document "Programme for the Strengthening of the Agrometeorological and Hydrological Services in the Sudano-Sahelian Zone" (herein referred to as the WMO/UNDP/CILSS program document) which was distributed by WMO at a donors' meeting in July 1975.

It is important to note that the WMO/UNDP/CILSS program is already in operation as a result of UNDP financing made available in early 1975. Experts in operational hydrology and agrometeorology have been assigned, or are being recruited, for each CILSS country to advise

on the development of the national services and networks; orders for network equipment have been placed, a regional Programme Headquarters has been established at Niamey, a Programme Coordinator has been appointed and training programs in agrometeorology and hydrology were initiated in temporary facilities in October and December 1975, respectively.

The U.S. has indicated its intention to contribute, over a five year period beginning in FY 1976, \$4.26 million, or about 15% of the approximately \$28 million total program cost estimated in the WMO/UNDP/CILSS program document.* \$260,000 of this amount is scheduled for obligation in FY 1976 and \$1.8 million in FY 1977. At a meeting of donors in Geneva in January 1976 the U.S. indicated that its contribution would largely consist of in-kind contributions (equipment, technical services, fellowships, etc.) but that cash contributions to WMO (which is administering the program on behalf of all donors) would be made when necessary.

The actual nature of U.S. contributions is determined by the program's priorities, as expressed by WMO, and by the recommendations of a report** prepared for A.I.D. by the National Oceanic and Atmospheric Administration (NOAA) based on its own analysis including a field study carried out by a multi-disciplinary team in April-May 1975. The NOAA report is basically supportive of the earlier WMO/UNDP/CILSS program document but suggests a number of ways in which U.S. technology could make a special contribution to the program and emphasizes the importance of interpreting and processing the data in terms meaningful to the agricultural production systems of the area. Details for FY 1976-77 funding have been largely identified.*** Major items include telecommunications, data processing (computers) and air conditioning equipment, solar radiation recording instruments, engineering services, and financing for the Center's building and training (the latter two items being contributions in cash and totaling \$560,000).

As indicated in Table VII, estimates have been made for the contributions scheduled for FY 1978-80 and involve implementation of NOAA recommendations regarding utilization of weather radar and satellite imagery as well as the replication of agricultural applications of the data from a prototype facility at Niamey to other CILSS countries. These estimates will be refined in discussions with WMO and NOAA (as well as taking into consideration the view of other donors and the CILSS countries) and obligated on an annual basis through amendments to the A.I.D./WMO grant agreement.

* See letter from David Shear to the Deputy Secretary General of WMO, September 5, 1975, reproduced as Annex IV.

** See Annex I.

*** See Table VII.

The program, taken as a whole, involves a coordinated, regional approach which includes a number of parties on both the donor and African sides. The program has its origins in several key resolutions adopted by the Chiefs of State of the CILSS countries at their first meeting in Ouagadougou in September 1973* and CILSS considers this project as its "first regional project to become operational".** The task of analyzing the vast problem of water data management in the region and preparing a program to address it was primarily the responsibility of WMO, FAO and UNDP, inter-acting at key points with the CILSS countries and the CILSS organization. By early 1975, the program was sufficiently well articulated as to cause UNDP to provide initial financing (\$4.2 million) to begin implementation. In July 1975, three additional donors agreed to contribute to the program, the U.S., the Netherlands and Belgium. In January 1976 WMO convened a donors' conference which succeeded in preparing the basic organizational and coordinating arrangements -- for both the donors and the seven CILSS countries -- for managing and financing the program. These will presumably be ratified at the next donors' meeting scheduled for May 1976.

There is no question but that the program is complex and a difficult one, covering a vast area, and involves seven bi-lateral recipients, a regional program at Niamey, four U.N. agencies (UNDP, UNSO, WMO, and FAO), two regional organizations (ASECNA and CILSS) and three bi-lateral donors. But roles and responsibilities are clearly defined; WMO is doing a most effective job in serving as the executing agency, and the attitude on the part of both donors and recipients is highly cooperative and positive. Initial implementation carried out to date with UNDP financing has been timely and effective and has generated considerable momentum for the program.

The WMO/UNDP/CILSS program contemplates a major, long run effort to rehabilitate, improve the technology and develop meaningful agricultural applications for a basic component of the development infrastructure of the CILSS countries -- the collection, interpretation and dissemination of their water and climatological data.

Such an effort will involve substantial inputs by both the donor countries and agencies as well as the CILSS countries themselves. Indeed, as shown in Table I and II below, the CILSS countries will be the major contributors to the program, financing approximately nearly \$14 million over the six year period, 1975-80, or 50% of total program costs. More than half of this contribution (\$8 million) represents the cost of expansion of the national meteorological and hydrological services to

* For summary of resolutions, see Annex II.

** Quoted from Resolution No. VI of the CILSS Chiefs of State meeting at Nouakchott, 21-22 December 1975.

man the expanded data networks and to staff the national headquarters where the data will be processed, interpreted and disseminated. \$3.6 million represents the cost of construction or rehabilitation of buildings to house the refurbished and expanded networks, and \$2.3 million represents total operating costs over the project period.

In addition, the CILSS countries have pledged to undertake in their project agreements with UNDP and WMO certain institutional "self help" measures which are necessary to assure that data acquisition makes a contribution to agricultural development. These include measures to coordinate agrometeorological and hydrologic data collection and to involve the agricultural agencies of the country in the interpretation and practical application of the data to the needs of the farmers and herdsmen. "Senior Councils for Meteorology and Hydrology" are to be established for this purpose which will include representatives of "all the agencies of producers or utilizers of hydrometeorological data."

Finally, the CILSS countries will share their experiences, coordinate their efforts and undertake their fund raising responsibilities through the formation of a "CILSS Technical Coordination Committee" which will be composed of the heads of the hydrologic and meteorologic agencies of the seven countries and will meet in Africa no less than twice a year.

As indicated earlier, donor contributions to the program are being coordinated by WMO under organizational arrangements which were worked out at the donors' meeting in January and which are expected to be ratified at the forthcoming meeting in May (for details, see Part IV, below).

In regard to the national projects, the donors are providing an operational hydrologist and an agrometeorologist to advise the national services in each of the CILSS countries, material and technical assistance to rehabilitate and expand the data collection networks, provide equipment to install or complete a communications system that will permit reporting of the data on a daily or twice daily basis to national headquarters, construction of buildings for the headquarters, where needed, and equipping each headquarters with data processing and interpreting facilities. Total external assistance for the national projects, 1975-80, is estimated at \$8.5 million of which UNDP has already contributed \$2.5 million.

With respect to the Regional Center, the government of Niger has donated a fifty hectare site on the West Bank of the Niger river, just south of and adjacent to the University of Niger. Meanwhile, it has provided temporary facilities in Niamey to permit the establishment of Programme Headquarters (the office of the WMO Programme Coordinator) as well as temporary facilities for the initiation of two year training programs in operational hydrology and agrometeorology for candidates from the CILSS countries.

External assistance will cover the following components of the regional program (a) staff and equipment for the office of the Programme Coordinator in Niamey, (b) technical staff to monitor and backstop the work of the hydrologists, and agrometeorologists assigned to the CILSS countries, (c) technical staff assigned to the Center to provide the training program and to undertake the data processing, application and research functions of the Center, (d) construction and equipment of the Center at the site donated by Niger, (e) communications linkage, where necessary, between the national headquarters and the Center. These inputs are expected to total \$5.2 million over the six year period, of which the UNDP, has already contributed \$1.7 million.

Thus "end of project status" for the national projects will consist of seven fully staffed and equipped national networks, capable of providing water and weather data information to national headquarters on a daily or twice daily basis with precision as to the specificity and location of phenomena. It will further consist of national headquarters capable of recording and processing the data for the country as a whole, and disseminating the data in terms meaningful for agriculturalists and livestock raisers, as well as for decision-makers in the agricultural and livestock services and agencies in these countries. Such information will be in the nature of weather forecasts, advice on planting and field preparation, location of well watered pastures, flood stage information for recession farming agriculturalists. Information processed by the seven national headquarters will be relayed daily to the Regional Center at Niamey for regional interpretation.

"End of project status" for the Regional Center will involve constructed facilities capable of housing 50-100 trainees and related training staff as well as data processing, interpretation and research facilities and technical staff to carry out those functions. The Center will have initial capability of training Class III (post high school) and Class II (post B.A.) hydrologists and agrometeorologists (in conjunction with course offerings at the University of Niger and the ASECNA Training School), with the possibility (in conjunction with the University and other African or European Universities) of training Class I professionals (post Ph.D). Agricultural applications of the training will be emphasized at the Center with the construction of two "satellite" training farms near the center, one emphasizing irrigation and flood recession practices, the other rain-fed agriculture.

In addition to its training function, the Center will carry out important service and research functions for the region. It will correlate and interpret reports from the national services, issue medium term forecasts on river basin and weather activity, and on the basis of interpretation of historical records and current data, construct an "early

warning system" that will be able to predict significant seasonal variations in rainfall and provide lead time for governments and external agencies to take actions toward mitigating the consequences of future droughts. In addition, the Center will become a "center of excellence" for research on agroclimatology for Sahelian West Africa, collaborating closely with ICRISAT, IITA and ILCA, with emphasis on crop/weather correlation studies and other applied research work designed to improve long-run agricultural productivity.

C. Summary Findings

The program is based on analyses carried out by three missions of experts, one by WMO (1973), one by WMO/FAO (1974) and one by NOAA in 1975. In the latter two cases, the teams were inter-disciplinary in composition. This was done to assure that sufficient attention was given to emphasizing that improvements in hydrology and meteorological data collection and interpretation technology resulted in applications that were beneficial to the agricultural agencies of the countries concerned and to their agricultural and pastoral clientele.

The first two surveys undertook detailed inventories of the existing material and human infrastructure that existed in the seven countries for collecting and disseminating water resources data. The second survey in particular laid the basis for a long-range program of network rehabilitation and expansion, human resources development, and technological improvements to serve the needs of the area. The NOAA study basically endorsed the results of the earlier two and added some interesting and important features to the program. These include the use of weather radar and remote sensing technology as tools to increase the accuracy and timeliness of data collection. Secondly, the importance of developing early in the program an experimental prototype user facilities, so that the techniques for disseminating the data in terms meaningful to the agricultural systems and social practices of the countries could be tested. These recommendations have received initial favorable reactions, and will be discussed further at the next donors' meeting.

It, therefore, seems safe to say that the program is based on extensive, careful technical analysis by European and American experts, many of whom were familiar with climatic and agricultural problems of West Africa. It is also important to note that the program is responsive to the "felt needs" of the Sahelian countries themselves, who have actively participated in its development and have committed substantial human and material resources to getting it underway. The "collaborative style" which has characterized the program thus far was formalized at the January donors' meeting in Geneva with the setting up of committees representing the interests of the donors and the recipients.

Implementation arrangements have been carefully worked out at (a) the CILSS level, (b) the donors' level, and (c) the A.I.D. input. The key to successful implementation is WMO which has committed major technical and managerial resources to its task as serving as the Executing Agency for both donors and CILSS. Implementation arrangements in the field have been established with a Programme Headquarters stationed at Niamey and headed by a Programme Coordinator and a small staff. He will be assisted by a "Sahelian" Director of the Regional Center, as soon as CILSS has appointed the latter. The Programme Coordinator, a highly qualified and energetic Dutch Agrometeorologist (with considerable background in West Africa) will be responsible for monitoring the successful implementation of the seven national projects and, in collaboration with the Center's Director, the construction and development of the Center.

A.I.D. has established efficient implementation arrangements by concluding a PASA with NOAA and NOAA in effect serves as A.I.D.'s advisor and executing agency with respect to A.I.D. contributions to the project. These arrangements have proved to be most satisfactory and effective, and have provided NOAA with excellent background as A.I.D.'s role changes from one of assessing the program to one of participating in it.

The project meets all applicable criteria. In regard to Section 611, where applicable, NOAA technical offices will determine reasonable cost estimates and implementation plans for the equipment which A.I.D. will contribute. With respect to A.I.D.'s contribution to the Regional Center, NOAA and A.I.D. engineers have reviewed the plans and architect's narrative and found them satisfactory from a 611 standpoint, subject to verification by an on-site visit to be performed by REDSO/WA. The visit will also assess the environmental impact of the Regional Center and will assure that all environmental considerations will be covered.

D. Project Issues

The following issues have been identified. They are discussed in other sections of this Project Paper and will only be summarized here. The U.S. delegation will plan to raise most or all of these at the next donors' meeting in May.

1. Requirement for additional external donor assistance, estimated at \$4-6 million, to complete planned program. Discussed at January donors' meeting; WMO and UNSO were designated to solicit additional funding from new donors. No known results to date.

2. Operating costs, Niamey Center. The operating costs of this Center, if it is to perform its proper functions, as described

elsewhere, will be beyond the capacity of CILSS to support alone. Examination of sources for long-term support for the Center should include the Club des Amis du Sahel, the Sahel Institute, or the IBRD-led Consultative Group Research on International Agriculture in which A.I.D. is a major donor.

3. Evaluation Plan. Criteria for evaluating the project have not been developed with desired precision, although a number of levels of criteria are suggested in Part IV. It is proposed that a technical panel on this subject be proposed by the U.S. at the next donors' meeting and that the U.S. seek to participate in the evaluation work that is already planned by UNDP in 1977.

4. Coordination with CIEH. No immediate problem is foreseen, but the two organizations need to establish early arrangements for consultation and coordination, particularly in the field of research. See detailed discussion of this topic in the Technical Analysis, Part III below.

5. Design Team for Prototype User Services Facility. Proposed by the U.S. at the January meeting and received positive comments by the Programme Coordinator. Now that all parties have had a fuller opportunity to study the NOAA report, matter should be raised at May meeting with objective of fielding a team this summer (subject to the concurrence of the Nigerien government).

Part II - Project Background and Detailed Description

A. Background

1. Relationship to the Drought and African/U.N. Response.

The origins of the present program can be directly traced to the first Chiefs of State and Ministers' meeting of the CILSS countries in September 1973 at Ouagadougou. It will be remembered that the meeting took place in the aftermath of the most devastating drought experienced by West Africa in half a century. Hence, among the numerous resolutions adopted by the Chiefs of State were three concerned specifically with obtaining a better understanding of the meteorological and climatological forces at work in the Sahel and for increasing local capacity to collect, manage and utilize water resources data.* Specifically, the Sahel leaders called for:

- a. Studies in hydrometeorology, agrometeorology and climatology;
- b. Agrometeorology and networks;
- c. Creation of sub-regional centers for applied meteorology, including:
 - 1) training in personnel;
 - 2) studies in agrometeorology for early warning of crop failure;
 - 3) experiments in rainfall augmentation.

The foregoing resolutions were not simply a spontaneous reaction by troubled national leaders but also the result of recommendations which had been prepared by expert committees meeting in advance of the conference.

* For cabled summary, see Annex II.

Commission No. 1 -- Agriculture and Hydraulic Engineering for Agriculture -- had stressed the importance of establishing national services responsible for data collection and research in water resources and climatology as a means of facilitating the planning and execution of water resources projects. Commission No. 2 -- Environment and Climatology -- likewise emphasized the need to establish infrastructure for producing data necessary for agricultural development including increasing the density of observation station networks, provision of equipment, creation of archives and a study center. Studies of rainfall cycles, utilization of remote imagery and improvement in forecasting methods had special mention.

It will be noted that all of the program elements recommended at this first meeting (except weather modification) have subsequently been incorporated into the WMO/UNDP/CILSS agrometeorological and hydrological program for the Sahel.

The CILSS conference at Ouagadougou had been preceded by a number of expressions of concern and willingness to respond to the long term needs of the Sahelian countries on the part of the donor community. These included a resolution adopted by the Economic and Social Council of the United Nations (ECOSOC) in May 1973, and more broadly, by a multi-donor conference sponsored by the United Nations in Geneva in June. At that meeting, the U.S., among other donors, pledged to participate in efforts addressed to the region's long term development.

Prompted by the Ouagadougou resolutions of CILSS, the World Meteorological Organization (WMO), initiated a survey of existing meteorological infrastructure in the six countries with a view toward formulating a long

term program for the more effective application of meteorology to the economy of the drought-stricken region. The survey was carried out in the late 1973 by E. G. Davy, a senior WMO meteorologist. The Davy report remains today an excellent inventory of the existing institutional and material meteorological resources of the Sahel, an analysis of priority needs, and recommendations for external assistance.* However, the Davy report focussed mostly on the meteorological aspect of the region's water data problems and did not deal as extensively with hydrology. Also, the report emphasized the technical aspects of the meteorological situation and dealt less extensively with their implications for agricultural utilization.

Accordingly, the United Nations Development Program (UNDP) agreed in early 1974 to finance a multi-disciplinary mission to the Sahel which would include hydrology as well as agricultural applications. Headed by Professor E. Bernard, an eminent Belgian agrometeorologist, the mission included an expert each from ORSTOM and the Food and Agricultural Organization (FAO).** Its country-by-country field survey*** (May-July 1974) resulted in establishing a detailed itemization of the material, institutional and

* "A Survey of Meteorological and Hydrological Data Available in the Six Sahelian Countries of West Africa," E. G. Davy, WMO, no. 379, 1974.

** UNDP officials indicate that several attempts were made to invite AFR to provide an expert for this mission but without success. Had this occurred, it would have smoothed and facilitated U.S. participation in the program.

*** By now, Gambia had joined CILSS and was included in the survey.

human resource needs of the Sahelian countries for hydrologic and meteorologic data collection for agricultural purposes, and in formulating a comprehensive long term program at both the national and regional levels.

This initially recommended program was cut back considerably, at UNDP insistence, to one which would more closely approximate donor funding possibilities and Sahelian absorptive capacities. The resulting modified version of the Bernard Mission's recommendations became the basis for the scope and structure of the current program in which A.I.D. has agreed to participate. Key features of the program include the role of WMO as the executing agency for the donors and the active role of CILSS in organizing and coordinating the participation of the Sahelian countries.* The program is described and summarized in Section B below.

Even as revised, however, total cost of the program was conservatively estimated at \$28 million (over a six year period, 1975-80) and was clearly beyond the capability of UNDP to finance alone. Nevertheless, in order to maintain the momentum of program planning and to permit the early initiation of implementation, UNDP agreed in early 1975 to provide \$4.2 million to finance certain basic components of the program for its first two years, leaving open the possibility of providing additional funding in subsequent years. The support of other donors would also be sought. Meanwhile, at their meeting in Banjul in December 1974, the CILSS countries endorsed the program as a whole and agreed to locate its regional center and field headquarters at Niamey.

* The program is referred to hereafter as the WMO/UNDP/CILSS Program Document."

2. A.I.D.'s Decision to Participate

A.I.D., and specifically the Bureau for Africa (AFR), were aware of the September 1973 CILSS resolutions referred to earlier, as well as those on a number of other projects. However, along with other donors, AFR was concentrating on responding to the most immediate needs and crises inflicted by the drought through its disaster relief program, through the Relief and Rehabilitation Program, (developed by the Sahel Task Force under the leadership of the late Dr. Fei), and through a series of "Medium Term" agricultural development projects.

However, in the spring and summer of 1974, a Research Committee of the Sahel Task Force pulled together a number of suggestions and proposals for studies and data collection efforts looking toward the longer term problems and potential of the region. Included among the Committee's high priority proposals was one, which had been discussed with representatives of the U.S. Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), for assistance in water resource data collection and interpretation. Preliminary estimates for funding such a project were included in the AFR/CWR FY 1975 Budget Submission. In the fall of 1974 it was agreed within AFR that the "Sahel Water Data Network" proposal should be included among those selected for early development and consideration. A Project Committee was formed* and a Project Review Paper (PRP) was prepared and reviewed at a Committee meeting on January 14, 1975.** Meanwhile, AA/AFR had written to the Administrator of NOAA on whether it

* The important contributions which representatives of the Technical Assistance Bureau, especially Mr. Bill Long (TA/OST) and Dr. Dillard Gates (TA/AG) to the formulation of the proposal and the study that followed is gratefully acknowledged.

** The Text is included as Annex V.

would be prepared to undertake the work outlined in the PRP and received an affirmative response. On February 6, AA/AFR approved an Action memorandum for providing \$82,000 (Surveys and Studies funds) to finance a PASA with NOAA to carry out Phase I of the project.*

The approach outlined in the PRP was to undertake a "feasibility study" to "... assess the potential utility, constraints, timeliness, international receptivity and necessary dimensions of a U.S. initiative in the context of a multi-donor effort to assist the Sahel countries to upgrade their hydrometeorological capabilities of that region." The study would involve analysis of existing or planned programs, present data collection and manpower training needs; unmet needs, particularly for agricultural purposes, constraints to meeting such needs, how these problems might be addressed in a multi-donor context, and finally, what role, if any, the U.S. might play. If the recommendations were positive, the Phase I study would be the basis for a Project Paper for justifying U.S. participation in a recommended program.

The PRP and the Action Memo emphasized A.I.D.'s interest in determining whether the U.S. might have special skills and technology (systems analysis, network design, use of remote sensing) to contribute to a multi-donor effort, and second, that the basic objective for such participation would be "to assist crop and livestock production... and support river basin development...". Thus, A.I.D.'s PASA with NOAA

* On advice of AFR/DP, it was not considered necessary to convene an ECPR meeting on the PRP since Phase I of the project was in the nature of a feasibility study.

stipulated that the survey and study would be carried out by an interdisciplinary team which would include agricultural and range specialists.

3. The NOAA Study

With AFR assistance, NOAA recruited a six man team* under the leadership of Mr. Gerald A. Petersen. Following briefings and literature reviews in Washington, the Team spent part of April and most of May visiting the major donors (UNDP, FAO, UNESCO, WMO, FAC), the headquarters in France of the various relevant data gathering or research agencies operating in the area -- ASECNA (aeronautical meteorology), ORSTOM (hydrology), BRGM (groundwater hydrology), GERDAT (agriculture) and several others -- and each of the six Sahelian countries. At the request of RDO/Niamey, the A.I.D. member of the team (Dr. Gates) attended a CILSS-convened donors' conference in Niamey May 7-9 to explain the purpose of the A.I.D./NOAA study and its relationship to the WMO/UNDP/CILSS program. The team reported back to the A.I.D./W in early June and its final report, after going through several drafts, was completed in December just in time for circulation at the January 8-9 donors' conference convened by WMO at Geneva. It should be noted that while the report has not -- pending other donor and African comments -- been formally endorsed by A.I.D., it is regarded as making "... a constructive contribution to an understanding of the problems involved and approaches to their solution.**

* In addition to Mr. Petersen (meteorology and hydrology) the team included Dr. Jay M. Bagley (agricultural hydrology), Dr. Dillard Gates, (range resources and animal sciences), Dr. Gilbert L. Jordan (dry land vegetation and range resources), Mr. Vaughn D. Rockney (meteorology, equipment and networks) and Dr. Norman Rosenberg (agrometeorology and climatology).

** Memorandum of Transmittal by Mr. Donald S. Brown, Deputy Assistant Administrator, AFR, 12/23/75.

The NOAA report* has played an extremely valuable role for A.I.D. in assessing the problems of water data management in the Sahel, the approach proposed in the UNDP/WMO/CILSS program, the strengths of that approach as well as areas in which the U.S. should encourage the breaking of new ground. Essentially, the NOAA report supports and endorses the major priorities of the WMO/UNDP/CILSS Program Document including (a) emphasis on restoration, rehabilitation and expansion of existing data measuring networks, (b) the need for developing viable national services for meteorological and hydrologic data gathering and interpretation, (c) the role which a regional center can play in training national hydrologic and meteorologic cadres and in serving as a focus for regional data processing and research. Thus, one important function of the NOAA report was to "help determine an appropriate level of U.S. support for the WMO/UNDP/CILSS program."

However, the report also has some important emphases of its own which, while not inconsistent with the earlier study, seek to delineate special U.S. concerns and ways in which the U.S. might most effectively contribute to the program. There is a strong emphasis in the NOAA report on (a) the importance of major African participation in the long run financing of the operational costs of the program, (b) the need to stress the practical application of water resource data for agricultural planning and for on-farm decision making, and (c) the applicability of new technologies, including weather radar and satellite sensing, for weather forecasting and for making data available in "real time." In particular, the report stresses

* Reproduced as Annex I.

the importance of involving the participation of the agricultural ministries and agencies in the planning of the data dissemination aspects of the program so that they will be applicable in content and format to the practical needs of the herdsmen and farmers of the area.

This approach is reflected in the program and funding recommendations of the NOAA report. The report recommends that A.I.D. contribute the full \$4.26 million (the amount that had been tentatively programmed earlier) toward the unfinanced portion of the program* of which \$3 million would be allocated equally between national activities and the regional center. Furthermore, the report recommends that \$250,000 of the \$1.5 million for the Niamey center be applied to establishing a "prototype user services experimental facility" and that some \$200,000 more be used to provide the center with weather radar and meteorological remote sensing (Automatic Picture Transmission) capabilities to supplement the data that will be fed in from the regional network. In addition, the report recommends that the remaining \$1.26 million be used to finance data dissemination and utilization programs in the other Sahelian countries, based on the experience with the prototype facility recommended for Niamey.

How closely A.I.D. will be able to follow NOAA's program and financing recommendation, particularly where they depart from the program requirements as budgeted in the WMO/UNDP/CILSS study will depend on a number of factors including (a) the reaction and agreement of other donors and the CILSS countries to the NOAA report, (b) the willingness of additional donors to contribute to the basic program, thus freeing up U.S. resources

* For detailed budget estimates of the total program, see Tables I - VI.

to finance the NOAA innovations, and (c) specific negotiations between A.I.D. and WMO as to how the annual tranches of the U.S. contribution can be most effectively applied.

4. Organizing a Multi-Donor Program

Shortly after UNDP's agreement to help get the program launched in early 1975, a meeting was convened in Niamey May 7-9 to solicit support from other donors. Given lack of adequate advance notice and preparations, the meeting was disappointing from a fund raising standpoint. All of the potential donor countries, except UNDP and the U.S., were represented by their local embassies and could only indicate that they would refer the matter to their governments. The A.I.D. member of the NOAA team participated on the U.S. delegation and was able to explain the purpose of the team's mission, although misgivings were nevertheless expressed by UNDP and CILSS officials that the NOAA survey would duplicate and distract attention from the work that had already been done.

On July 1st, a second meeting of potential donors was convened in Geneva by WMO in conjunction with a broader meeting sponsored by UNSO and CILSS to mobilize donor support for a number of long range programs requested by CILSS. This meeting was more successful in broadening donor support for the regional hydrometeorological program. The U.S., encouraged by the endorsement of NOAA, pledged \$4.26 million to the program, a pledge later formalized in a letter to WMO of September 5.* The Netherlands pledged some \$2.9 million, contingent on other donors financing the remaining two-thirds of the unfinanced "gap" as presented in the WMO/UNDP/

* For text of letter, see Annex IV. It should be noted that the negotiating instructions of the U.S. delegation stipulated that U.S. contribution to "CILSS-list" projects (including the WMO/UNDP/CILSS program) were to be made, insofar as possible, in terms of in-kind donations to a mutually agreed program rather than cash donations to a common fund.

CILSS program document. Belgian and Switzerland spoke of contributing lesser amounts (although Switzerland's has not yet been forthcoming). It was also agreed that WMO would call, as soon as possible, a subsequent meeting of the interested parties to establish organization arrangements for the coordination of donor inputs and African participation in the program.

The planned meeting took place January 8-9, 1976 at WMO headquarters in Geneva with UNDP, the U.S., the Netherlands and Belgian representing the donors and with representation from UNSO and CILSS (the latter in the person of Mr. Bayere, the newly-appointed CILSS Coordinator). The conference was extremely successful in recommending the basic organizational arrangements for the program.*

WMO, as the executing agency, was given responsibility for the day to day implementation of the program. A "Coordinating and Advisory Committee" made up of the donors, WMO, UNSO, and CILSS will be responsible for coordinating donor inputs and for providing overall oversight of program progress and prospects. This Committee can also establish technical panels on particular subjects. A second major body, the "CILSS Technical Coordinating Committee" was also recommended for adoption by the CILSS countries. Its major purposes would be to assure adequate local financing of the projects, to articulate needs and priorities from an African perspective, select trainees and recommend counterpart staff. It will be made

* At the insistence of the Netherlands, it was agreed that the conference would simply recommend the organizational arrangements to their governments with a view to being ratified at the next meeting. That meeting is now scheduled for May 24-26, 1976.

up of representatives of the CILSS countries (the directors of the meteorological and hydrological services) plus representatives from WMO, CILSS and the Coordinating and Advisory Committee. It was also agreed at the meeting that a strong effort should be made to bring additional donors into the program, and WMO/UNSO were requested to take appropriate action in that regard.

The January Geneva meeting was also very satisfactory from the standpoint of meeting a number of special concerns of the U.S. These included acceptance of the principle of contributions in kind, payment of WMO overhead costs on the basis of budget submissions rather than a fixed "overhead fee," and presentation of the concepts and approaches of the NOAA report. Although it was possible to distribute the report only shortly before the meeting, preliminary reactions were, on the whole, favorable. In particular there was endorsement of NOAA's emphasis on the importance of stressing practical agricultural applications of the data to be generated by the program as well as the importance of long term African support. The idea of a "prototype user services experimental facility" was endorsed for early design. There was some questioning of NOAA technical recommendations on weather radar and APT, (on grounds of excessive sophistication and problems of operation and maintenance) although a willingness to look into the subject further once the basic network was in place and operating.* The meeting was also productive in terms of informal program discussions with the WMO on priorities for the U.S. contribution for FY 1976-77.

* It must be emphasized that the above opinions were preliminary ones mentioned at the meeting itself and in discussions with the WMO Secretariat.

B. Detailed Description

The "project" may be described at two levels, first, overall WMO/UNDP/CILSS program in agrometeorology and operational hydrology, and second, A.I.D.'s proposed contribution to the program. Clearly the validity of the first is basic to the validity of the second and will be described first.

1. The WMO/UNDP/CILSS Program

The WMO/UNDP/CILSS program in agrometeorology and operational hydrology represents a long-range broad-scale effort to upgrade the scope, quality and timeliness of meteorological and hydrological data acquisition in and among the seven CILSS countries and to develop and strengthen local capabilities in the collection, interpretation and dissemination of such data for increasing agricultural and livestock productivity and for improving agricultural planning. The program consists of seven "national projects" designed to develop and strengthen national water data networks and services, and a complementary "regional project" through which a Regional Center at Niamey will be established for training national technicians and later for serving as a regional data processing, dissemination and technical research institution.

The national projects are the "building blocks" of the program and are based on the country-by-country surveys of needs carried out by the Davy and Bernard missions. They have in common (a) the rehabilitation of existing national networks of meteorological/hydrological measuring instruments and selected expansions in existing systems to increase the quality and geographic scope of the data, (b) linking the reporting stations

to national hydrometeorological centers through new or strengthened telecommunications systems so that data can be reported, recorded and interpreted in "real time" (rather than a month or more after the phenomenon occurs as is usually the case today), (c) the establishment of national agrometeorological and hydrological services in each of the countries and the training of a cadre of professionals and sub-professionals in each discipline to operate and maintain the national networks,* and (d) establishment of data processing units at the national level for the interpretation and dissemination of agrometeorological and hydrological data in a form readily usable by the agricultural sector, for short term forecasts and to relay significant information to the regional center.

Each of the national projects is covered and partially funded by a project agreement between WMO, UNDP and the host government which sets forth the contributions the parties will make over the first two years of the program including the experts, equipment and training assistance to be financed by UNDP and the counterpart personnel and funding to be provided by the African government. In this connection, UNDP is providing each country an

* At present, with the exception of Senegal, practically all of the meteorological data gathered in the Sahel is conducted by ASECNA and oriented toward air navigation purposes. Thus the meteorological services are usually located in the Ministries of Transport and Public Works. Most of the directors of the national meteorological services are also directors of the national ASECNA office. ASECNA was established and operated by France for some time but is now becoming Africanized and its headquarters have moved to Dakar. The hydrologic services are in an even earlier stage of development, are located in different ministries (often the Ministry of Mines) and often bifurcated between ground water and surface hydrology. ORSTOM has continued to play a significant role in the day-to-day data collection of surface water.

expatriate agrometeorologist and an operational hydrologist* to advise on establishing the networks, upgrading the services, following the training program and helping to organize the collection and dissemination of data in agriculturally useful terms, in liaison with the agricultural agencies of the country. The host governments agree to coordinate the collection of data by the hydrological and meteorological services through the establishment of a Senior Council of Meteorology and Hydrology which will also include representatives of the utilizing agencies. The host government also agrees to provide the counterpart personnel, land for the buildings for the national services, furnishings, some equipment and operating costs. In regard to training, it is envisaged that sub-professional training (e.g., Class IV meteorologists and below) will be carried out in country, middle-skill training (e.g., Class III) at the Niamey Center, and Class I and I professional training either abroad or at the Center in cooperation with the University of Niamey.

The five-year agreement for the Regional Center for Training and Applications of Agrometeorology and Operational Hydrology (signed by WMO, UNDP and CILSS) is concerned with the immediate launching of the training program but looks toward the future role of the Center for data processing, regional dissemination, studies and research. Funding for the building, data processing equipment and related technical assistance is to be sought from bi-lateral sources. Under the agreement, UNDP will finance an expatriate Programme Manager, the meteorological teaching staff for the Center --

* The hydrologists assigned to the national projects are provided under a two-year sub-contract between WMO and ORSTOM. They will operate under the supervision of two WMO-recruited hydrologists stationed at the Niamey Center.

four experts in various disciplines for various periods -- plus two hydrologists to coordinate and supervise the implementation of the two-year ORSTOM sub-contract.* In addition to providing hydrologists for the national projects, ORSTOM is also responsible for conducting the hydrologic training courses at the Center. The training program envisages six two-year courses each at various levels of meteorology and comparable courses in hydrology. For these purposes the agreement includes funding by UNDP of teaching materials and equipment. The Nigerien Government undertakes to provide a Director for the Center as well as land for the Center's site.

2. Program Progress to Date

It is important to understand that A.I.D. is not being asked to participate in a program that is still on the drawing board, but one that has been in actual implementation since June of 1975 and in full swing since October.

As a result of decisions reached at the May Niamey meeting, a WMO official was posted to Niamey to organize preparations for the activation of the training courses at the Center. The WMO Programme Coordinator took up his responsibilities in October. On October 15, the first two-year course for Class III agrometeorologist students was initiated. The course is being provided to seven students from Upper Volta, Mali, Niger and Senegal**

* The ORSTOM sub-contract provides hydrology personnel for the six Francophone countries; the hydrologists for Gambia is provided by WMO directly.

** Applications for students from Mauritania and Chad arrived too late for consideration.

in facilities provided in the ASECNA training school in Niamey and with furniture and teaching materials provided under the program. On the hydrological side, the ORSTOM subcontract has been signed and an ORSTOM expert has organized a course for Class III hydrologists which commenced in temporary facilities provided by the Nigerien Government in December 1975. Twelve students from five of the six CILSS countries (except Mali) are in attendance.* The Nigerien Government has also provided temporary facilities for the programs' field headquarters. Meanwhile, a contract has been signed with a French architectural firm to prepare plans and specifications for the Niamey Center. These have gone through several revisions and are scheduled for completion in April 1976.** The Nigerien Government has made available a fifty hectare plot of land (which is in process of being cleared) for the Center near the river and the University.

With respect to the seven national projects, as of December 1, 1975, WMO-recruited meteorological experts had been posted to Mali, Niger, Senegal and Upper Volta and the vacancies for Gambia and Chad were due to be filled in early 1976. Recruitment for Mauritania was still in progress. All of the seven hydrologist positions have been filled, mostly by ORSTOM under its sub-contract. Equipment for refurbishing and expanding the national meteorological and hydrologic networks is on order.

* Thirteen applications from non-CILSS countries had to be rejected for lack of facilities. However, participation by non-CILSS students on a supplementary basis is contemplated when conditions permit.

** The schedule for construction envisages final plans by July 1976, the tendering of bids in September, conclusion of a contract in December and completion of construction in December 1977.

Plans for the immediate future envisage the initiation, in cooperation with the University of Upper Volta, of a course for Class II meteorologists and hydrologists in October 1976. Demand for training at the Class III level has been so great that consideration is being given to starting a second course at the same time, rather than October 1977 as originally planned.

At its Chiefs of State meeting in Nouakchott in December 1975, the CILSS countries noted that the project was the first CILSS-sponsored project to become operational. The conferees requested that the Programme Coordinator convene "national experts" (i.e., the heads of the meteorological and hydrological services of the CILSS countries) to look into the following problems of the Niamey Center: management, recognition of diplomas, and extending the life of the national projects. This body (which the Geneva conference had labelled the "CILSS Technical Coordinating Committee") did in fact meet in February.

3. The U.S. Contribution to the Program

The U.S. has indicated, subject to a number of caveats noted in a letter from AFR to WMO of September 5, 1975,* that it will seek financing of up to \$4.26 million over a five year period as its contribution to the program and that \$260,000 of the total will be sought in FY 1976. As indicated earlier, A.I.D.'s contribution will reflect both its intention of assisting a multi-donor and multi-recipient effort to achieve common objectives as laid out in the basic program, and secondly, within that framework, to emphasize those aspects reflected in the recommendations of the NOAA report. In actuality, this duality of purpose should not create any serious problems since the first priority for all donors during the first two-three years will be to establish a basic physical and human resources infrastructure on which a dynamic and technically sound program can be constructed. During this initial period it should also be possible for the U.S. to carry out planning and design work of the innovations recommended by NOAA, assuming they are accepted by the other donors and the CILSS countries. As indicated elsewhere, the initial reaction to the NOAA report, as expressed at the January 1976 donors' meeting has been quite favorable.

(a) FY 1976 Contribution

The proposed U.S. input for FY 1976, is based on recommendations prepared by the WMO Programme Coordinator and have been reviewed within A.I.D. and by NOAA's experts. In the opinion of both A.I.D. and NOAA

* For text of letter, see Annex IV.

technical staff, the items to be financed are technically sound and the cost estimates have been checked and are reasonable. Some adjustments have been made to reflect funding constraints and the desire to maximize U.S. procurement.

Basically the proposed funding represents a modest but important contribution of commodities and technical services for helping to establish both the national programs and the regional program at Niamey. A budget for the FY 1976 contribution is shown on Table VII.

In regard to the national program, the U.S. will finance up to 50 solar radiation measurement units to be installed over the CILSS region at a density of about one station per 20,000 square miles. These units will form an important additional component to the national meteorological networks that are being rehabilitated and expanded under financing being provided by other donors, principally UNDP. At present there are only about seven solar radiation stations in operation in the entire area. Installation of the 50 additional stations will provide the national centers with a new category of agrometeorological data essential to the two basic processes of agricultural production, namely photosynthesis and evapotranspiration. Solar radiation data are necessary for estimating the water requirements of irrigation crops and the amounts of water actually available for rain-grown crops. It is also extremely useful for planning the introduction of more productive varieties and crops and of more effective farm management and water conservation methods.

The U.S. made recording units will be paired with Dutch-made sensors (in accordance with WMO-tested recommendations) and assembled and

calibrated in Niamey prior to their placement at the measuring sites in the field. Financing from the Netherlands' contribution will be sought for the Dutch equipment. The U.S. will also finance an expert to assemble and calibrate the equipment and to train a "Sahelian" counterpart to maintain and re-calibrate the instruments on an annual basis. Given the lead time necessary for procurement, funding for the services of the instrument expert can be deferred until FY 1977. The cost for the U.S. units is estimated at \$150,000.

A second in-kind contribution will be the services of a telecommunications/engineer to advise on the planning and design of the communications network that will (a) link the various recording stations to each of the national headquarters and (b) link the national headquarters with the center at Niamey. Construction of the telecommunications system is essential if data are to be made available on a "real-time" basis for hydrological and agricultural forecasting and will play a vital role for the early warning system. Given the fact that elements of a telecommunications system for meteorological reporting are already in place and are being operated by ASECNA, the task will be one of designing additional components and linkages which will be compatible with the ASECNA system, thus permitting joint, cooperative use for both air navigation and agrometeorological purposes. The engineer will also make recommendations with respect to the computer facilities required at the national headquarters and at the Niamey Center, taking into consideration the volume of telecommunications data expected. The mission will be 3 months in duration, including a detailed survey of existing national networks and ASECNA facilities, and its cost is estimated at \$30,000.

It is also proposed to provide in FY 1976 the following items for the Niamey Center:

(a) American scientific and agricultural reference works and subscriptions to technical journals (\$2,000).

(b) Agricultural equipment and implements for a training/experimental farm to be located at the Center's 50 hectare site. The objective of the farm will be to demonstrate to the trainees the practical response of both irrigated and rainfed crops to differing agrometeorological and hydrological conditions, to demonstrate the value of timely meteorological data for making agricultural management decisions, as well as to demonstrate improved farming practices. Demonstrations will include both traditional crops as well as improved varieties tested by the international agricultural research centers. The cost of the various implements, including one tractor and irrigation equipment is estimated at \$58,000.

The first item would be an in-kind contribution. For reasons of services and spare parts, the latter item should be procured locally and would be financed by a direct contribution to WMO which would make the funds available to the Programme Coordinator in accordance with the A.I.D./WMO Grant Agreement.*

In addition, approximately 10% of each year's contributions (\$20,000 in FY 1976) will be needed to defray NOAA and WMO actual costs for administering the activities.

Summarizing the contribution proposed for FY 1976, 70% will be in-kind, 22% in cash, and the remainder will cover NOAA and WMO administrative costs. Thus the bulk of the contribution will go for items with

* Annex III

a direct applicability to benefiting agricultural productivity. The work of the telecommunications engineer will be of particular importance for allocating A.I.D.'s FY 1977 contribution, for much of it has been requested for financing the telecommunications system and the program's computer facilities (see below). Procedures for implementing A.I.D.'s contribution are discussed in Part IV, below.

NOAA and A.I.D. technical personnel have reviewed the foregoing proposals for FY 1976 and have found them to be technically sound and reasonable in cost. See Annex VI for NOAA technical assessment.

(b) FY 1977 Contribution

A.I.D.'s contribution for FY '77 has been programmed at \$1.5 million. Based on preliminary discussions held at the January donors' meeting and written comments by the WMO Programme Coordinator, it is recommended that the contribution be adjusted upward to \$1,830,000 (see Table VII).

A major item for the national projects will be to provide final design services and equipment for the telecommunications system that will be recommended by the engineering consultant to be financed in FY 1976. \$500,000 has been allocated for this item.

It is estimated that this amount will finance radio facilities to link 100 agrometeorological and hydrological stations in the CILSS countries with their national headquarters and give them a twice-daily reporting capability. An additional \$140,000 will finance the equipping of six national headquarters (Niamey is already so equipped) with reception units to receive the data being transmitted from the field

stations as well as mini-computers to store and process the data, thereby building in each country a water resources data bank. The data would also be relayed immediately to the Regional Center (telecommunications with Niamey would be transmitted via the existing ASECNA regional telecommunications network under cooperative arrangements that would give ASECNA access to the expanded Agromet telecommunications network). In support of such assistance, the U.S. would also provide an engineering consultant to supervise the installation of the telecommunications and computer equipment and to train Sahelian technicians in procedures for maintenance, service and repair. \$100,000 is budgeted for this item.

Equipment of U.S. source and origin would be procured except in cases where non-U.S. procurement was clearly necessary to assure compatibility with existing equipment. The extent to which non-U.S. procurement would be required will not be known until the survey to be conducted from the FY 1976 contribution has been completed.

\$500,000 has been earmarked as A.I.D.'s contribution to the cost of constructing the Niamey Center. This would represent a contribution of over one third to the total cost (including training, data processing and dormitory structures) presently estimated at \$1.3 million. The timing is appropriate since the contract for construction is scheduled for award in December 1976. Architectural plans and specifications are being prepared by a French firm and the fifty hectare site is now being cleared by the Nigerien government. The plans have been reviewed and approved by NOAA and A.I.D. engineers and a REDSO/WA engineer will visit the site for a final

review to assure that it meets Agency engineering (Section 611) and environmental analysis standards prior to requesting obligation of funds. Since the Center will be constructed under a contract to be awarded by WNO, the U.S. contribution would be in the nature of cash transfer to WMO.

REDSO/WA has assigned an engineer to make periodic monitoring visits to the site while construction is in progress, but WMO will have principal responsibility, on behalf of all the donors, for selecting the supervising engineer and the contractor and for monitoring construction. It is estimated that \$238,000 will be required for air conditioning equipment for the Niamey Center, together with related engineering services. Such equipment is necessary, not only to staff and classroom efficiency, but to enable the computers and other sensitive equipment to function effectively. \$100,000 has also been budgeted for the cost of providing for one year a technician to assemble, calibrate and install the solar radiation measurement units provided in FY 1976 and to train an African counterpart in maintenance and recalibration procedures. An additional \$100,000 has been budgeted to finance the cost of providing a design team to consult in Niamey on the organization and planning of an experimental user services facility, as recommended in the NOAA report. Action on this initiative will depend on discussions with WMO and the other donors at the next donors meeting in May as well as on discussions in Niamey with the Nigerien government. If these are positive, they will clear the way for planning the application of one of the most innovative and agriculturally significant features of the NOAA report.

(c) Subsequent Year Contribution (FY 1978-80)

Table VII provides estimates as to the allocation of the remaining \$2.17 million of A.I.D.'s contribution over the final three fiscal

years of the project. The distribution of these resources within a given fiscal year are intended to be indicative only and will need to be worked out in a cooperative exchange of views with WMO, the other donors and the CILSS countries, as has been the case with the FY 1976 and 1977 contributions. At this time, it may be pointed out that the funding plan contained in Table VII reflects (a) the completion of the installation of the telecommunications system (both national and regional), (b) the initiation in Niamey in FY 1977-78 of a prototype user services and dissemination activity, including the use of weather radar and Automatic Picture Transmission (see NOAA report, page 16) and (c) a heavy emphasis on expanding activities in the agricultural applications of the information within the other CILSS countries during the remaining two years of the project, drawing on the lessons gained at Niamey.

Summary Cost Estimate and Financial Plan - U.S. Contribution
(Obligation in \$000)

	<u>1976</u>	<u>1977</u>	<u>Fiscal Year</u>		<u>1980</u>	<u>Total</u>
			<u>1978</u>	<u>1979</u>		
I. <u>Regional Center</u>						
Contribution to Construction	-	500 ^{a/}	-	-	-	500
Data processing and other equipment	-	238	125	100	-	463
Weather radar and A.P.T.	-	-	190	-	-	190
Training equipment	58 ^{a/}	-	40	40	40	178
Publications	2	2	2	2	2	10
Technical Assistance ^{b/}	30	200	150	200	100	680
Fellowships	-	-	33	28	28	89
Sub-Total	<u>90</u>	<u>940</u>	<u>540</u>	<u>370</u>	<u>170</u>	<u>2,110</u>
II. <u>National Projects</u>						
Meteorological and hydrological stations	150	-	50	50	50	300
Telecom equipment	-	500	100	-	-	600
Data processing equipment	-	140	100	-	-	240
Engineering services	-	100	100	-	-	200
Data dissemination and utilization activities ^{c/}	-	-	-	140	250	390
Sub-Total	<u>150</u>	<u>740</u>	<u>350</u>	<u>190</u>	<u>300</u>	<u>1,730</u>
III. NOAA and WMO Administrative costs	20	150	100	80	70	420
Total	260	1,830	990	640	540	4,260

a/ Cash contribution.

b/ Includes prototype data utilization program.

c/ Includes technical assistance based on experience learned from Niamey prototype.

Part III - Project Analysis

A. Technical Analysis

This section may best be presented in terms of (a) the basic technical analysis contained in the WMO/UNDP/CILSS program document, and (b) the additional technical recommendations contained in the NOAA report.

1. The WMO/FAO Analysis

The agricultural system of the CILSS countries may be summarized as consisting largely of (a) rain-fed subsistence farming, mostly for food crops, (b) irrigation farming, related to the river basins and Lake Chad, often for export crops, (c) recession agriculture in the flood plains, lakes and ponds, again mostly for food. In addition, livestock plays a major role in the economy of the area, both as a major source of local consumption and as a major export to the coastal countries.

All of these aspects are intimately tied to climatic variations and to the volume, periodicity and location of rainfall during the "rainy season". Generally speaking, the climatic regime of the area is characterized by the advance of the monsoon (Intertropical Convergence Zone) from the Gulf of Guinea into the Sudano-Sahelian region with diminishing amounts of rainfall as it proceeds northward until it peters out at some point along the northern boundary of the Sahel. The rainy season usually lasts from June-October and is the direct source of moisture for rain-fed agriculture of the Sudano zone and the more northerly range lands of the Sahel. Rainfall is characterized by considerable local variations in periodicity and location. In addition, there are great variations in the length and northward advance of the monsoon, and the volume of precipitation it produces, from one year to the next. These factors, in turn affect the timing and amount of run-off which feeds the lakes and river basin systems of the area.

Because of the rainfall- run-off cycle, agriculture in the CILSS countries is generally characterized by a two-phased system: First the period June-October during which there is peak agricultural activity for rain fed farming, and second, the period August-February during which recession agriculture is practiced as the rivers and ponds recede.

As emphasized in the Davy, Bernard and NOAA reports, agriculture in the CILSS countries is presently carried on without adequate information either for agricultural or river basin planning or for direct support to the farming and herding populations.* Nor are historical climatological records available in a form which permits early recognition of significant seasonal variations, particularly for droughts. As indicated earlier the meteorological services are almost entirely oriented toward the needs of civil aviation rather than agriculture. The hydrologic networks and institutions are even less well developed and at present much of the day-to-day hydrologic information is gathered either by ORSTOM or as a result of previous ORSTOM activities or as a part of aviation supported observations. Coordination of meteorological and hydrologic information at the national level is often weak, due in part to the separations of the two services in different ministries. The limited non-aeronautical data which is collected usually arrives from the observing station a month or more after the event. At present, little is being done to interpret this data in terms meaningful to agricultural or river basin planners, nor to national extension and "animation" services. Thus, there is no basis for a data dissemination effort to the farming and herding populations nor one for early warning.

The situation may be summarized by saying that a basic component of the infrastructure necessary to support increased

*A partial exception to this conclusion is the various hydrologic data gathering projects that have been activated with external financing, as for example the WMO project for measuring the headwaters of the Niger and the Lake Chad hydrologic activities.

agricultural and livestock production is either largely missing or non-functional.

As described in Section II above, the WMO/UNDP/CILSS program addresses the foregoing problems in several interrelated ways including:

(1) Initiation of a new major training program to strengthen and expand the national agrometeorological and hydrological services and to man the hydrological and meteorological networks;

(2) The rehabilitation of existing data measurement networks together with selected additions of new stations (equally important is the need to keep the networks well maintained and operational to assure the gathering of high quality data);

(3) A communications system that will permit the rapid (real time) transmission of data to national centers for analysis and for relay to the regional center at Niamey;

(4) The preparation of a methodology for interpreting the data in a form that can be readily assimilated and acted upon by both government users and agricultural producers;

(5) A means of disseminating the interpreted data rapidly to the users;

(6) The development of new applications for the derived data, and historical data, through research and experimentation;

(7) As one major product of the foregoing, the elaboration of a forecasting system that will be tied into an early warning system for agriculture. Such a system will permit the early detection of adverse rainfall patterns and thereby alert governments (and donors) of the need to take adaptive measures so as to mitigate the effects of the on-coming drought. For example, an early indication of a shortfall in moisture for rainfed agriculture would alert governments to the need for a shift of effort and concentration on maximizing production from flood plain cropping which takes place later in the year.

The initial \$4.2 million input of UNDP into this overall approach is concentrated on financing for two years to enable WMO to initiate the training program and to rehabilitate and expand the grid of data measuring stations.

2. The NOAA Analysis

The NOAA analysis is basically supportive of the WMO/FAO assessment but contains some emphases of its own and includes several technical recommendations that go beyond the WMO/FAO study. First, the NOAA team stressed the importance of refurbishing, rehabilitating and recalibrating the instruments of the existing networks before beginning to add significant numbers of additional stations.* Second, NOAA recommended the use of weather radar and satellite sensing stations to complement and supplement data being gathered by traditional network sources, particularly after the European Space Agency geostationary meteorological satellite has been positioned to cover the CILSS area.** NOAA's analysis reasons that "the complementary information obtained from weather radars and satellites would be especially valuable for identifying, tracing and predicting the extent of rainfall associated with the Intertropical Convergence Zone". that is, the coming of the monsoons which inaugurate the rainy season. Thus, NOAA recommends that weather radar and satellite read out capability be included in the technical package for the Niamey Center where they could be used both for training purposes and for improving the accuracy and timeliness of the services to be provided by the Nigerian weather services.*** If the demonstration proves itself, the team recommends similar equipment for the remaining CILSS countries.****

Third, the NOAA study stresses the importance of adapting and interpreting the data in terms meaningful to the agricultural crops and systems, and the livestock practices, which operate in the CILSS countries, and of disseminating the data in modes readily understood and usable by both officials and the producers. For this purpose, it recommends "the establishment of a

*It seems clear from statements made by the WMO Programme Coordination at the Geneva donors meeting in January that this approach is in fact being followed in the implementation of the program. Also WMO is not replacing some of the instruments whose accuracy NOAA questioned.

**This is scheduled for 1977.

***As the report points out, an ASECNA weather radar is already installed at the Niamey airport so that information from this source can be obtained by simply wiring it to a scanning device at the Center.

****Mauritania is not included for weather radar because a station at Nouakchott would not pick up many clouds at any time of the year. Gambia would be covered by the station at Dakar.

prototype user services experimental facility (at the Niamey Center)... as a model system offering practical advice and experience...and processing agrometeorological and hydrology data into user-oriented products..." The team also recommended that a substantial portion (\$1.3 million) of the AID contribution "be directed to the purpose of helping to assure the effective dissemination and utilization by the agricultural agencies of the area and their clientele."

At the January donors meeting in Geneva, this emphasis was articulated by the U.S. Delegation* and was concurred in as being wholly compatible with the approach and philosophy of the WMO and the other donors. The meeting agreed, at the suggestion of the U.S., that technical advisory panels should be established on such subjects as the dissemination of data.

In addition, the U.S. plans to offer at the May 1976 donors meeting the services of a design team to design a prototype user services at Niamey so that practical planning of such facilities can be developed in coordination with the planning of the Center's program and the strengthening of the agrometeorological services for Niger.

3. Agricultural Implications of the Program

The program has long-term implications for increasing agricultural productivity in the CILSS countries, thereby increasing farmer and herder welfare and reducing the requirements the area would otherwise have for food imports. However, it should be recognized that the program is a long-term undertaking which depends on increasing and upgrading the manpower resources of the CILSS countries; of creating improved data processing systems which can disseminate agrometeorological data in terms meaningful to agricultural technicians and to the farmers and herders.

As noted in the social and economic analyses below, the program, once it is functional and has "shaken down", should be capable of the following: (a) providing accurate, timely data to cultivators of rain fed crops as to when, at the advent of the

*See U.S. Delegation opening statement, reproduced on Annex VII.

monsoon, would be the best probable time for field preparation and planting, thus reducing the risk of premature planting and loss of seed; and, (b) providing herdsmen with more accurate data as to pastures which have received adequate moisture and are available for grazing.

Moreover, as noted in a recent FAO report, "Study of the Prospects for Agricultural Development of the Countries of the Sahel, 1975-1990",* a significant portion of the agricultural output of the CILSS countries is derived from flood recession agriculture, of two kinds; one is planting in depressions (corvettes, bas fonds, marigéaux) that fill with water during the rainy season. The areas used are normally shallow depths of water suitable for rice, and leaving sufficient residual moisture for corn, sorghum and millet. Yields could be increased for this kind of "free flood" agriculture if better long-term rainfall forecasts were available for both time and quantity of precipitation.

The other form of flood recession agriculture takes place along the banks of rivers with planting in saturated flood plains and river banks after the over-bank flood has receded. At the present time, because of no accurate forecasting and the farmers' inability to predict upstream secondary crests, rate of fall, etc., no planting is done until the surface has dried. If better forecasts were available, planting could be timed to take advantage of the full available moisture, just after the flood has receded, making it possible to plant two crops rather than one. However, the timing of the planting must be fairly precise, since the time range for two crop planting is only about 10 days.

The proposed program has also important implications for reducing agricultural losses from severe climatic changes. Accurate upstream precipitation measurement and tributary stream gauge measurements can predict the advent of abnormal flooding

*Volume I, Table 5, page 95.

conditions, giving advance warning to populations living downstream. An even more important objective of the program is to develop an "early warning" system for recognizing severe seasonal scarcities of rainfall and thereby provide lead time for governments and agriculturalists to take the actions which will help to mitigate the consequences of future droughts.

Finally, the program is an essential component of efforts to increase agricultural productivity through river basin development. Since the whole subject of river basin development (for agriculture and other uses) is receiving increased attention as an approach to the development of the CILSS countries, its relationship to the program is treated at greater length in the following section.

4. The Role of Hydrology and Meteorology for River Planning in the Sahel

In order to plan rational development for long-term utilization of water resources in the Sahel, a number of studies and pilot projects are necessary because this is an area of water shortage in which the various uses of surface and groundwater are mutually exclusive and competing. Before final decisions can be made on priority assignments for water utilization, particularly for the water in major river and lake systems, a number of basic studies and policy decisions are necessary. Among such studies are quantity and quality of groundwater and its relationship to the major rivers and lakes and a full understanding of the existing riverine regime, including likely maximum and minimum flows. If these and other necessary studies of the river and lake basins proceed and the full potential becomes clearer -- while at the same time efforts are intensified to obtain maximum production from rain fed and flood recession agriculture, livestock and fisheries through improved husbandry and increased modern technology -- it is conceivable that one would find sufficient water is available from surface and ground sources to have some water resources projects in which priority is reserved for other uses than irrigation. If this proves to be true, then large blocks of hydro-power

for agro-industry, mining exploitation and refining, and urban activities can be planned; extensive water storage and releases for maintenance of through navigation can be contemplated; and consumptive use of water by industry can even be considered.

However, until the basic data-gathering studies are completed and a number of years of experience with large-scale modernization of rainfed agriculture, including through a drought cycle, is evaluated, it is clear that planning consideration must assume over-riding priority for surface water for use in irrigated agriculture, livestock and fisheries for food production.

In all of the major basins of the Sahel-Senegal River, Niger River, Lake Chad, The Gambia River and the Volta River, there are fundamental data - gathering studies and surveys that have not yet been made on a satisfactorily reliable basis, and which are essential to any planning of rational use of water in these systems. Without such reliable basic data, almost any isolated or ad hoc project development will lead to uneconomic under-building or over-building of project sites and will virtually assure the misutilization of the scarce and invaluable resource of surface water.

The most fundamental physical facts of any surface water system are how much water is there in the system? where is it? and when? What is the run-off in various soils in various rainfall conditions? what is the evapotranspiration rate? The sciences for obtaining the answers to these questions are hydrology and meteorology.

Fortunately, the countries of the region and the UNDP have already recognized that these basins represent a great potential resource that can only be developed for the maximum benefit to the region if they are recognized as a system in which any developmental activity affecting a part of the system will have some effect on the other parts of the system. Accordingly, in the Senegal, Niger, Lake Chad, Gambia and Volta basins, international basin commissions have been established with membership by all or most countries riparian to the surface water system.

As noted by the U.S. Bureau of Reclamation, the IBRD, A.I.D. and many other reports over the past several years, the most glaring weakness in basic data for any kind of water resources planning in the Sahel river basin systems is the scarcity of hydro-meteorologic records and the unreliability of those records which are available. It is often asserted that there is a vast reservoir of records on file in the various basin commission documentation centers. However, on closer examination one finds that, first of all, what readings there are in hydrology have for the most part been compiled by ORSTROM and the most complete records are located in Paris. The Sahelian countries' hydrologic services are under funded and under staffed. The hydrologic and meteorologic services are in different ministries with little coordination or means of exchanging and cross-checking data.

The river basin commissions have no hydro-meteorologic networks of their own to obtain regular rainfall and river flow readings every day for years over long periods of time. The various stations placed and read by OSTROM and others sometimes have one to three years of continuous daily records during a hydrologic campaign or specific study, perhaps ten or fifteen years ago. Others have continuous records for many years, but readings only once or twice a month with many months missing and completely inconsistent readings that have little or no reliability from gauges that have not been recalibrated for 5 to 25 years, instead of monthly. The commissions have no skilled hydrometeorologic staff and have access to neither their own nor national networks of rainfall and river-gauge stations. Neither have the basin commissions access to the information on a real-time basis, often waiting years for publication of a year book, if ever receiving the data, and there is no present capability for evaluating hydrometeorologic data or compiling statistical hydrologic techniques for synthesizing historic flow records.

A communications system for receiving daily real-time

advice of both rainfall and river stage at key stations -- as is contemplated in the WMO/UNDP/CILSS program -- is essential for both flood warning and notice to farmers for key agricultural decisions. The time for preparing fields for flood recession planting is usually less than ten days, and essential data on time, extent of flood, likely secondary peaks, etc. is still totally unavailable. Such real-time data is not only vital for flood warning and planting preparation, but is absolutely essential for the operation of reservoirs for irrigation, flood control, and navigation.

5. Relationship to the River Niger Commission

The River Niger Commission, composed of nine riparian countries, was formed in 1964 and, like the Agromet Regional Center for Training and Applications, has its headquarters and Secretariat resident in Niamey. The NRC Secretariat is currently weak and under-funded. It has no staff working on the essential fields of water resources engineering, hydrology, irrigation engineering, etc. But both the Executive Secretary and the donors recognize this constraint to the functioning of the Secretariat, and the authority of the Council of Ministers has been sought to hire qualified riparian personnel in hydrology and other disciplines and to seek multilateral and bilateral secondment of experts.

The first priority project to increase the data base and planning capability of the NRC Secretariat is the establishment and operation of a hydromet network and training of the necessary riparian staff. Preliminary discussions in Niamey with the NRC Secretariat, the WMO Programme Coordinator, UNDP and the Government of Niger has produced complete agreement on a cooperative undertaking between NRC, and the WMO/UNDP/CILSS program.

The WMO Programme Coordinator has set aside sufficient space in the plans for the Regional Center to provide offices for the NRC hydrometeorological staff (about five professionals) and will reserve training spaces for trainees selected and funded by NRC. Both organizations agree on NRC use of the Center's computer

and programs when they become functional. NRC will also utilize the same telecommunications system and, where applicable, the same network of rainfall and river gauges, although the NRC will need to install some selected supplementary gauges of its own. In return for this sharing arrangement, the NRC will pay rental-rates to be worked out-for space in the building and for time on the computer.

6. Relationship to CIEH Project

The Bureau for Africa is also assisting, in cooperation with France, another water resources program in Africa, through its support to the Inter-African Committee for Hydraulic Studies (CIEH). The question naturally arises as to the relationship between this program and the hydroagrometeorological program, and the extent of duplication or complementarity.

Certain obvious differences between the two program are that CIEH involves 13 countries (including four observers) and thus covers most of West and part of Central Africa, while the hydro-agrometeorological program concerns only the CILSS countries. A second distinction is that CIEH includes major attention to ground water resources in its terms of reference while the hydroagrometeorological program is concerned only with rainfall and surface water.

CIEH is performing valuable functions in the water resources field, but they are quite different from those to be performed by the WMO/UNDP/CILSS program. CIEH is at this time primarily a gatherer, repository and organizer of documents on water information in its member countries -- surveys, feasibility studies, project proposals and data collected by the various water services. It also disseminates water resources information, periodically circulating lists and abstracts of studies or surveys to member countries and outside Africa. Thus it is providing its members with a "water resource memory" or data bank which can be drawn upon by national authorities in determining their needs for additional information or for preparing water resource projects.

CIEH also performs research, planning and technical assistance functions in the water resource field, and is evidently

seeking to strengthen this aspect of its work. The French experts provided to the organization have carried out a number of studies. A Technical Bureau has been established and is working on a long term plan for the development of the water resources of the entire savannah region, and the identification of projects to implement the plan. Over the shorter run the organization is seeking to develop a technical "outreach" capability which can be drawn upon by member countries for help in preparing water resources development plans or project proposals for donor financing.

As discussed above, the basic thrust of the WMO/UNDP/CILSS program is quite different. It is concerned with strengthening the operational capabilities and national networks of the hydrologic and agrometeorological services in the CILSS countries. It is concerned with providing seasonal water data information on a daily, "real time" basis as a means of assisting both agricultural planners and the agriculturalists themselves. The Regional Center at Niamey, in addition to its training function, will process the flow of data from the national headquarters and put it into meaningful regional terms. It will develop meteorologies for forecasting and for an early warning system.

The only area in which duplication might arise would be as the Niamey Center moves later more deeply into the research field, including for example, climate/crop correlation studies and use of historical data to improve agricultural production decision-making. Clearly, it will be necessary for the two organizations to establish arrangements to exchange information and to collaborate in the design of their research programs so as to avoid any overlap of activities.

7. Environmental Assessment

A. Potential Environmental Impact - Successful completion of the overall 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 program appear to be minimal. There is the possibility that, over the long range, improved knowledge of the water resources base would attract populations (esp. 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 would effect 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 construction of the data collection and dissemination network, the regional training center, and the buildings to house new and expanded national meteorological and hydrological services. These are judged to be of a very minor nature, however. It should be noted that the AID contribution financed under this project is not planned to support the buildings for the national agro-meteorological services. Also, it is worth noting that AID is only one of a series of 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 (if required) during its final design and implementation phases in a manner that mitigates any potential short and long-term undesirable environmental effects.

With respect to the regional data collection and dissemination network, AID's 1976 contribution will provide for establishment of new solar radiation stations on a broadly dispersed grid (i.e., 1 to every 20,000 sq. miles, covering for the most part remote, unsettled areas). The stations are small structures (at the most no larger than a small one bedroom house) which will house sensors for collecting and transmitting data. The structures are already in existence or will be constructed by the host countries. Few if any effluents will be released to the air and water, and the amount of any ionizing radiation emission will be minimal. The stations will be monitored on a daily (or twice daily) basis by non-live-in personnel, or else will be completely automated. They will also be removed from population centers.

The construction of the regional training center in Niamey will be the principal component of the program with recognizable environmental costs. These will consist of waste emissions (principally sewage), utilization of land now being partially used for trade and residential purposes, some increase in local traffic and noise and dust during construction. The training center will, however, be a series of relatively small laboratories, training and data processing rooms, and separated dormitory buildings -- spread over a 125 acre site. This site is adjacent to the University of Niamey and, as such, will be essentially an extension of the University. The dormitories will contain approximately 50 rooms, suitable for no more than ^{50 - 100} inhabitants. This is a relatively small number of individuals, and in turn reflects a low level of human waste emissions and resource usage additive to that now imposed by the present University. While some noise and typical construction pollution (e.g., dust) will occur during the building period, it should not be excessive and annoying (or hazardous) given the fact

that the buildings will be toward the center of a large site which is bounded on one side by the Niger River and on a second side by a major road, across from which is the University grounds. Prior to requesting obligation of AID's FY 1977 contribution (which will include a \$500,000 contribution to the Center) REDSO/WA engineers will perform an on site inspection of the location and plans of the Center and will make a determination as to whether it meets Section 611 and AID environmental assessment standards.

The program includes two pilot farm plots at the regional center for training and demonstration purposes, one for hydrology and one for agrometeorology. Their small size limits the possibility of significant pollution by pesticides or other agricultural chemicals or wastes.

B. Alternatives - The overall program, given its nature and minimal environmental impacts, does not lend itself to many viable alternatives. The selection of data stations is based on the location of existing stations, considerations of the need for good spatial coverage of the geographical region and, in some instances, the need to sample at certain critical locations. Given the lack of significant environmental impacts from these small structures, there is no reason to consider alternate sites based on this type of consideration.

With respect to the regional center, alternative sites (particularly Ouagadougou, Upper Volta) were considered, but not on environmental grounds. The Niamey site resulted from a joint decision by the involved CILSS countries with a major determinant being the gift of the land by the Government of Niger. The location adjacent to the present University appears to be ideal, given the training and education orientation of the regional center and the opportunity to share facilities and equipment with the University.

Summary: The potential environmental "costs" of the program appear to be minimal, and a more detailed assessment is not required. The

principal undesirable impact will be the additional wastes (e.g., sewage and solids) generated at the regional center. Attention will be paid to ensuring that they receive at least the same level of treatment and disposal as those from the University. Given the relatively small size of the regional center, there is little likelihood of a significant undesirable "cumulative" effect (e.g. overtaxing waste disposal capacity by adding on the center's sewage effluents).

8. Planning and Cost Estimates

The planning and cost estimating that has been prepared for the WMO/UNDP/CILSS program, as a result of the Davy and Bernard missions, has been reviewed in detail by NOAA. As indicated earlier, NOAA itself mounted a mission to review the program and visited each of the countries involved as well as the various European and international agencies concerned with the program. Based on these investigations, it is considered that the WMO/UNDP/CILSS program meets legislative (section 611) criteria for the engineering, financial and other planning that is required in advance of authorization. The cost estimates of the program are judged to be reasonable firm at least as of July, 1975. NOAA's assessment of these points is contained in Annex VI.

9. Financial Analysis

The financial analysis contained herein is based on the estimates contained in the basic WMO/UNDP/CILSS document that was presented at the July 1975 donors meeting in Geneva. That document, in turn, is based on the field surveys carried out by the Davy and Bernard missions, although the funding estimates made by the field missions were reduced somewhat by UNDP to fit more reasonable expectations of both African and external donor financial capabilities.

Nevertheless, the program represents a major, comprehensive long-term investment by both African and donor countries alike. Total program cost over the six year period 1975-1980 is

estimated at \$27.7 million of which about half (\$13.9 million) would be borne by the CILSS countries themselves. The CILSS countries' estimated contributions are shown in Tables 1 and 2. The UNDP contribution, shown in Table 3, totals \$4.2 million leaving \$9.6 million to be financed by other donors (table 4). As of January, 1976 three bi-lateral donors had agreed to participate, the U.S. (\$4.3 million), the Netherlands (\$2.9 million) and Belgium (\$0.2 est.), leaving an unfinanced balance of \$2.2 million. In actuality, the unfinanced balance is undoubtedly larger because the U.S. wishes to earmark a considerable portion of its contribution (about \$1.5 million) to items not included in the WMO/UNDP/CILSS budget but, as discussed above, are believed to offer opportunities for considerably enhancing the value of the whole program. Price increases over the past year have also contributed to an increase in total financial requirements. The unfinanced balance may therefore be estimated in the magnitude of \$4-6 million.

a. CILSS Contributions

The contributions estimated from the CILSS countries are based on actual commitments in project agreements concluded between UNDP and the seven countries for the period 1975-76 and on estimates for 1977-80. Table 1 shows the breakout of these figures by function (namely, personnel, building of stations and running costs) over the six year period. Personnel costs increase in all cases in the magnitude of about 100% over the period of the project, reflecting the results of the training program and the expansion of the national services. There are even sharper increases in annual operating costs. However, the total annual cost burden per country does not increase proportionately, and in some cases only moderately, because expenditures for the building of stations to house the measuring instruments tapers off at the end of the period as the expanded networks are completed. The fact that the CILSS countries have concluded project agreements committing themselves to make these investments from their own resources for the first two years of the program is a promising

indication of the priority which they attach to it and of their readiness to continue to make the domestic financial effort necessary to play an effective role in the program.

b. The UNDP Contribution

In order to permit the early activation of the initial essential elements of the program, UNDP agreed in early 1975 to contribute the \$4.2 million shown on table 4. UNDP financing has permitted WMO to launch, for the first two years the agro-meteorological and hydrological training program at temporary facilities in Niamey, the provision of resident advisors to the CILSS countries in each of these fields, and funding for equipment for the initial phase of rehabilitating and expanding the national networks. Thus UNDP's initial contribution covered both the national and regional phases of the program as well as a field manager to coordinate the entire exercise.

However, it is important to keep in mind that the initial UNDP grant is due to expire in late 1977. This applies to the ORSTOM contract for hydrologic services as well as the funding for advisors and equipment for the national meteorological services.

Subject to a favorable evaluation of the program in early 1977, UNDP is planning to provide additional support for the regional training program in its 1977-81 Africa regional program budget (which is currently in preparation). However, the regional budget is not planning to finance a continuation of the national activities after 1977; specifically, the resident advisors and the assistance to the national hydrologic and agrometeorological services in the CILSS countries. Further UNDP support for the national activities will depend on whether they are included in the UNDP's bilateral programs for each country. Thus there is a danger, which has been sharpened by UNDP's recent financial difficulties, that some of the national programs may require assistance from other donors after 1977.*

*This may not be a good candidate for U.S. help, given the lack of French speaking agrometeorologists and hydrologists available in this country.

c. Other Donor Contributions

The major items requiring other donor contributions are shown in Table 4. With respect to the Niamey Regional Center, this includes virtually all the costs of construction and for its telecommunications and data processing equipment (much of the instructional equipment is included in the UNDP grant). In addition, there is a need for experts to design and carry out the Center's data processing and dissemination program, develop the early warning system and to train African staff in these techniques. These costs are estimated to total \$3.5 million. An additional \$6.0 million is estimated for the seven national programs. The estimate evidently includes \$1.5 million for experts on the assumption that UNDP will not finance national experts after 1977. The major remaining items are \$2.3 million for buildings for their national services and \$1.1 million for equipment, including the telecommunications systems.

If one adds the \$1.5 million of the NOAA recommendations that are not included in Table 4, the total required for bilateral financing is \$11 million of which \$6.4 has been pledged to date by the U.S., the Netherlands and Belgium. The question of raising funds from other donors was raised several times at the January donors meeting, and WMO and UNSO have been specifically charged to seek out such support. Canada, West Germany and Switzerland appear to be possible candidates and support from Belgium might be increased. The U.S. will need to continue to urge that attention be given to this issue, including at the donors' meeting scheduled for May 1976.

A second major financial issue which needs to be examined early on in the program is that concerned with meeting the running costs of the Niamey Center after it has been placed in operation and external assistance in phasing down. In addition to its continuing training function, the Center will play a vital operational role in interpreting and disseminating regional

weather and hydrologic data, trigger an early warning system, and undertake weather/crop correlation studies which can have long run significance for increasing agricultural productivity in the region. It should seek to become a center of excellence for research and scientific achievement in the Sahel, with strong professional linkages with the international agricultural research institutes, particularly IITA, ICRISAT and ILCA.

This is clearly a function that will be beyond the capabilities of the CILSS countries to support alone. Attention will need to be given early on to ways of linking the Niamey Center with the Consultative Group on International Agricultural Research or with the proposed Sahel Institute or as a continuing project of the Club des Amis du Sahel so that long term regular financing from outside the region can be assured.

10. Social Analysis

As the NOAA report points out, the beneficiaries of the program may be conceived as falling into two categories, the direct beneficiaries -- the cadre of CILSS technicians and specialists who will be trained under the program -- and the ultimate beneficiaries, namely, the millions of farmers and herders who comprise the "target group" which the program intends to reach.

A major objective of the program is to upgrade and expand the national agrometeorological and operation (surface water) hydrological services in each of the CILSS countries. NOAA's estimate as to the desired numbers of trained technicians and various levels of proficiency for each country are shown

below.*

SUGGESTED MANPOWER REQUIREMENTS FOR
EACH OF THE SIX SAHELIN COUNTRIES

<u>TYPE</u>	<u>AGRICULTURAL METEOROLOGY</u>	<u>OPERATIONAL</u>	<u>HYDROLOGY GROUND WATER**</u>	<u>TOTAL</u>
Professional				
Class I (MS/PHd)	1	1	1	3
Class II (BS)	5	5	5	15
Subprofessional				
Class III (Technician)	30	20	20	70
TOTAL	36	26	26	88

Assuming that Gambia's and Mauritania's requirements are half of the other countries, and assuming there is a need to train 50% more than actual requirements to compensate for dropouts, illnesses, and other forms of "slippage", there is a total training target of about 550 specialists of which 450 are Class III (para professional) and 100 professional. These targets may be reduced somewhat by specialists already trained, but it is probable that most of these persons should be exposed to at least some retraining. Most of the training would take place at the Niamey Center whose capacity will greatly expand when the permanent building is completed. Nevertheless, probably all of the Class I and many of the Class II will be trained abroad. In addition, one must include the large number of sub-professional (Class IV) employees who actually observe, record and transmit the data. Furthermore, a major purpose of the project will be to involve the staffs of the agricultural development agencies in formulating their water

*Ground water hydrology not included in WMO/UNDP/CILSS Program.

**The NOAA report urged the inclusion of groundwater hydrology as an integral part of the program. However, this discipline is not a part of the WMO/UNDP/CILSS program. In informal discussions at Geneva in January, WMO officials resisted such inclusion because of the additional burdens it would impose and also because in the U.N. system, groundwater is a responsibility of UNESCO.

data needs, in interpreting the data in terms of the agricultural and livestock systems of the country, and in suggesting the proper format for data dissemination. Finally, there will be the involvement of agencies concerned with the actual dissemination of the data (national radio services, publishing agencies). Thus, the program will actually affect, through training, joint planning and various implementation activities, two or three thousand CILSS personnel. This group represents the "human infrastructure" which is essential to the program's larger purpose.

The ultimate beneficiaries of the program are, of course, the farmers and herdsmen who make up some 90% of the CILSS countries' population of about 25 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 dykes against possible losses. As indicated earlier more accurate flood recession information would 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 farming practices.

Another characteristic of the program which will directly benefit the farming and herding populations, and the

countries of the area generally, will be the introduction of "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 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.

Role of Women. No special attention has been given to this aspect of the program in the U.N. or NOAA documentation, and it is not clear the extent to which the program will be able to address the question of increasing women's participation in the development process. As one of the donors, however, the U.S. can exert influence for seeing that greater attention is given to this subject. One step that the U.S. plans to take is to encourage the participation of women trainees in the program of the Niamey Center and in the in-country and external training programs. At this time, all of the trainees at Niamey are men.

A second opportunity will be in the design of the prototype user services experimental facility which the U.S. plans to propose as part of its FY 1977 contribution. Women of course, play an important part in West African agricultural activities generally, and in certain societies cultivate their own fields. Therefore, the format and method of data presentation will be adapted to these realities. For this reason, it is proposed that a female social anthropologist, familiar with farming systems in Niger, be a member of the design team that AID plans to provide.

11. Economic Analysis

A program of this nature does not lend itself to usual methods of economic analysis. The costs of the program can readily be identified but the benefits are long term, difficult to quantify

and do not directly produce revenue which can help to finance the costs.

The program aims at building up an essential element of the agricultural infrastructure of the Sahel. It seeks to provide the agricultural and herding population of the CILSS countries with a service they have never had before, namely, reliable, timely and agriculturally useful weather, climate and hydrology data. It assumes that, if the data is reliable, farmers and herders will have a greater capability of managing their resources more efficiently and thus increase their productivity. But this end product is a number of years away, since it depends on the training of a cadre of Sahelian agrometeorologist and operational hydrologists, and construction of a network of measurement stations able to report their data in "real time" and rapid interpretation and dissemination of the data in terms readily understandable to the agricultural population.

Another factor complicating an economic analysis is that agricultural production is not solely a function of water availability. Other factors include agricultural practices, types of seeds, price and marketing conditions, availability (and economic feasibility) of other inputs, such as fertilizer, and damage or loss caused by pests, diseases, and poor storage conditions. Thus, it would be very difficult to attribute gains in agricultural output (or reductions in losses) to the successful functioning of this project alone.

Nevertheless, "other things being equal", the program, when it is fully functional, will make a real contribution to increasing agricultural output and farmer income. If, for example, one could assume that the program would enable farmers and herdsmen to increase their output by only 1%, then taking agricultural production figures for 1970, total agricultural output in the six Sahelian CILSS countries would be increased by an estimated \$12 million annually.*

*Estimates computed from Tables 3, 13, 14 and 15 of "The Recent Economic Evolution of the Sahel", Elliot Berg, Center for Research on Economic Development, University of Michigan, June 1975.

Another hypothetical but plausible example involves the reduction in losses to herdsmen of a future drought resulting from the functioning of an "early warning" system, which would enable the herders to move their animals more rapidly to southerly pasture and water resources. If the estimated 25% loss in herd size which resulted from the 1973-74 drought could be reduced the next time as a function of this program to 20%, this would result in a net saving to the herdsmen of the six Sahelian CILSS countries of some \$20 million.*

Thus the sizeable investment that the program represents (some \$30 million over a six year period) is not disproportionate when one considers that it is aimed at about 90% of the Sahelian population of 25 million and deals with some 50% of the area's total gross domestic output. Identifying means of measuring and evaluating the programs actual contribution to agricultural productivity will be an important aspect of the evaluation plan to be designed (see below).

From the standpoint of cost-effectiveness, the program is extremely well designed. 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.

The initiation by the seven CILSS countries in financing the local costs of their participation for the first two years is a promising indication that the national networks will be placed on a firm footing.

*Berg, ibid, Table 3 and footnote 4, page 31.

Part IV. Implementation Arrangements

A. Analysis of the Recipient's Other Donors and A.I.D.'s
Administrative Arrangements

1. Recipient

a. The Regional Project

The Nigerian Government has taken steps to enable the regional aspect of the program to be initiated on a timely basis. It has made land available for the site of the permanent Center and site clearance and preparation activities are currently in progress. It has provided temporary office facilities for the Programme Coordinator and temporary classroom facilities for the first group of hydrologic students (the agrometeorological students are being trained at the ASECNA school). The Nigerian Government has signed a five year Project Agreement with WMO and UNDP in which it undertakes broad commitments to provide support to the project including such items as providing personnel and the defrayal of customs duties for project equipment.

The rapid start up of project activities in the fall of 1975 is an indication of the strong support which the Nigerian Government is giving and of its capacity to handle its share of the implementation burden.

b. The National Projects

Each of the CILSS countries has signed two year project agreements with WMO and UNDP which include the elaboration of administrative and implementing arrangements. For example, the one for Mali commits the Malian Government to contributions in cash or kind of about

\$700,000.* Of particular interest is that the agreement provides for the organization of a "Senior Council for Meteorology and Hydrology" to assure coordination between the two services. It further provides that "all the agencies of producers or utilizers of hydrometeorological data in Mali will be represented at the Council." The agreement also specifies that "the government will take the necessary measures during the project to officially establish the necessary relationships between the agrometeorological and hydrological service on the one hand and the user Ministries (agriculture, water and forests, livestock) on the other."

The agreement specifies the training requirements for the two services and how they will be met and agrees to furnish the trainees and assign them to the program on their return from training. In an annex to the agreement, the Malian Government agrees to provide various modes of support to the project (including the appointment of a full-time Director) similar to the agreement for the regional project.

No serious implementation problems have been reported with respect to either the regional or national programs to date, other than that Mauritania and Chad failed to get their trainee applications in on time for the first agrometeorological course, and Mali failed to provide a candidate for the hydrology course.

c. Regional Coordinating Arrangements

At the January donors' meeting (which included representation by the CILSS Coordinator), it was proposed that a "CILSS Technical Coordination Committee" be established with "overall responsibilities for the participating governments participation in the execution

* However, \$365,000 of this amount is for construction of buildings for the national services for which bi-lateral donor assistance will be sought. The balance is for personnel salaries, maintenance of scholarship holders, equipment and operating expenses.

of the programme... and (to) act as the Coordinating and Advisory committee for the governments..." The draft terms of reference drawn up at the meeting propose that the Committee be made up of the directors of the meteorological and hydrological services of the CILSS countries and that it meet in Africa at least every six months. The Secretary of the Committee will be the Director of the Niamey Center. Its function will be to assure that CILSS contributions to the program are made available as needed, establish standards for the training of counterpart staff and nominate candidates for training, advise on external inputs required for the implementation of the program, and review the general progress of the program and advise on its future operations.* In other words, the Committee will play a vital role in coordinating the seven national programs, developing intra-African professional linkages, and assuring adequate implementation and financing at the national level.

2. Other Donor

WMO has been designated by UNDP, and accepted by the other donors and the CILSS countries, as the Executing Agency of the program and, as such, has been delegated principal responsibility for program coordination, implementation and soliciting the needed financial resources. Responsibility for the program within WMO is a function of its Department of Technical assistance whose Director reports to the Secretary General of WMO. Within the Department of Technical Assistance, the program is a major responsibility of the Division for Africa which has appointed the equivalent

* See Appendix V of Annex VIII (WMO's Summary Report on the January Donors Meeting) for the full text of the proposed terms of reference for the Committee.

of a "Desk Officer" to backstop day to day operations. Technical backstopping for the program is also provided by the two major technical departments of WMO (which played major roles in the studies leading to the development of the program), namely, the Department of Meteorological Applications and Environment, and the Department of Hydrology and Water Resources. A major WMO responsibility at the "Geneva level" will be the coordination of other bilateral in-puts into the program, providing donors with program and financial reports, proposing plans for the future, etc. The formalization of these functions into an agreed procedure was one of the principal results of the January donors' meeting. At that session, the terms of reference of a "Coordinating and Advisory Committee" were agreed upon.* This committee is composed of representatives of the donors (including UNDP, WMO, UNSO) as well as CILSS and the Chairman of the above-noted CILSS Technical Coordinating Committee. Chairmanship (or the donor committee) will rotate among the members and WMO will furnish its Secretary. Its major functions will include advising on the handling of donor funds and contributions, reviewing CILSS Technical Coordinating Committee reports, and their financial implications, reviewing WMO program reports and proposed plans and budgets, reviewing fund raising plans, and advising on the establishment of technical advisory committees. The Committee will meet at least once a year at Geneva or Niamey; it was informally agreed that during the early years of the program, meetings more frequent than annual would be desirable. The atmosphere of good will and hard work that prevailed at the January meeting in Geneva gives promise that the

* See Report of January Donors' Meeting, Annex VIII, Appendix IV.

the Committee will be an effective instrument for addressing questions of basic policy, program direction and financial requirements.

Program coordination at the field level is carried out by the WMO Programme Coordinator and his staff at Programme Headquarters in Niamey. At the moment; the Programme Coordinator has the dual role of managing the training program at Niamey as well as other questions related to the construction of the Regional Center, and secondly, of monitoring and coordinating the implementation of the seven national projects. Once CILSS appoints a Director for the Center, the Programme Coordinator will be able to delegate much of the former responsibility to the Director. The Programme Coordinator is also WMO's principal liaison with the CILSS Technical Coordinating Committee and, in fact, helped to organize the first meeting of that Committee in Niamey, February 25-28. The Programme Coordinator will thus also perform the important role of channelling African perceptions and priorities to WMO headquarters and to the donors.

The Netherlands and Belgium. The Netherlands has made a commitment of approximately \$2.9 million (7.2 million guilders) to the program which it provides in cash to WMO in tranches upon request with few if any restrictions as to what program elements it should finance. The Belgian contribution appears to be primarily an "in kind" contribution in the nature of various studies worked out with WMO experts and are expected to contribute significantly to the Center's subsequent research and data processing capability.

3. A.I.D.

The program imposes limited administrative/implementation

burden on A.I.D. because (a) WMO is executing the program on behalf of all of the donors, and (b) A.I.D. has executed a PASA with NOAA for advising it on the program and implementing its contribution to it.

The Africa Bureau has formed a Project Committee (with NOAA representation) which meets from time to time to review important items concerned with the program, such as positions to be recommended at a forthcoming donors' meeting or WMO funding requests. Day to day backstopping is coordinated between a desk officer in AFR/SFWA and a design officer in AFR/DR.

NOAA will play a major role in the actual implementation of A.I.D.'s contribution to the program because much of it will be of an in-kind nature (equipment, technical services, supplies, fellowships). NOAA will advise A.I.D. on the technical merits of the items requested and will procure them for the program upon A.I.D. approval. NOAA will also provide (from its own staff or through sub-contracts with consultants) technical services requested by WMO. NOAA appears to be the ideal choice for assisting A.I.D. in these respects, not only because of its technical competence but by virtue of its close professional working relationships with WMO. A.I.D.'s cash contributions to the program will be provided to WMO in accordance with the provisions of a WMO/A.I.D. grant agreement and its financial annex.

A.I.D. has also established a field liaison relationship with the WMO/Programme Coordinator through its Regional Development Office in Niamey. Since WMO/Geneva has delegated to WMO/Niamey operational responsibility for program implementation, this channel of communications has been

helpful in providing A.I.D./W with specific information relative to the U.S. contributions for FY 1976 and 1977.

An A.I.D. or NOAA engineer will be required to make an on-site review of the plans and specifications of the Regional Center for Section 611 and environmental analysis purposes. It would be desirable if this could be performed by REDSO/WA staff. Periodic on-site visits by REDSO/WA engineers should also be performed during the period of construction in accordance with a schedule worked out with the Programme Coordinator.

B. Implementation Plan

The planning and monitoring of implementation actions will be pursued at two levels, first with respect to the U.S. contributions to the program, and second, with respect to the execution of the program as a whole.

In regard to the U.S. contribution to the program, A.I.D. will look to NOAA as its technical advisor and agency for keeping the Agency currently informed on the progress and problems of its contribution to the program. A PPT sub-network has been prepared to monitor the implementation of these contributions.* Under its PASA with NOAA, NOAA submits bi-monthly reports which will cover progress (or problems) with respect to achieving (or missing) critical performance indicators (CPIs). These regular reports can be supplemented by special reports, as for example, should a particularly important CPI be missed. NOAA would normally call the subject to the attention of WMO/Geneva (with which it has close professional contacts and good communications) which would in turn obtain

* See Annex IX, Attachment I.

the information from the field, normally going through the Programme Coordinator in Niamey.

If an extraordinary situation arose, A.I.D. also has the option of calling on RDO/Niamey (which maintains liaison with the Programme Coordinator) or on the RDO/CDO of the other CILSS countries. However, it will be necessary for A.I.D. to act with discretion in such matters, as WMO has the official and actual responsibility for the execution of the program, and A.I.D. should not undercut that responsibility by acting unilaterally. Thus requests for information regarding field implementation questions should normally be addressed to the Programme Coordinator and be channelled by NOAA through Geneva.

In regard to the implementation of the program as a whole, A.I.D. will be able to exercise its monitoring responsibilities through its participating in the meetings and activities of the Coordinating and Advisory Committee. NOAA will assist A.I.D. in this function as a NOAA official will normally be included in the U.S. Delegation to the Committee's meetings. A PPT Network has been prepared on the execution of the program as a whole, based on information currently available. This will be revised and amplified after the next donors' meeting in May. As discussed above, the Coordinating and Advisory Committee has broad functions for keeping track of the execution of the program including the review of donor contributions, CILSS counterpart contributions, WMO program execution reports, WMO plans of action and budget reports, and reviewing the work of technical advisory committees that may be established. This Committee will meet at least once a year, and probably more often during the early years

of the program. In addition, should a problem of particular concern to A.I.D. arise, A.I.D. can ask WMO to call a meeting of the Committee to deal with it, and the U.S. itself can cause a meeting of the Committee to be called if its request is supported by at least two other donors.

C. Evaluation Arrangements for the Project

The subject of program evaluation is a complex one and merits more study and thought than time has allowed since the U.S. began to formally participate in the program. The program can be evaluated at a number of levels, of ascending order of importance and complexity.

In regard to inputs (U.S. and other donor) the timeliness and efficiency of providing the material infrastructure and the technical services can be adequately monitored and evaluated through the implementation planning arrangements discussed in the preceding section.

There are several levels of outputs that the program will seek to produce. In regard to the rehabilitation of the meteorological and hydrological networks, and the strengthening of their institutional and staffing capabilities, excellent pre-project base line information exists as a result of the Davy and Bernard surveys. An important component in evaluating the basic hydrological and meteorological infrastructure of the CILSS countries will be the outputs of trained manpower generated by the training program at Niamey as well as those trained abroad and in-country. Another output that should be measured is the increase in quantity and quality of the hydrologic and agrometeorologic data that the program investments in improved networks and communications facilities makes possible, and also that it is being made available in "real time."

Moving to a higher degree of sophistication, one might try to evaluate the increase in the reliability and sophistication of the information obtained from the networks and the growth in capability at the national and regional levels to process the data. Similarly, one might evaluate progress toward processing and interpreting data in terms meaningful to the farming and herding systems of the area, and success or lack of success in disseminating the data. Another fascinating but illusive "output" indicator would be changes in farmer and herder attitudes toward and confidence in the data over time and whether it had a significant impact on their decision making. The ultimate question for evaluation might be whether the project is having an impact on increasing agricultural and livestock production and, if so, in what ways and by how much?

It should be pointed out that some plans for evaluating the program have already been provided for in the U.N. documentation on the project. The two year project agreements concluded by WMO and UNDP with the CILSS countries state that "a review of the project will take place six months prior to its end with the aim of evaluating the results as well as the government's additional strengthening of the networks, and the processing of data for national planning as well as establishing linkages with the Regional Center whose aim will be data processing at the regional level and medium term forecasting."

In addition, the five year project agreement establishing the Regional Center provides that "twelve months before the project is due to end, a mission consisting of representatives of CILSS, WMO and UNDP will review the operation of the Centre and, if necessary, make proposals for

additional support." The same document also includes a provision for undertaking a "review of the activities continuing from or consequent upon the project with a view to evaluating its results" at an agreed time after the completion of UNDP assistance.

The next meeting of the donors in May will give the U.S. an opportunity to learn more about the specifics of WMO/UNDP's evaluation plans, the topics they plan to cover, and whether other donors will be invited to participate. Depending on the information obtained, the U.S. may wish to suggest that a technical panel be established on the subject, perhaps with some funding to engage consultants to propose additional evaluation activities. Also, the design team that the U.S. will propose for the prototype user services project at Niamey might include in its terms of reference criteria and techniques for evaluating the impact of the prototype. This evaluation methodology might then be applied elsewhere when the prototype is replicated.

TABLE 1

National Inputs

(for 1975 and 1976 based on project documents for the 7 national projects and
for 1977-1980 on extrapolations in line with proposals of 1974 WMO/FAO mission)

	1975	1976	1977	1978	1979	1980	Total
<u>CHAD</u> (in thousands of CFA)							
- Personnel	37,000	53,000	55,000	57,000	60,000	62,000	324,000
- Building of stations	31,000	72,000	70,000	50,000	20,000	10,000	253,000
- Running costs	5,000	7,000	8,000	9,000	10,000	10,000	49,000
Total	73,000	132,000	133,000	116,000	90,000	82,000	626,000
<u>GAMBIA</u> (in Dalasis)							
- Personnel	89,000	120,000	130,000	140,000	150,000	160,000	789,000
- Building of stations	40,000	40,000	30,000	20,000	10,000	5,000	145,000
- Running costs	16,000	20,000	22,000	24,000	26,000	28,000	136,000
Total	145,000	180,000	182,000	184,000	186,000	193,000	1,070,000
<u>MALI</u> (in thousands of MF)							
- Personnel	41,000	58,000	62,000	65,000	68,000	70,000	364,000
- Building of stations	50,000	50,000	40,000	35,000	30,000	10,000	215,000
- Running costs	4,000	8,000	10,000	12,000	14,000	16,000	64,000
Total	95,000	116,000	112,000	112,000	112,000	96,000	643,000

TABLE 1

	1975	1976	1977	1978	1979	1980	Total
<u>MAURITANIA</u> (in thousands of Ouguiyas)							
- Personnel	8,000	11,000	13,000	15,000	17,000	18,000	82,000
- Building of stations	2,000	2,200	2,000	2,000	1,000	500	9,700
- Running costs	3,000	4,500	6,000	6,500	7,000	7,500	34,500
Total	13,000	17,700	21,000	23,500	25,000	26,000	126,200
<u>NIGER</u> (in thousands of CFA)							
- Personnel	26,000	37,000	40,000	45,000	50,000	55,000	253,000
- Building of stations	40,000	40,000	30,000	20,000	20,000	10,000	160,000
- Running costs	5,300	10,500	13,000	15,000	17,000	18,000	78,800
Total	71,300	87,500	83,000	80,000	87,000	83,000	491,800
<u>SENEGAL</u> (in thousands of CFA)							
- Personnel	14,000	25,000	28,000	30,000	33,000	36,000	166,000
- Building of stations	5,000	5,000	5,000	5,000	3,000	1,000	24,000
- Running costs	5,000	9,000	12,000	15,000	17,000	20,000	78,000
Total	24,000	39,000	45,000	50,000	53,000	57,000	268,000
<u>UPPER VOLTA</u> (in thousands of CFA)							
- Personnel	28,500	40,000	43,000	45,000	47,000	50,000	253,500
- Building of stations	30,000	40,000	30,000	20,000	10,000	10,000	140,000
- Running costs	5,400	10,000	12,000	14,000	16,000	18,000	75,400
Total	63,900	90,000	85,000	79,000	73,000	78,000	468,900

TABLE 2

<u>Totals in thousands of US dollars</u>	1975	1976	1977	1978	1979	1980	Total
CHAD	344	622	627	548	425	386	2,952
GAMBIA	87	108	110	111	112	116	644
MALI	224	273	264	264	264	227	1,516
MAURITANIA	306	417	495	555	590	613	2,976
NIGER	336	412	392	377	410	393	2,320
SENEGAL	113	184	212	236	250	269	1,264
UPPER VOLTA	301	425	401	373	344	368	2,212
Total	1,711	2,441	2,501	2,464	2,395	2,372	13,884

Combined National Inputs

<u>In thousands of US dollars</u>	1975	1976	1977	1978	1979	1980	Total
Co-Director (appointed by CILSS)	4,5	6	6	6	6	3	31,5
Running cost of centre building	1,0	2	12	12	12	4	43,0
Total	5,5	8	18	18	18	7	74,5

TABLE 3

UNDP Inputs
(in US dollars)

	1975	1976	1977	1978	1979	1980	Total
<u>TRAINING CENTRE</u>							
- Expert services	146,500	298,000	232,000	175,000	130,000	61,500	1,043,000
- Subcontract for hydro- logical activities	160,000	160,000	80,000	-	-	-	400,000
- Fellowships for national instructors	-	-	3,600	14,400	10,800	-	28,800
- Equipment	59,000	43,000	34,000	24,000	14,000	9,000	183,000
- Running costs	4,000	13,000	13,000	13,000	13,000	15,200	71,200
Total	369,500	514,000	362,600	226,400	167,800	85,700	1,726,000
<u>NATIONAL PROJECTS</u>							
- Expert services	225,000	261,000	63,000	-	-	-	549,000
- Fellowships	75,600	211,500	227,700	169,200	72,900	8,100	765,000
- Equipment	336,500	499,500	193,500	-	-	-	1,029,500
- Running costs	21,800	40,750	45,450	-	-	-	108,000
Total	658,900	1,012,750	529,650	169,200	72,900	8,100	2,451,500
<u>GRAND TOTAL</u>	1,028,400	1,526,750	892,250	395,600	240,700	93,800	4,177,500

TABLE 4

Multi-national Inputs for which Bilateral Donations are Solicited
(in thousands of US dollars)

	1975	1976	1977	1978	1979	1980	Total
<u>TRAINING CENTRE</u>							
- Expert services (1)	-	-	159	300	282	141	882
- Telecommunication equipment	-	-	150	150	-	-	300
- Data processing equipment	-	-	100	100	-	-	200
- Didactic equipment	-	-	20	30	30	20	100
- *Building and dormitories	500	1000	500	-	-	-	2000
- Running costs	-	-	10	10	10	10	40
Total	500	1000	939	590	322	171	3522
<u>NATIONAL PROJECTS</u>							
- Expert services (1)	-	-	252	504	504	252	1512
- Fellowships	-	-	175	175	175	175	700
- Equipment	-	-	175	350	350	175	1050
- Running costs	-	-	35	35	35	35	140
- *Buildings for national headquarters	1000	1628	-	-	-	-	2628
Total	1000	1628	637	1064	1064	637	6030
<u>GRAND TOTAL</u>	1500	2628	1576	1654	1386	808	9552

* First priority items
(1) Explanation given on next page

TABLE 5

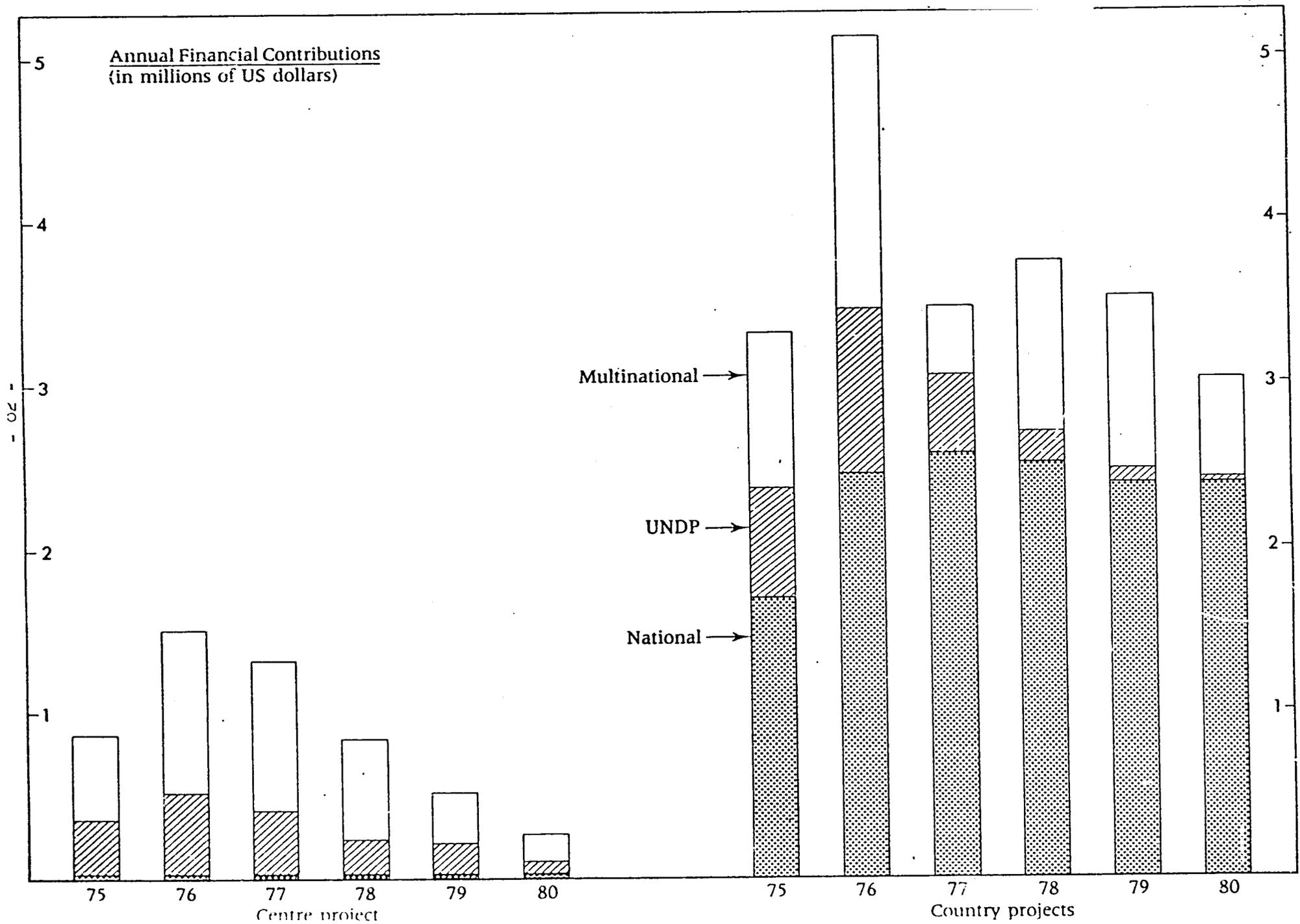


TABLE 6

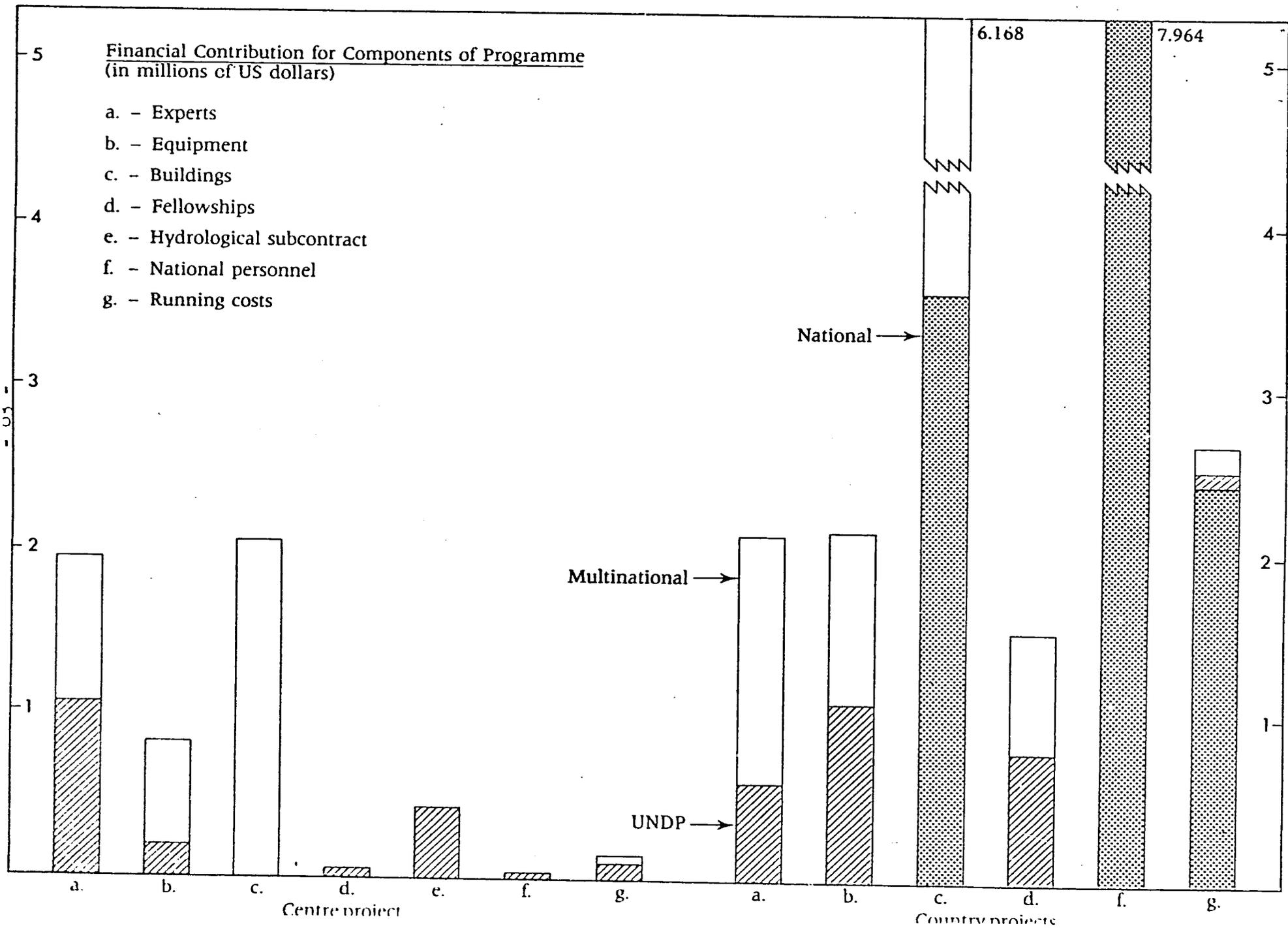


TABLE 7

Summary Cost Estimate and Financial Plan - U.S. Contribution
(Obligation in \$000)

	<u>1976</u>	<u>1977</u>	<u>Fiscal Year</u>		<u>1980</u>	<u>Total</u>
			<u>1978</u>	<u>1979</u>		
I. <u>Regional Center</u>						
Contribution to Construction	-	500 ^{a/}	-	-	-	500
Data processing and other equipment	-	238	125	100	-	463
Weather radar and A.P.T.	-	-	190	-	-	190
Training equipment	58 ^{a/}	-	40	40	40	178
Publications	2	2	2	2	2	10
Technical Assistance ^{b/}	30	200	150	200	100	680
Fellowships	-	-	33	28	28	89
Sub-Total	<u>90</u>	<u>940</u>	<u>540</u>	<u>370</u>	<u>170</u>	<u>2,110</u>
II. <u>National Projects</u>						
Meteorological and hydrological stations	150	-	50	50	50	300
Telecom equipment	-	500	100	-	-	600
Data processing equipment	-	140	100	-	-	240
Engineering services	-	100	100	-	-	200
Data dissemination and utilization activities ^{c/}	-	-	-	140	250	390
Sub-Total	<u>150</u>	<u>740</u>	<u>350</u>	<u>190</u>	<u>300</u>	<u>1,730</u>
III. NOAA and WMO Administrative costs	20	150	100	80	70	420
Total	260	1,830	990	640	540	4,260

^{a/} Cash contribution.

^{b/} Includes prototype data utilization program.

^{c/} Includes technical assistance based on experience learned from Niamey prototype.

AFR 551.511211

Final Report

Sahel Water Data Network and Water Resources Management Project

PASA NO. AFR CC/SHL-907-16-75 between
THE AGENCY FOR INTERNATIONAL
DEVELOPMENT and
THE DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
December 1975

FINAL REPORT

SAHEL WATER DATA NETWORK AND
WATER RESOURCES MANAGEMENT PROJECT

PASA NO. AFR CC/SHL-907-16-75

BETWEEN

THE AGENCY FOR INTERNATIONAL DEVELOPMENT

AND

THE DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

DECEMBER 1975

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	1
A. Description of the Problem	1
B. Approach	1
C. The NOAA Team	2
II. Needs of the CILSS Countries	3
III. The WMO/UNDP/CILSS Program	4
IV. Findings of the NOAA Team.	9
A. Regional Center.	9
B. Manpower Expansions.	10
C. Improved Networks and Systems.	12
D. National Institutional Capabilities.	14
V. Recommendations of the NOAA Team.	15
A. The WMO/UNDP/CILSS Program.	15
B. Other Significant Additions	19

I. INTRODUCTION

A. Description of the Problem

The recent extended drought in the Sahel (the east-west zone at the southern edge of the Sahara desert in West Africa) has attracted considerable worldwide attention. Although periods of protracted drought have been experienced before in the Sahel, their impact has perhaps never before been so serious in terms of human and economic disaster. Most of the Sahelian countries of West Africa are poor in terms of natural resources and the incomes of most of the people are based largely upon "subsistence" agriculture and animal husbandry, both very sensitive to drought.

The magnitude of the disaster has caused many organizations and governments to look for ways to mitigate the effect of such droughts in the future. Inasmuch as a weather phenomenon is a major cause of the Sahelian problem, the U.S. Agency for International Development (AID) sought the assistance of the National Oceanic and Atmospheric Administration (NOAA) in analyzing the extent to which improved meteorological and hydrological services in the Sahelian countries would contribute to the following major objectives:

- Acquisition of a better information base that includes the extent, variation, and quality of water resources on both the national and regional levels.
- Delivery of this information to the decision-maker (from government officials to small farmers) in a usable and timely manner.

B. Approach

Through an interagency agreement between AID and NOAA, an interdisciplinary team of experts was brought together in March 1975. This NOAA Team conducted a fact finding study that included field visits in April and May. These visits included contacting many of the agencies in Geneva, Rome, and Paris involved in various aspects associated with relieving the impact of the Sahelian drought as well as on-the-site surveys in Chad, Niger, Upper Volta, Mali, Senegal, and Mauritania. An analysis and evaluation of on-going efforts with special concentration upon the World Meteorological Organization/United Nations Development Program/Comite Permanent Inter-Etat pour la Lutte Contre la Secheresse au Sahel (WMO/UNDP/CILSS) Program for

Strengthening the Agrometeorological and Hydrological Services in the Sudano-Sahelian Zone has been completed.

In fact, the NOAA Team study was carried out in specific relationship to the proposed WMO/UNDP/CILSS Program which became known after plans for the U.S. effort had been formulated. Ultimately, the principal result of the team's analysis was to help determine an appropriate level of U.S. support for the WMO/UNDP/CILSS Program.

C. The NOAA Team

The composition of the team, their particular areas of expertise, and affiliations are as follows:

Dr. Jay M. Bagley - Hydrology
Utah Water Research Laboratory
Utah State University
Logan, Utah 84322

Dr. Dillard Gates - Range Resources and Animal Sciences
Department of State/AID
Washington, D.C. 20523

Dr. Gilbert L. Jordan - Dry Land Vegetation and Range Resources
School of Renewable Natural Resources
University of Arizona
Tucson, Arizona 85721

Mr. Gerald A. Petersen (Team Leader) - Meteorology and Hydrology
NOAA, 6010 Executive Blvd.
Rockville, Maryland 20852

Mr. Vaughn D. Rockney - Meteorology, Equipment and Networks
P.O. Box 245
Aneta, North Dakota 58212

Dr. Norman Rosenberg - Agrometeorology and Climatology
Institute of Agriculture and Natural Resources
University of Nebraska
Lincoln, Nebraska 68503

Miss Tina Loughran - Interpreter
NOAA, 6010 Executive Blvd.
Rockville, Maryland 20852

II. NEEDS OF THE CILSS COUNTRIES

The ultimate objective to be attained from strengthening the agricultural meteorology and hydrology capabilities of the Sahel countries is, of course, to increase agriculture (food, fiber, and animal) production through better land and water management practices and techniques. The weather and water aspects are of fundamental importance in a complex system that includes several components. For meteorology and hydrology, these components involve people trained to aid in making production recommendations and decisions, availability of data in a useful format, better understanding of the relationships between production and land and water use, and a mechanism for disseminating useful information to the planners and users (comprised mainly of sedentary farmers and sedentary or migratory herdsmen).

As a result of literature reviews, visits with a variety of organizations in Geneva, Rome, and Paris, and the on-site surveys conducted at N'Djamena, Niamey, Bamako, Ouagadougou, Nouakchott, and Dakar, the team believes the means for achieving the objectives identified in Section 1 are concerned with the need for:

- A facility for conducting training, studies, and regional coordination.
- Expansions in trained manpower.
- Improved networks and systems for information collection, analysis, and dissemination.
- Stronger national institutional capabilities.

The team strongly supports the WMO/UNDP/CILSS Program discussed in the next section since it provides a broad, logical, and viable framework for addressing the priority needs of the Sahelian countries. The remainder of this report examines each of the four elements described above in terms of specific needs and in relation to the WMO/UNDP/CILSS Program. It also must be recognized that all of the needs are interrelated. Thus, to achieve improvements, all must be included if a reasonably efficient and effective system is to be created.

III. THE WMO/UNDP/CILSS PROGRAM

A major item considered by the team throughout its survey was the proposed WMO/UNDP/CILSS Program which became known to the team a few weeks before it left Washington. This program is based on rather extensive surveys made under WMO auspices and is comprised of eight major parts. These parts include the establishment of new National Meteorological and Hydrological Services in Mauritania, Senegal, Mali, Upper Volta, Niger, Chad and the Gambia along with the creation of a new regional training center in Niamey, Niger, for the six French speaking CILSS members (Gambians would train in the English-speaking facility at Nairobi). The center would concentrate on training in agricultural meteorology and hydrology, initially at WMO's Class III level (subprofessional observers and technicians) but would eventually train professionals to the Class II (BS) and Class I (MS/PhD) levels. At first, the intent is to train Class I professionals in France (meteorology) and Switzerland (hydrology). The program has five major aspects that need funding:

- Training for both the training center staff and the national services, as discussed above, and fellowships.
- Rehabilitation of weather equipment at most existing radio-reporting stations along with establishment of a few more weather stations and river and streamflow stations along the major rivers.
- Construction and equipping of a building for the new center at Niamey.
- Funds for operating the program.
- Construction of buildings in the CILSS capitals to house the new national services.

The program--as presented in the Programme for the Strengthening of the Agrometeorological and Hydrological Services in the Sudano-Sahelian Zone document presented by CILSS at the July 1, 1975, donor's meeting in Geneva--contemplates a major investment by both the CILSS countries and external donors of nearly \$28,000,000 over the six-year period, 1975-80. The major contributors to the program, as shown in Tables 1 and 2, would be the CILSS countries themselves. These costs, amounting to nearly \$14,000,000, are estimated as necessary to finance

TABLE 1
 NATIONAL INPUTS FOR PERSONNEL, BUILDING OF STATIONS AND RUNNING COSTS
 (in thousands of U.S. dollars)

	1975	1976	1977	1978	1979	1980	TOTAL
Chad	344	622	627	548	425	386	2,952
Gambia	87	108	110	111	112	116	644
Mali	224	273	264	264	264	227	1,516
Mauritania	306	417	495	555	590	613	2,976
Niger	336	412	392	377	410	393	2,320
Senegal	113	184	212	236	250	269	1,264
Upper Volta	301	425	401	373	344	368	2,212
TOTAL	1,711	2,441	2,501	2,464	2,395	2,372	13,884

5

TABLE 2
 COMBINED NATIONAL INPUTS
 (in thousands of U.S. dollars)

	1975	1976	1977	1978	1979	1980	TOTAL
Co-Director (appointed by CILSS)	4.5	6	6	6	6	3	31.5
Running cost of center building	1.0	2	12	12	12	4	43.0
TOTAL	5.5	8	18	18	18	7	74.5

the infrastructure for the national networks of stations, for staff salaries for local personnel, and for operating costs of the national services. Also included are smaller amounts which the CILSS countries would contribute (Table 2) for the CILSS-appointed Co-Director, and for some of the operating costs of the regional center.

The program will be partially funded by the UNDP at the levels shown in Table 3. As can be seen, the UNDP pledge of \$4,177,500 over the next six years is sufficient to start the program but continuing multi-national support will be needed at least through 1980 and possibly longer to keep the program going. Table 4 shows the funding requirements to be met by the other donors.

At the July 1 donor's meeting, the Netherlands, Belgium, Switzerland and the United States indicated their intention to provide support to the program. In particular, the Netherlands offered \$3,000,000 for the WMO/UNDP/CILSS Program if other donors would provide enough funds to bring the total supported to two-thirds of the required \$9,552,000. In a letter to the WMO dated September 5, 1975, AID's Director, Office of Central and West African Regional Affairs, stated "we have also informed the Congress we are currently estimating the U.S. share of this project to total \$4,260,000 over a seven year period (through September 1982)." Annual contributions within this total would be "dependent on AID programming decisions, approval of project design and the availability of funds from the U.S. Congress."

Other related activities also will help in the overall effort to build this new infrastructure in the Sahel. Among these are the Senegal and Niger River Commissions which involve the nations concerned in such things as dam construction, new irrigation projects, and management of the available water flowing through these two large rivers. In addition, the Comite Inter-African d'Etudes Hydrauliques (CIEH) located in Ouagadougou, and partially supported by FAC and AID, serves as an important center for the collection of Sahel water related information and the conducting of hydrologic research studies. All of these serve to complement the WMO/UNDP/CILSS Program which is directed mainly toward establishing operational national services concerned with agricultural meteorology and hydrology. Considering the state of development in the Sahel, the team believes the on-going efforts are not duplicative. Rather, they together offer opportunities for satisfying the needs more effectively.

TABLE 3
UNDP INPUTS
(in U.S. dollars)

	1975	1976	1977	1978	1979	1980	TOTAL
<u>TRAINING CENTRE</u>							
-Expert services	146,500	298,000	232,000	175,000	130,000	61,500	1,043,000
-Subcontract for hydrological activities	160,000	160,000	80,000	-	-	-	400,000
-Fellowships for national instructors	-	-	3,600	14,400	10,800	-	28,800
-Equipment	59,000	43,000	34,000	24,000	14,000	9,000	183,000
-Running costs	4,000	13,000	13,000	13,000	13,000	15,200	71,200
TOTAL	369,500	514,000	362,600	226,400	167,800	85,700	1,726,000
<u>NATIONAL PROJECTS</u>							
-Expert services	225,000	261,000	63,000	-	-	-	549,000
-Fellowships	75,600	211,500	227,700	169,200	72,900	8,100	765,000
-Equipment	336,500	499,500	193,500	-	-	-	1,029,500
-Running costs	21,800	40,750	45,450	-	-	-	108,000
TOTAL	658,900	1,012,750	529,650	169,200	72,900	8,100	2,451,500
<u>GRAND TOTAL</u>	1,028,400	1,526,750	892,250	395,600	240,700	93,800	4,177,500

7

TABLE 4
MULTI-NATIONAL INPUTS FOR WHICH BILATERAL DONATIONS ARE SOLICITED
(in thousands of U.S. dollars)

	1975	1976	1977	1978	1979	1980	TOTAL
<u>TRAINING CENTRE</u>							
-Expert services	-	-	159	300	282	141	882
-Telecommunication equipment	-	-	150	150	-	-	300
-Data processing equipment	-	-	100	100	-	-	200
-Didactic equipment	-	-	20	30	30	20	100
-*Building and dormitories	500	1000	500	-	-	-	2000
-Running costs	-	-	10	10	10	10	40
TOTAL	500	1000	939	590	322	171	3522
<u>NATIONAL PROJECTS</u>							
-Expert services	-	-	252	504	504	252	1512
-Fellowships	-	-	175	175	175	175	700
-Equipment	-	-	175	350	350	175	1050
-Running costs	-	-	35	35	35	35	140
-*Buildings for national headquarters	1000	1628	-	-	-	-	2628
TOTAL	1000	1628	637	1064	1064	637	6030
<u>GRAND TOTAL</u>	1500	2628	1576	1654	1386	808	9552

*Designated as first priority items

IV. FINDINGS OF THE NOAA TEAM

The findings of the team are summarized below in terms of the previously identified needs. In our view, they represent what has to be done to achieve some measure of success within the next five to ten years.

A. Regional Center

The need for a facility to provide training, to conduct supporting studies, and to perform regional coordination is acute. The Regional Center now being planned for construction in Niamey under the WMO/UNDP/CILSS Program has been agreed to by the CILSS nations. We fully endorse this concept. We further suggest that the training and experience to be gained at this center should go beyond the traditional approach. Exposure to newer technologies that would contribute to a quantum jump in Sahel water management capabilities should be given. These should include exposure to satellite readout capabilities, weather radars, and automatic stations as well as the techniques for conducting studies involving crop-weather relationships (e.g., statistical analyses).

Plans call for regional coordination to be performed at this center. The team feels this can be a significant aspect in better overall management of water resources for the entire Sahel. This is particularly important for those facets requiring computer processing and for analyzing and evaluating the extent and variation of the available water over the six countries. It is quite possible that no single country could conduct such programs as effectively as can be done on a cooperative basis at a single center. As an example, the backbone of both agricultural meteorological and hydrological services must include current and historical or climatological data. Climatological data summarized in a practical and useful format makes it easy to apply by a variety of decision makers, planners, and designers as well as any other users. Development of agriculture and hydrologic projects of almost any kind will require such information and these projects will be one of the keys to self-sufficiency in food production.

A question requiring eventual resolution with regard to the Regional Center (and for the national services as well) is that of funding and manpower support as the donor contributions phase out. This problem will have to be faced by the CILSS members as only through their cooperative efforts can the center be maintained over a long period of time. The Team believes a funding formula needs to be developed by the donors and African countries that will help to assure the continued funding of the national services and the regional program, including the Niamey Center, after donor participation has been completed. This problem needs to be faced early in the life of the project and an appropriate solution found.

B. Manpower Expansions

For agricultural meteorology and hydrology, the most critical limitation facing the Sahelian countries, other than monetary, is the lack of qualified professional and sub-professional personnel organized to carry out effective national and regional programs. Generally, a basic core consisting of a few people--some very well educated--does exist within each of the countries in both the meteorological and hydrological areas. This means that a footing upon which to build a foundation and eventually a completed organizational structure is available.

At present, almost the entire available meteorological community is associated with the Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar (ASECNA). As a result, the aviation weather needs are being reasonably well met in the Francophone countries. The Directors of Meteorological Services hold dual leadership roles both at the level of the National Service and with ASECNA (except in Senegal). Organizationally then, the new meteorological services are still in the planning stage (and their development will be supported in the WMO/UNDP/CILSS Program) with the exception of Senegal where work has begun on establishing a separate National Meteorological Service.

Hydrology suffers from the same manpower limitations as does meteorology and no operational counterpart to ASECNA exists. In general, hydrology is functionally divided among a variety of ministries on the basis of surface water (operational hydrology) and ground water (subsurface) to more or less align with the responsibilities exercised by France's Office de la Recherche Scientifique et Technique Outre Mer (ORSTOM) and Bureau de Recherches Geologiques et Minieres (BRGM), respectively.

Initial efforts have been expended, with the help of ORSTOM primarily, in developing hydrologic capability for better understanding and use of the Senegal River and the Niger River in the region of its inner delta. Much remains to be done before what may be termed an operational hydrology program really comes into being in the Sahel.

With regard to subsurface water, BRGM has prepared a set of detailed charts which delineate existing and potential ground water sources for much of the Sahel. However, definitive knowledge about ground water quality must be obtained so that water management planners can make effective use of this valuable resource.

A basic requirement, if either meteorological or hydrological capabilities are to be improved in support of agriculture, is manpower. Without expanded personnel resources, little can be accomplished by the countries. As we see it, each of the Sahelian nations should strive for the following numbers of personnel trained to the indicated levels in order to become self-sustaining.

TABLE 5
SUGGESTED MANPOWER REQUIREMENTS FOR
EACH OF THE SIX SAHELIAN COUNTRIES

TYPE	AGRICULTURAL METEOROLOGY	HYDROLOGY		TOTAL
		OPERATIONAL	GROUND WATER*	
Professional				
Class I (MS/PhD)	1	1	1	3
Class II (BS)	5	5	5	15
Subprofessional				
Class III (Technician)	30	20	20	70
TOTAL	36	26	26	88

*Ground water hydrology not included in WMO/UNDP/CILSS Program

Ideally, each country would require around 60 trained people to sustain a viable national service for agricultural meteorology and operational hydrology plus another 25 or so in ground water hydrology. Budgetary restrictions may require these countries to approach such staffing levels in gradual stages but a beginning is clearly required. The training program should include attention to water quality and ground water hydrology, given their importance in the Sahel. The training challenge must be met if agricultural production improvements are to be achieved through better use of weather and water information. Without properly trained people, little if anything can be done even with the data now available.

Some potential issues with regard to training also should be mentioned. These include job availability upon return to the countries, use of traditional techniques as opposed to practical operational training, and exposure to the newer technologies. Consideration of these issues should be given by the donors, the WMO, and the CILSS countries if success

is to be attained. Certainly, the training planners should influence the development of the curricula to be used so that the training will be operationally focused. Planning should also involve the establishment of appropriate positions for the trainees in the individual countries upon completion of their training, and the possible requirement for longer-term training from donors should be recognized.

C. Improved Networks and Systems

For the most part, current data networks are extensive enough to begin operation of the national services. These networks include a total of 71 synoptic, 17 agrometeorological, 91 climatological (plus the 71 synoptic), 13 radiation, 56 evaporation, 66 recording rainfall, 726 ordinary rainfall, 44 discharge, 252 river stage, 10 sediment, and 34 chemical stations in the six countries (from: A Survey of Meteorological and Hydrological Data Available in the Six Sahelian Countries of West Africa, E.G. Davy, WMO/OMM No. 379, 1974).

There is a considerable range, however, in capability between countries. For example, Upper Volta has seven synoptic stations and Mali has 18 while no total radiation recorders are available in Mauritania, Niger, and Senegal. Observational sites of any kind become very sparse in the Sahel north of 15° north latitude. In spite of this, we are convinced that any further analysis of data needs leading to significant network expansion would be premature at this time. This does not mean that limited additions to observational capability using higher technology equipment should not be made. For example, a few weather radars along with read-out equipment for the upcoming European Space Agency (ESA) geostationary satellite would be beneficial in the agricultural areas. The complementary information obtained from weather radars and satellites would be especially valuable for identifying, tracking, and predicting the extent of the rainfall associated with the Intertropical Convergence Zone. Also, some more surface observational sites, stream gages, rainfall gages, water quality measurements, agricultural stations, etc., certainly should be considered on a country-by-country basis. But such expansions should be consistent with improved manpower capabilities resulting from an active training program.

The biggest observational problem at this time has to do with the condition of the existing equipment. Deterioration of equipment appears to have reached the point where some data may be questionable or only obtainable with difficulty. Thus, a program for either replacement or restoration of the equipment in hand must be undertaken as a first important step in improving the data available for

supporting the agrometeorology and hydrology services. In addition, the equipment to be replaced should be of an approved type that meets international standards. Continued use of outdated or unsatisfactory instrumentation must be avoided, if at all possible. Such a program should also include the logistics (spares, fuel, etc.) as well as the manpower to maintain the equipment at an acceptable standard of performance in the future. It is suggested that a technical committee be formed comprising experts knowledgeable in the field of agrometeorological technology to advise on the equipment planned for purchase in the total program.

Assuming the implementation of expanded national services, the output of such services must be made available to a range of interests extending from planners to decision makers and, finally, to the end users--the farmers and herdsmen. This output necessarily has to be easy to obtain and use if it is to help in increasing agricultural production through better management practices.

For the more technical uses within the Governments, organization and recognition of an identifiable national service will help but efforts must be made to utilize the product. Otherwise, data simply accumulates in books and is made available only to those who make a strong effort to seek it out. As far as we could determine, this presently is a serious problem. Only a concerted drive by the developing national services will make even current information available to those involved in agricultural development who otherwise may not be aware of what meteorology or hydrology has to offer.

The team has strong doubts about whether improvements in the meteorological and hydrologic data collection services along the lines recommended in the WMO report will have an appreciable influence on agricultural production in the Sahel unless accompanied by parallel improvements in the interpretation and dissemination of such information by the agricultural agencies of the countries involved. The team believes that the extension services of the various agricultural and livestock organizations that operate in Francophone Africa should be involved in the implementation of the program, should be made aware of the applicability of the data to farm or livestock management decisions, and should be consulted with respect to the frequency and format of the data they require. Thus, the team believes that the program should include the establishment--at the national level--of stronger linkages between the meteorological and hydrological services and the agricultural and livestock services, and that the activities to be financed by the program should include projects involving the direct participation of these services in designing the nature and format of their data requirements.

Since no general weather or hydrologic forecasts are being made today for dissemination to the public in the Sahel, steps must be taken to ensure that such forecasts are initiated and that understandable products are presented. This means the information should be action-oriented rather than in specific weather or water terms. Descriptions related to crop and animal productions would be the most useful to the farmers (e.g., planting of millet in the following regions should begin, pasture located in northeast regions available to support herds, etc.).

Except for very limited television, the best practical means for transmitting "near real-time" advice is over the national radio systems operated in each of the countries. We understand that practically all villages have receivers and regularly scheduled broadcasts do take place from time to time throughout the day. It seems feasible to allot a segment of this time for routine transmission of weather and water information in the form of agriculturally related actions. To be effective, however, the suggested actions will have to be reliable and that won't be easy to accomplish until the Services are in being with adequately trained manpower and suitable operational programs. Development of dissemination procedures should begin as soon as feasible to take advantage of learning as well as educational opportunities.

D. National Institutional Capabilities

At present and as indicated earlier, the national capabilities in agricultural meteorology and hydrology are weak or almost non-existent. Any support for improving capabilities must include the development and strengthening of the National Services. The WMO/UNDP/CILSS Program is directed toward such improvements. The team firmly believes the approach taken by the WMO offers the most reasonable means for achieving success. The Regional Center, training, and improved networks and systems all will contribute to strengthening of the National Services. In the final analysis, however, the countries themselves are the most important factor as only through their efforts can an effective infrastructure be built and maintained.

V. RECOMMENDATIONS OF THE NOAA TEAM

This section presents the recommendations of the team in two parts. The first is concerned with U.S. support for the WMO/UNDP/CILSS Program for Strengthening the Meteorological and Hydrological Services in the Sahel. The second part identifies related items that offer significant potential for improvements but which require funding support in addition to that indicated for the WMO/UNDP/CILSS Program. Our hope is that the WMO might consider these as possibilities for inclusion either as expansions to the program cited above or as candidates for consideration under some other mechanisms such as the WMO Voluntary Assistance Program (VAP).

A. The WMO/UNDP/CILSS Program

The following recommendations reflect the team's views of which aspects of the WMO/UNDP/CILSS Program are recommended for U.S. funding. Quite obviously, the suggested U.S. dollar amounts may need to be adjusted to reflect the amounts approved by the Congress in any particular year, the contributions from the other donors, and the implementation progress made from year to year.

RECOMMENDATION 1

The team concurs in the decision of CILSS to construct the Regional Center at Niamey and recommends the U.S. provide \$1,500,000 for constructing and equipping the center and for the required expert services (see Table 6). With regard to data processing equipment we recommend that the U.S. contribution be applied to financing such equipment at the Center since the state of U.S. technology permits the acquisition of the most effective equipment at the lowest cost.

Because of the importance of developing an effective dissemination program and providing training in new technologies, we further recommend that up to \$250,000 be set aside for the establishment of a prototype user services experimental facility. We see this facility as a model station offering practical experience in the collection, handling, and processing of agrometeorology and hydrology data into user-oriented products including the preparation of radio broadcast scripts for transmission and verification.

In addition, training in the interpretation and application of weather radar and satellite data should be accomplished. The weather radar at the Niamey airport could be used for hands-on training, although it might also be possible to install a slow-scan radar remoting system using a telephone line from the airport to the Center for about \$50,000 to \$75,000. This system uses a facsimile recorder as a display device and allows for comparative analyses to be made as scans are periodically accumulated. (A weather radar set at the Center would cost up to \$200,000.) Satellite interpretation training can be done using a series of pictures prepared for classroom use. However, an Automatic Picture Transmission (APT) capability for receiving cloud imagery from the polar-orbiting satellites would be better (APT equipment costs between \$50,000 and \$100,000). Training in the use of these newer technologies would be especially valuable for the Class II professionals who will be developing practical operational techniques for analyzing and forecasting precipitation in the Sahel.

RECOMMENDATION 2

As to the National Projects, the team recommends the U.S. provide \$1,500,000 for expert services, fellowships, equipment, and running costs (see Table 6). The combination of the Niamey Center along with the National Project fellowships are the most critical elements in meeting the previously identified training needs of the Sahelian countries. To reemphasize, training is of the utmost importance and absolutely necessary if progress in the practical aspects of applied agrometeorology and hydrology is to be made and sustained. We further recommend that at least two agrometeorologists and one hydrologist from each country be trained to the Bachelor of Science level in the U.S., including English training if needed. There are several U.S. universities both capable and willing to provide BS and graduate level training in meteorology and hydrology.

The equipment funds under the National Projects would be used to meet the need of the CILSS countries for improving observational capability. The WMO/UNDP/CILSS Program lays out a plan for replacement of existing equipment and for modest expansions in observation sites. We regard this as the proper approach to take and one which provides the necessary capability to operate a new and developing service. As indicated earlier, we recommend that a technical committee be established to identify the most appropriate items for procurement.

RECOMMENDATION 3

The team believes that a critical factor for the success of the program will lie in the extent to which the data generated by the agrometeorological and hydrological networks will be utilized in ways meaningful to agricultural planners, technicians, and ultimately, by the farmers and herdsmen in the Sahel-Sudano zone of Africa. This will require the preparation and interpretation of data so that it relates directly to the types of crops that are grown in the area, the farming practices and the cultivation systems that are in use, and the water data needs of the sedentary and migratory pastoralists. Also, traditional and innovative techniques should be experimented with for disseminating such data in an area which is largely characterized by scattered villages, small farms, extended grazing patterns, and low population density. The format and mode of presentation of the data may also be of great importance for assuring that it can be readily understood and acted upon.

To achieve such results will require close cooperation, consultation and coordination between meteorological and hydrologic services and the people who are familiar with the needs of the agricultural sector--the ministries of agriculture and rural development as well as the numerous semi-autonomous production and marketing agencies which are often established for particular crops. Close linkages will need to be established to help assure the proper interpretation of the data and its rapid dissemination.

The team, therefore, proposes that \$1,260,000 of the U.S. contribution be directed to the purpose of helping to assure the effective dissemination and utilization of the data by the agricultural agencies of the area and their clientele. The team hopes that other donors might also direct part of their contributions to this purpose. Activities to be financed should be designed in collaboration with the African agencies concerned and under the overall coordination of the Steering Committee and the Programme Manager. The team proposes that a Dissemination and Utilization Subcommittee be established under the aegis of the Steering Committee to advise and assist such efforts.

Lessons learned from the establishment and operation of the prototype user services facility proposed for Niamey in the first recommendation should be drawn upon in setting up similar facilities in the other countries.

RECOMMENDATION 4

Since the WMO plans on subcontracting with ORSTOM for the hydrological aspects of the WMO/UNDP/CILSS Program, the U.S. role in hydrology should be supportive mainly through its contributions towards the equipment and training recommendations given above. There is, however, the question of subsurface water which is not covered under the program. This item, along with some others, will be discussed later.

RECOMMENDATION 5

So far, nothing has been said about the funding and administrative arrangements for carrying out U.S. support for the WMO/UNDP/CILSS Program. For major items requiring multi-donor support, such as the construction of the Niamey Center, our recommendation is that funds be transferred directly to the WMO for management. For other items such as fellowships, computers, and equipment, AID may wish to (1) provide the funds directly to the WMO, (2) arrange to have NOAA assist in purchasing and installing, or (3) use direct AID financing arrangements. Our feeling is that the administrative arrangements for funding various elements of AID's contributions should be determined on the basis of efficiency and assurance of achieving the most appropriate and desirable goals and services. In any event, a steering group or committee made up of representatives from the donors, the CILSS countries, and the WMO should be established under the chairmanship of the WMO. We visualize this steering group as an administering body holding periodic meetings to assess progress, review programs and financial reports, and recommend future plans and actions based on the funding support available.

Table 6 summarizes the financial implications of the team's recommendations based upon a five-year schedule that corresponds with the WMO/UNDP/CILSS Program.

TABLE 6
FINANCIAL SUMMARY FOR THE WMO/UNDP/CILSS PROGRAM
(in thousands of U.S. dollars)

	FY 76	FY 77	FY 78	FY 79	FY 80	TOTAL
1. Niamey Center	260	700	200	200	140	1,500
2. National Projects	-	300	400	400	400	1,500
3. Data Utilization	-	500	400	200	160	1,260
TOTAL	260	1,500	1,000	800	700	4,260

Emphasis has been placed in the early years upon the construction of the Niamey Center which remains the key to an effective training program initially and as a regional center later on. Of the \$1,500,000 total for the Niamey Center, \$500,000 is recommended for building construction, \$500,000 for telecommunications and data processing equipment, \$250,000 for the prototype user services experimental facility, and \$250,000 for expert services.

The National Projects funding of \$1,500,000 is recommended for support of expert services (\$500,000), Fellowships (\$500,000) and equipment (\$500,000).

The Data Utilization funding of \$1,260,000 is recommended for the development of methods and techniques for the effective dissemination and utilization of the agrometeorological and hydrological data within the individual countries.

As to NOAA's part in the above recommendations, we see a continuing role in providing advice, participating in the steering group with AID, assisting in the procurement of U.S. equipment, and, if requested, undertaking site survey and evaluation activities. Where funds are required for NOAA travel, etc., reimbursable arrangements could be made between the Department of Commerce and the U.S. Agency for International Development. We should add that non-governmental representation on the steering group (e.g., NOAA Team university members) could be used effectively to assist in arranging training and in providing advice under consultant arrangements.

B. Other Significant Additions

There are a few other meteorological and hydrological items that would materially enhance the ability of the Sahelian countries in their efforts to improve agricultural productions. For the most part, installation of the indicated technologically advanced hardware is predicated upon the countries having the necessary manpower and resources for operation as well as upkeep and maintenance. The indicated studies could be carried out under contract for the present and by the Regional Center and the countries later on.

1. Weather Radars. The use of radars for observing and tracking precipitation is a proven technology. The weather radar recently installed in Niamey has also proven useful in conducting rain enhancement studies. Of the modern technologies available we believe this equipment offers a significant opportunity for expanding the observational capability of the countries. As can be seen in Figure 1, installation of four more radars at N'Djamena, Ouagadougou, Bamako,

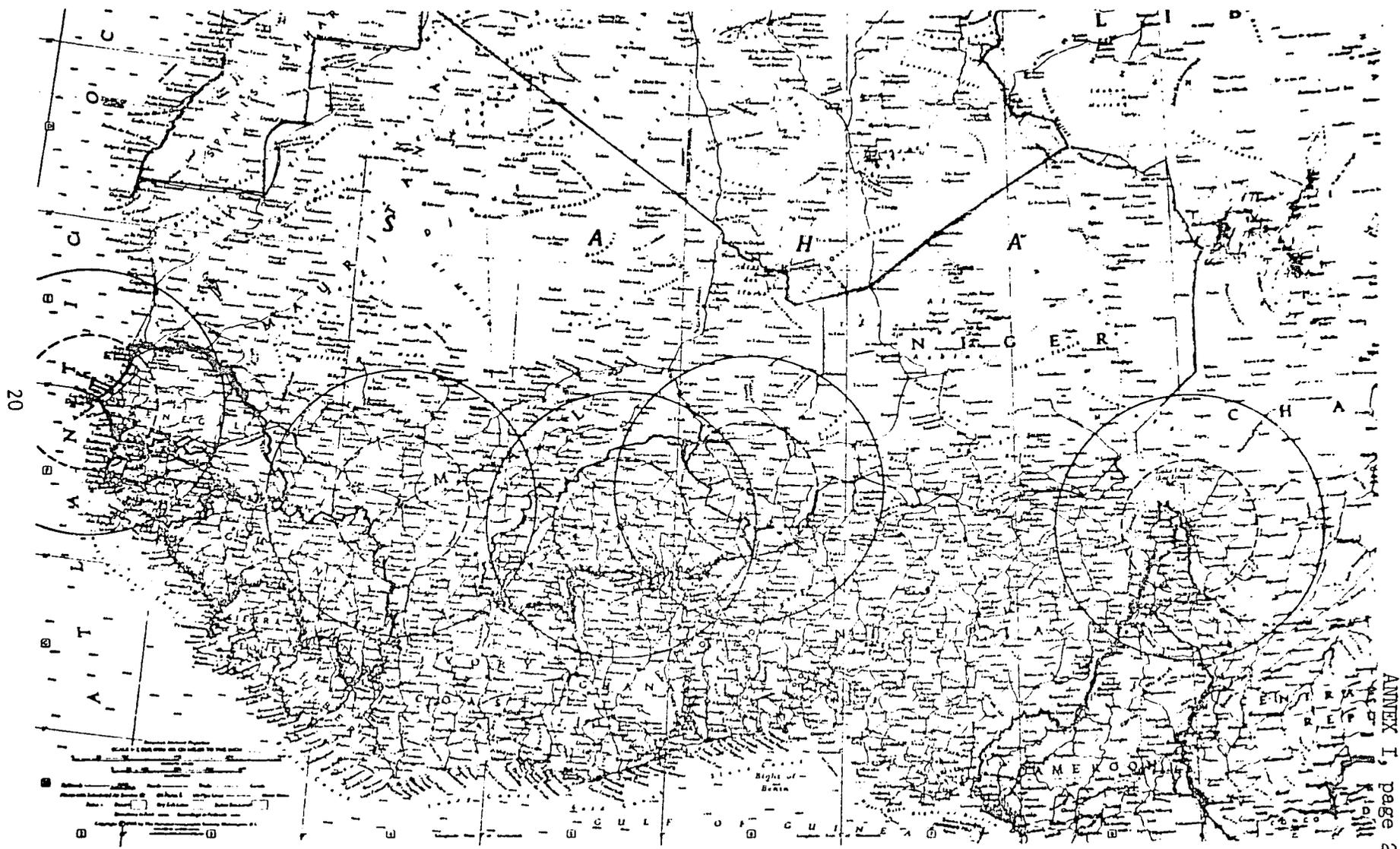


Figure 1. Weather Radar Coverage Map (Dashed line = 210 km range-- detect almost all precipitation; solid line = 420 km range-- maximum range)

and Dakar would provide reasonable coverage of a good part of the agricultural areas of the countries but would leave two areas without adequate coverage. The dashed circles indicate the range within which most precipitation echoes can be identified. The solid circles indicate the maximum range for precipitation detection but, because of the earth's curvature, only those clouds projecting to great heights (e.g., thunderstorms) can be seen at the longer range. The cost for a complete 5 cm radar including emergency power, minicomputer for digital processing of the data (e.g., for relating echo return to precipitation amounts and extrapolation of echo movements), installation, spares, and training is on the order of \$300,000. The basic radar unit installed would cost about \$200,000.

The cost for the four radars would be anywhere from \$800,000 to \$1,200,000 and, if the two blank areas were to be covered (see Figure 1), the total cost would range from \$1,200,000 to \$1,800,000.

2. Satellite Read-Out Stations. With the anticipated launch of the ESA geostationary satellite, near real-time high resolution cloud image photographs will become available for all of the Sahel at frequent intervals. This satellite (particularly if used in combination with the weather radars) would allow for analysis of the structure and movement of the Intertropical Convergence Zone and its associated rainfall in more detail than could be achieved through an even greatly expanded surface observation network. Each country should be equipped to receive data from the ESA satellite but the major thrust for installing such equipment should come from ESA and/or the WMO. However, the U.S. has expertise for training in satellite image interpretation as well as in advising on the technical aspects of ground receivers and display devices. Based on U.S. experience, receiving and processing equipment capable of retransmitting images to other locations in West Africa probably would cost anywhere from \$750,000 to \$1,000,000 depending upon how elaborate the system is. APT (Automatic Picture Taking) or WEFAX (Weather Facsimile) equipment for direct receipt of imagery from satellite costs much less (about \$50,000) and represents a real possibility for installation.

3. Measurements of ground water and water quality. There are some recognizable gaps in the WMO/UNDP/CILSS Program which deserve consideration. Further, the program includes consideration of both hydrological and meteorological networks and implies coordination and cooperation between the two elements. The way WMO plans to divide and contract for the two components does not clearly guarantee the needed coordination.

From the standpoint of comprehensive river basin planning, two important components of the needed data base are not provided for. These are (1) groundwater monitoring, and (2) water quality monitoring. The establishment of rainfall stations, stream discharge stations, groundwater observational wells, and ground and surface water quality stations should be done in a coordinated fashion with the potential uses clearly in mind.

While it is true that groundwater exploitation in quantities sufficient to cause major changes in water regime has not yet taken place, it is well known that groundwater will and should play an important role in the overall water development picture. Thousands of wells and bore holes have been drilled in recent years mostly for domestic and livestock use. Others have been drilled in connection with groundwater investigations. Consideration should be given to the monitoring of certain key wells so as to accumulate needed data to underpin unified and integrated planning and management. The urgency for establishing a groundwater monitoring network in the Sahel region is certainly not as pressing as for the surface water component. Nevertheless, its incorporation into overall network design should be analyzed concurrent with the climate and surface water elements.

Groundwater surveys which define the constant parameters of a groundwater system are an essential prerequisite to establishing and operating observational networks. The geometry and properties of aquifer materials are first determined and then those changeable parameters of hydraulic head distribution and water movement in and out of the groundwater basin are sought. BRGM has made substantial progress in mapping these hydrologic-geologic units of the Sahel and in assessing their water yielding properties. There should be some discussion with BRGM as the WMO/UNDP/CILSS project takes final form.

Measurements of water quality are of increasing importance in the management of water. Every potential use of water has a quality requirement as well as a quantity requirement. In the use process, constituents are added which degrade the effluent quality (chemical, physical, biological). Where the use entails substantial consumption in the process (e.g., evaporation and transpiration) there is a concentration of these constituents even though additional materials may not be added in the use process.

Particularly in river systems such as the Niger and the Senegal, which course through many different countries and where substantial reuse will take place, it will become extremely important to understand the water quality regimen. The ability to project the changes

in water quality that may take place as a result of particular configurations of water development will be critical. Like the groundwater network, the water quality network perhaps does not deserve the time priority that should be given to the climate and surface water networks. However, water quality data constitutes an extremely important component of the water information system which becomes a basis of design, operation, and monitoring of complex water use schemes.

The WMO should seek assistance in the final hydrologic network design and in operation as well to assure adequate consideration for groundwater monitoring and water quality networks. Initially, two experts for about six months would be required. Once network designs are completed, further support for quality and groundwater monitoring may be justified. The costs would likely be about \$200,000 over three years for manpower plus about \$300,000 for equipment.

4. Automatic Weather Stations. The team feels that large-scale expansion of data networks, in general, is impractical at this time. But there are significant data voids particularly in the desert regions where automatic radio-reporting stations could provide useful data for general weather analysis. A few such stations, perhaps one per country, would prove worthwhile for operational test and evaluation of the equipment's performance under desert conditions. In addition, an automatic weather station should be installed at the regional center for demonstration and training purposes. The stations should be dependable, possibly solar-powered, operate in the high frequency radio band with conversion to satellite read-out capability. Costs, including installation, spares, and training, would be about \$75,000 each.

5. Studies. In addition to the development of an up-to-date climatological data base there is a need for a variety of studies. Among these are the relationships between crop and animal production and weather and improved understanding of the hydrologic cycle of the Sahel (i.e., the movement of water from precipitation to runoff to storage to evaporation and evapotranspiration). A case in point is the development of water balance values for Lake Chad.

The aim of the regional center as well as the assignment of experts under the WMO/UNDP/CILSS Program includes conducting of studies. However, as manpower capability increases, an increasing need for funding studies will occur. What would be a reasonable amount is difficult to determine at this time, but we can picture each country eventually investing anywhere from a few thousands of dollars to as much as \$250,000 per year in research and development.

The following list summarized the range in total costs for the other significant additions to the meteorological and hydrological capabilities of the Sahelian countries.

1. Weather Radars	
a. Four locations	\$ 800,000 to \$1,200,000
b. Six locations	\$1,200,000 to \$1,800,000
2. Satellite Read-out	
a. Complete Ground Station	\$ 750,000 to \$1,000,000
b. APT Type	\$ 50,000 to \$ 100,000
3. Ground Water and Water Quality	
a. Manpower	\$300,000
b. Equipment	\$200,000
4. Automatic Weather Stations	
a. One per country	\$450,000
5. Studies	
a. Six countries	\$150,000 to \$1,500,000



Department of State

TELEGRAM

UNCLASSIFIED 032

alcom
 9FR
 PAID
 EXE
 PPC
 PA
 SC
 ECAF
 SCAD
 -
 -
 FEF
 OFF

PAGE 01 OUAGAD 01984 191734Z

72
ACTION AID-20

INFO OCT-01 AF-10 EUR-25 IO-13 ISO-00 PC-15 AGR-20 SCI-06
 ABF-01 INT-08 CIAE-00 COME-00 FB-11 FRB-02 INR-10
 NSAE-00 RSC-01 TRSE-00 XMB-07 OPIC-12 SPC-03 CIEP-02
 LAB-06 SIL-01 OMB-01 DODE-00 PM-07 H-03 L-03 NSC-10
 PA-03 PRS-01 SS-15 USIA-15 ACDA-19 NASA-04 ARA-16
 EA-11 NEA-10 DRC-01 /293 W

007027

R 191515Z SEP 73
 FM AMEMBASSY OUAGADOUGOU
 TO SECSTATE WASHDC 7045
 INFO AMEMBASSY ABIDJAN
 AMEMBASSY DAKAR
 AMEMBASSY BRUSSELS
 AMEMBASSY BAMAKO
 AMEMBASSY FORT LAMY
 AMEMBASSY NIAMEY
 AMEMBASSY NOUAKCHOTT
 AMEMBASSY PARIS
 AMEMBASSY ROME
 AMEMBASSY YAOUNDE
 USMISSION GENEVA
 USMISSION USUN NY

UNCLAS OUAGADOUGOU 1984

AFDROUGHT

F.O. 11652: N/A
SUBJ: PERMANENT INTERSTATE COMMITTEE ON DROUGHT (PIC) CONFERENCE

REF: OUAGADOUGOU 1934

1. AS SUMMARIZED REFTEL, CHIEFS OF STATE OF SIX SAHEL



Department of State

TELEGRAM

UNCLASSIFIED

PAGE 02 OUAGAD 01984 191734Z

COUNTRIES SEPT 12 APPROVED (1) RESOLUTION; (2) DECLARATION; (3) COMMUNIQUE; (4) CONVENTION GIVING PIC PERMANENT LEGAL STATUS (FORWARDED SEPARATELY); (5) REPORT-PROGRAM PREPARED BY MINISTERS' MEETING (SUMMARIZED IN OUAGA 1922). FOLLOWING ARE TEXTS OF OPERATIVE PARAS OF FIRST THREE ITEMS. PREFAMBULAR PARAS AND UNNECESSARY WORDS OMITTED. PREAMBLES MENTION SERIOUSNESS OF DROUGHT AND ITS CONSEQUENCES, CONTINUATION OF DROUGHT, NEED FOR COORDINATED, COMMON ACTION, AND APPEAL TO INTERNATIONAL COMMUNITY TO ASSIST.

2. RESOLUTION. CHIEFS OF STATE...QUOTE DECIDED TO CREATE PERMANENT INTER-STATE COMMITTEE TO FIGHT DROUGHT IN SAHEL (CILSS). (THEY) ADOPT: (1) DRAFT CONVENTION ON STATUS OF SAID COMMITTEE, WHICH IS ANNEXED TO PRESENT RESOLUTION; (2) PROGRAM ESTABLISHED BY MEETING OF MINISTERS OF SEPT 7, 8, 9, 10, 1973. (THEY) MANDATE COUNCIL OF MINISTERS TO CARRY OUT ALL MEASURES NECESSARY TO BEGIN IMMEDIATELY IMPLEMENT PROGRAMME THUS ADOPTED. UNQUOTE.

3. DECLARATION. CHIEFS OF STATE...QUOTE CONSIDERING THAT APPEARANCE OF PRESENT RAINY SEASON SERIOUSLY WORRIES GOVERNMENTS AND POPULATIONS OF ZONE, SOLEMNLY DECLARE THAT ZONE OF SIX SAHEL COUNTRIES CONTINUES DISASTER-STRICKEN. (THEY) DEMAND IMMEDIATE LAUNCHING OF EMERGENCY WORLD PLAN TO SAVE MILLIONS OF HUMAN AND ANIMAL LIVES EXPOSED TO FAMINE, MISERY, AND SICKNESS. (THEY) LAUNCH URGENT APPEAL TO INTERNATIONAL COMMUNITY... FOR RAPID MOBILIZATION OF ALL RESOURCES NECESSARY FOR: (A) EXECUTION OF REPORT-PROGRAM ADOPTED BY PRESENT CONFERENCE; (B) RECONSTRUCTION AND SUPPORT OF SORELY-TESTED ECONOMIES. (THEY) DEMAND THAT FINANCIAL INSTITUTIONS AND FRIENDLY GOVERNMENTS ENVISAGE ALL POSSIBILITIES FOR POSTPONING FOR TEN YEARS SETTLEMENT (REGLEMENT) OF STATES' DEBTS BASED ON STUDY AND CONCERTED ACTION AMONG PARTIES CONCERNED. UNQUOTE.

4. FINAL COMMUNIQUE. CHIEFS OF STATE...QUOTE AFTER HAVING EXAMINED CONCLUSIONS OF MEETINGS OF MINISTERS OF SIX COUNTRIES HELD IN OUAGADOUGOU MARCH 23-27 AND

UNCLASSIFIED



Department of State

TELEGRAM

UNCLASSIFIED

PAGE 03 OUAGAD 01984 191734Z

SEPTEMBER 7-10, 1973, HAVE UNANIMOUSLY ADOPTED REPORT-PROGRAM PRESENTED BY MINISTERS, MAIN LINES OF WHICH ARE AS FOLLOWS: URGENT PROGRAM TO SAVE POPULATIONS AND LIVESTOCK; NATIONAL PROGRAMS ORIENTED TOWARD SOLUTION OF WATER PROBLEM, RECONSTITUTION OF HERDS, AND REFORESTATION; SUB-REGIONAL PROGRAM INCLUDING MAJOR PROJECTS TO BE CARRIED OUT, SUCH AS DAMS, INTER-STATE COMMUNICATIONS, LARGE-SCALE REFORESTATION, ANIMAL HEALTH, AND CREATION OF SPECIAL SAHEL FUND. THIS SUB-REGIONAL PROGRAM ALSO INCLUDES PERMANENT FRAMEWORK OF COOPERATION, NOTABLY IN FIELDS OF RESEARCH, TRAINING, METEOROLOGY, PROMOTION OF HUMAN HEALTH, AND FIGHT TO PROTECT FOOD CROPS.

5. CHIEFS OF STATE HAVE AGREED THAT THIS PROGRAM CONSTITUTES FIRST STEP TOWARD IMPLEMENTING VASTER PROGRAM TO RAISE SAHARAN-SAHELIAN ECONOMY. THEY HAVE ADOPTED CONVENTION CREATING AND ORGANIZING PERMANENT INTER-STATE COMMITTEE TO FIGHT AGAINST DROUGHT IN SAHEL, HEADQUARTERS OF WHICH IS AT OUAGADOUGOU.

6. CHIEFS OF STATE HAVE UNANIMOUSLY DESIGNATED H.E. GENERAL SANGOLE LAMIZANA, PRESIDENT OF REPUBLIC OF UPPER VOLTA, AS PRESIDENT (PRESIDENT EN EXERCISE) OF COMMITTEE. COMMITTEE HAS CONFIRMED MINISTER OF AGRICULTURE AND LIVESTOCK OF REPUBLIC OF UPPER VOLTA AND DR. IBRAHIMA KONATE IN THEIR RESPECTIVE FUNCTIONS OF REGIONAL COORDINATOR AND REGIONAL COUNSELOR IN CHARGE OF TECHNICAL SECRETARIAT. CHIEFS OF STATE ENTRUST PRESIDENT SANGOLE LAMIZANA, PRESIDENT OF COMMITTEE, WITH MISSION OF SENSITIZING INTERNATIONAL COMMUNITY. THEY MANDATE PRESIDENT TO GO TO NEXT SESSION OF UNITED NATIONS GENERAL ASSEMBLY TO PLACE BEFORE ALL NATIONS OF WORLD THE GRAVE PROBLEMS OF SAHEL. THEY REQUEST HIM ALSO TO FOLLOW WITH MOST CAREFUL ATTENTION NEGOTIATIONS FOR RENEWING YAOUNDÉ CONVENTION IN ORDER THAT FUTURE PROGRAMS OF EUROPEAN DEVELOPMENT FUND GIVE SPECIAL PLACE TO PROJECTS FOR FIGHTING DROUGHT IN SAHEL. IN GENERAL WAY, PRESIDENT IS MANDATED TO USE DIRECT CONTACTS TO ATTRACT ATTENTION OF ALL FINANCING ORGANIZATIONS AND FRIENDLY GOVERNMENTS TO PRIORITY

UNCLASSIFIED



Department of State

TELEGRAM

UNCLASSIFIED

PAGE 04 OIJAGAD 01984 191734Z

PROJECTS OF SAHEL. PRESIDENT WILL BE ASSISTED IN
THESE VARIOUS APPROACHES BY REGIONAL COORDINATOR AND
MINISTERS OF SIX MEMBER STATES OF COMMITTEE. UNQUOTE.EASUM

UNCLASSIFIED

~~S. P. ...~~

ANNEX IV

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

September 5, 1975

Deputy Secretary General
World Meteorological Organization
c/o U.S. Mission, Geneva
Geneva, Switzerland

Dear Sir:

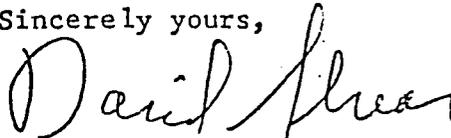
The U.S. participants at the donors meeting convened by UNSO-CILSS in Geneva on July 1, 1975 indicated their general support for the Agro-Meteorological/Hydrological project (CILSS/RAF 601). This letter provides confirmation of U.S. support and indicates the steps taken to date.

On the basis of preliminary information, the Agency for International Development (A.I.D.) has requested \$260,000 from the U.S. Congress for obligation in fiscal year 1976 (through June 1976) in order to begin U.S. participation in the project. We have also informed the Congress that we are currently estimating the U.S. share of this project to total \$4,260,000 over a seven year period (through September 1982). Specific Congressional approval of each obligation of funds will be required with respect to each fiscal year in which the obligation will be made.

U.S. project analysis is currently being prepared by the U.S. National Oceanic and Atmospheric Administration (NOAA) and is expected to be ready for review by A.I.D. and the World Meteorological Organization before the end of October 1975.

The obligation of U.S. funds and commencement of project activities in fiscal year 1976 and subsequent years are dependent on A.I.D. programming decisions and approval of project design and the availability of funds from the U.S. Congress. However, at this time, we see no basic problems which are likely to prevent the beginning of U.S. participation in this project in the present fiscal year.

Sincerely yours,



David Shear
Director, Office of Central and
West African Regional Affairs

cc: Executive Secretary
Permanent Interstate Committee for
Drought Control in the Sahel
Ouagadougou, Upper Volta

ANNEX V

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

FEB 03 1975

THRU: AFR/DP, Mr. Robert Huesmann *RH*

FROM: AFR/CWR, *David Shear for* David Shear and AFR/DS, Princeton Lyman *PL*

Problem: Funding of feasibility study concerning possible U.S. role in establishing a Sahel water data network and water resources management project.

Discussion: AFR has had under consideration for several months the question of possible participation in a multi-donor effort to assist the Sahelian countries to establish a regional network, based on national systems, for providing better water resources data. AID consideration of the subject has been prompted by several requests made to the donor community on behalf of the Sahelian countries by CILSS (Comite Inter-etat de Lutte contre la Secheresse) as well as by subsequent studies of the problem conducted by WMO and FAO. In addition, the Research Committee of the Sahel Task Force considered the subject one of high priority. Hence, when the FY 1975 FES was prepared for the CWR countries, it included a proposed project for a "Sahelian Water Data Network" estimated at \$1.7 million for FY 1975 and a three year follow-on "Sahel Water Resources Management" project which would begin in FY 1976 at \$1 million per year. More recently, it was decided to combine the two proposals into a single proposal, since their purposes and scopes were so interrelated.

Accordingly, a draft PRP (attached) was prepared which sets forth the scope and approach of the proposed project and how AID would propose to implement it. This approach reflects the views of the Project Committee (which reviewed the PRP on January 14) as well as staff discussions with officials of the National Oceanic and Atmospheric Administration of the Department of Commerce (NOAA) which would implement the proposed project under a PASA with AID.

We would like to call your attention to three basic features of the proposed project, as discussed in greater detail in the attached draft PRP. First, the "project" deals not with the totality of this major, basic problem, but rather with a possible U.S. role in a broader multi-donor effort. There is an assumption that if a multi-donor effort can be organized, there might be a particular aspect of it in which the U.S. has special skills and could make a distinctive contribution. These include, in particular, specialized skills in systems analysis, network design and use of remotely sensed data. The second basic feature of the PRP is its "phased" approach in which U.S. involvement in each subsequent phase is dependent on the results-as judged by AFR- of the previous phase. Thirdly, the overall objective is to assist crop and livestock production in the Sahelian countries, and support river basin development, through making available accurate, timely and relevant water data.

-2-

Phase I, which could commence within 30 days of your approval of this memorandum would be in the nature of a feasibility study of up to six months to determine the costs and benefits of such a network and management project, the likelihood and dimensions of a possible multi-donor effort, and what kind of role the U.S. might play, if any. The cost of the Phase I study is estimated at \$82,000 (see Financial Plan, page 11) and would be carried out by a multi-disciplinary team headed by NOAA. The scope and methodology of the Phase I study is outlined on pp. 4-6 and 11-13 of the attached draft PRP.

Phase II, if it is undertaken, would involve detailed planning and some training over a one year period with costs in the range of \$300,000 - \$500,000 (see pp. 6-7). Phase III, if it is undertaken, would involve significant funding (\$2-5 million) for equipment, facilities and training as part of a multi-donor effort (see p. 7) and would be two and a half years in duration.

At its meeting on January 14, the Project Committee approved the draft PRP for the purpose of recommending that AFR finance the costs of Phase I under a PASA with NOAA. On the advice of AFR/DP (Mr. Donoghue) it was also felt there was no need to convene an ECPR meeting to approve the PRP since Phase I was, in effect, simply a feasibility study and could be approved through an Action Memorandum. It was also emphasized in the Project Committee that while the draft PRP would permit the inclusion of the project in the FY 1976 Congressional Presentation, such inclusion would in no way oblige the Bureau to proceed with the project beyond Phase I.

Recommendation: We concur with the recommendations of the Project Committee and request that you authorize use of up to \$82,000 of Studies and Surveys funds for the Phase I study. The funds will be allotted to Project 625-11-995-907, Development Studies of the Sahel Sudano Zone.

Approved: _____

Disapproved: _____

Date: FEB 6 1975

Clearances:

AFR/DP, E. Donoghue	<u>ED</u>	Date: <u>1/21/75</u>
AFR/DP, M. Warnecke	<u>MW</u>	Date: <u>1/21/75</u>
AFR/CWR, S. Rea	<u>SR</u>	Date: <u>1/21/75</u>
AFR/CWR, C. Hanrehan	<u>CH</u>	Date: <u>1/21/75</u>
AFR/GC, R. Johnson	<u>RJ</u>	Date: <u>1/21/75</u>
PPC/DPR, J. Shannon	<u>JS</u>	Date: <u>1/21/75</u>
TA/CST, B. Long	<u>BL</u>	Date: <u>1/21/75</u>

AFR/DS: JLgart:smt:1/21/75

January 15, 1975

DRAFT

PROJECT REVIEW PAPER

Title: Sahel Water Data Network and Water Resources Management

FY Proposed for Financing: FY 1975-1979 (Grant)

Appropriate Category: Special Sahel (Phase I)

Date of Submission to Bureau: December 1974

Project Development Team: Bill Long - TA/OST

John Blumgart - AFR/DS

Ernest Gibson - AFR/DS

Samuel Rae - AFR/CWR

I. Priority and Relevance: Relationship to DAP and the development priorities of the Sahelian countries.

Although review of the CWR DAP has not been completed, the CWR program is expected to form around four areas of concentration: Food Crop Production, Livestock, Population Planning and Health, and Education and Manpower. Selected activities outside the areas of consideration include water resource development and management. In the Sahel, CWR will focus on the agricultural sector of the region, especially that portion which contributes to domestic food crop and livestock production.

A crucial element is the availability and management of water resources. It is almost impossible to over-estimate the importance of water in the Sahel area. The availability or scarcity of water influences the options of people as to where they live, the patterns of living, the daily workload and, in some cases, their social and religious values. Even under normal conditions (which elsewhere would be considered adverse), the major limiting factor to

food crop and livestock production is the availability of water resources, i.e., ground water, surface water and rainfall. Optimum use of the available water is therefore an essential factor in any crop or livestock sector strategy. Effective management, in turn, depends upon a clear comprehension of water resources which are, or may be, available to all sectors of the economy, for whatever purpose. In the absence of prudent water management, the Sahel zone resists serious, intensive development efforts, and problems of desertification, soil erosion, and reduction of soil fertility rapidly emerge to offset anticipated developmental benefits. For this reason, the African governments and regional organizations of the Sahel have begun to seek answers to the essential ecological and economic problems of the Sahel area. High on their list is a better understanding of the magnitude, distribution, behavior and management of their water resources.

Specifically, the Sahel countries, under the aegis of the Permanent Inter-State Committee on Drought Control (Comité Permanent Inter-Etat de Lutte Contre la Secheresse dans la Sahel -- CILSS) have stressed^{the} importance of assistance in meeting their needs for meteorological and hydrological services. At its inaugural session in September 1973, CILSS made a special request for donor assistance to include (a) drought-related studies, (b) the establishment of a regional network of water data stations, and (c) the creation of regional centers for the coordination of data and for the training of African meteorologists and hydrologists.

This project therefore addresses a key constraint in efforts to increase food crop and animal production in the Sahel. At present, there are few if any meteorological facilities devoted to agricultural purposes. Hydrographic stations to measure lake levels and stream flows are totally inadequate for planning purposes. Consequently, the Sahel states are in urgent need of advice on essential water factors to be measured, the best

techniques now utilized for collecting the required information, the cost of these operations, and the possible required efficiencies which may be achieved.

It is further believed that the U.S. possesses certain unique and heretofore underutilized (by AID and the LDCs) capabilities for contributing to an international program designed to meet these needs. Specifically, U.S. knowledge, experience and technology with respect to systems analysis, network design, and collection and transmission of remotely sensed data are believed to be particularly relevant and could form the basis for a significant U.S. contribution to a multi-donor project to design and implement a regional water data network for the Sahel. Such a network -- based on functioning national systems -- could provide a basic framework for future decision-making on equipment investment and training requirements as well as stimulate and guide upgraded forecasting services in support of agriculture, livestock and water resources planning.

II. Grantee/Administering Agency

The project will be both national and regional in scope. At the national level it will assist the Meteorological and Hydrological Services of the six Sahelian countries to develop their capabilities, to coordinate their efforts, and to more effectively disseminate the data they gather. At the regional level the project will assist in the establishment, or strengthening, of a regional water resources center capable of centralizing, processing and interpreting water data for the zone as a whole, providing longer term forecasts, and providing training for African meteorologists and hydrologists. In this context, the project will give particular consideration to the role and potential of the 13-nation Comite Inter-Africain d'Etudes Hydrauliques (CIEH) at Ouagadougou, which is currently receiving AID assistance.

III. Description of Project

It is proposed that a five-year project be initiated in FY 1975, to be carried out in three Phases, the initiation of Phases II and III being dependent on a positive review by AFR on the results of Phase I. It should also be pointed out that the project would represent the U.S. contribution to a larger, multi-donor undertaking which would probably involve such agencies as the World Meteorological Organization (WMO), UNDP and the French foreign aid agency, Fonds d'Aide et de Cooperation (FAC). Total funding at this point is estimated at \$2-5 million of which \$82,000 is requested immediately to undertake Phase I.

Phase I

A 6-month feasibility study will be undertaken by an interdisciplinary team of experts to assess the potential utility, constraints, timeliness, international receptivity and necessary dimensions of a U.S. initiative in the context of a multi-donor effort to assist the Sahel countries to upgrade their hydro-meteorological capabilities of that region. Major elements of the study will include the following:

(1) analysis of related programs and projects underway or being planned by Sahelian countries and donors on the basis of literature reviews, previous studies, and personal contacts with officials from institutions such as FAO, UNESCO, WMO, FAC, UNDP, UNEP, CILSS and CIEH;

(2) evaluation of present Sahel hydrometeorological data collection and manpower capabilities and training needs based on a visit to the region and discussions with aforementioned donor agencies;

(3) identification of the presently unmet water resources data needs of the Sahelian countries, both nationally and as a regional complex, for development planning with particular emphasis on crop production, livestock

development and river basin planning. The foregoing assessment would be related to an overview descriptive report of the state-of-the-art of alternative instrumentation, systems and networks for collecting and transmitting the required hydrometeorological information;

(4) assessment of the constraints and problems confronting the Sahelian countries in the effective dissemination of water resource information for forecasting, planning and agricultural development purposes, both in the national context and at the regional level, and ways in which external assistance might contribute to solutions;

(5) assessment of the most effective way of organizing and implementing a multi-donor program, assuming one is recommended, which would address the problems identified in paragraphs (3) and (4) above, i.e. the most efficient and effective fashion in which the U.S. might participate in an international program presumably headed by another agency (e.g., WMO);

(6) assessment on ways of integrating water resource data into the planning and execution of development projects so that such projects can generate some of their own water resource data for their own use and for national requirements;

(7) recommendations to AID on the type of project the U.S. could support (if any) that would meet the water data collection and management needs of the region; and the type, scope, and institutional focus, if any, of an expanded training effort to meet projected manpower requirements (i.e., should a new regional training institute be created or should existing institutions such as the CIEH be strengthened?). The report should be framed in terms of alternative solutions to the problems identified -- or "optimal" and "minimal" solutions -- so that AID will be presented with a range of choices. If recommendations are positive, the report should include preliminary estimates

of costs of the major components of the project (by alternative), indication as to phasing and timing of implementation and preferred modes of implementation, and estimates as to type and magnitude of contributions from other donors and the Sahelian countries, and how they relate to the proposed AID inputs. A more general Phase I report will also be prepared in English and French for external distribution.

Phase II

Assuming there is agreement to proceed, Phase II would be initiated in FY 1976. It would involve preparing the detailed plans, cost estimates and collaborative arrangements with other donors and the Sahelian countries which would be necessary for full project implementation. Alternative network designs will be prepared by NOAA for the Sahelian region, and evaluated in country-region specific situations through cooperative studies and analyses with LDC institutions and other donors. Throughout, the network and systems will be tailored to fit within the particular development goals and needs of the region, and to be responsive to special financial, institutional, and social/cultural constraints. It is expected that this second phase will take approximately 12 months to complete, terminating in the second quarter of FY 1977. Funding requirements are roughly estimated to be \$261,000 for NOAA (and sub-contractor) analytical services, overseas travel, and training in the U.S. for selected LDC participants in the design and operation of data networks. Some of the training will involve working with NOAA experts on the design and evaluation of alternative networks for the Sahel.

In addition, Phase II would include the preparation of detailed plans and cost estimates for whatever regional training and data coordination center is recommended and agreed to. Such planning might be carried out by AID, or by another donor, depending on the results of Phase I. If carried out by AID

the above funding figure would require upward adjustment.

Furthermore, Phase II would initiate the program for out-of-country training for African specialists, especially those to be trained at the higher technical levels and for executive positions.

Phase III

The final Phase III effort would involve (and require) a multi-donor effort given the fact that the up-grading, expansion and operation of a viable water data network and management system requires significant expenditures for equipment, instrumentation and training. A 1973 WMO consultant study estimated that the total cost of establishing adequate national and regional networks and a central training institution would be in the magnitude of \$7 million. A more recent WMO/FAO study has estimated a cost of \$7 million for the national programs alone and an additional \$6 million for a central institute. Clearly, these studies and cost estimates will be evaluated in detail in Phase I of the project but it is already evident that multi-donor financing will be necessary.

It is anticipated that Phase III would be carried out in the remainder of FY 1977, and in FY 1978-79 AID would provide financing in the magnitude of \$2-5 million for those activities, technologies and facilities for which the U.S. has a particular expertise. Phase III would involve the procurement, construction and financing of the facilities planned in Phase II and the further implementation of the training program.

IV. Beneficiary

The purpose of this project is to make available more comprehensive and accurate water resource data to support increased food and livestock production in the Sahelian countries as well as to develop longer range forecasting methods and early warning systems. All of the strata of the rural population

should therefore benefit from the results of the project -- migratory and sedentary herdsmen, rain-fed crop farmers, and farmers working irrigated lands. The project is also to be focussed on providing data for better river basin planning and water resource development and will therefore contribute to the planning and implementation of such schemes as those for the Senegal and Niger Rivers, and for Lake Chad.

V. Project Design

See Tab A, attached.

VI. AID Experience

AID has had successful experience in working with other donors on partial water resource data gathering networks such as those used for basin development planning. For example, AID contributed to a multi-donor program sponsored by the Mekong Coordinating Committee to establish a comprehensive network of stream and rain gauges in Indochina along the main stream of the Mekong River and its major tributaries and to training the staff of the Committee and the hydrologic services of the four member countries in the interpretation of the data and the maintenance of the system.

In addition, AID has carried out in collaboration with the U.S. Geological Survey an intensive survey of the state-of-the-art and research priorities in the field of hydrological-meteorological measurements as part of a larger effort to provide U.S. inputs into the work of the OECD's Planning Group on Science and Technology. The study which was based on information and perspectives received from some thirty U.S. and international organizations (e.g., WMO, FAO, ORSTOM, USDA) was published in December 1971 as "Techniques for Assessing Water Resource Potentials in the Developing Countries, with Emphasis on Streamflow, Erosion and Sediment Transport, Water

Movement in Unsaturated Soils, Groundwater and Remote Sensing in Hydrological Applications" (George Taylor, U.S. Geological Survey, Open File Report). In September 1972, the survey was reviewed and updated by an international panel of experts convened at Colorado State University. One of five major areas identified for priority attention by the international community (based on its potential importance to upgraded water assessment and management in the LDCs) was "Data Network Design: design of low-cost networks of data collection stations for rainfall-runoff measurements, streamflow, groundwater sampling, etc., that would optimize use of existing equipment and manpower by identifying minimum sampling requirements for meeting desired objectives."

VII. Other Donor Coordination

The project, as proposed, will require major coordination with, and contributions by, other donors. A major element in the Phase I segment of the project will be (a) to determine previous and ongoing activities of other donors, and (b) assessment of other donor interest in the development of a comprehensive water resources data network for the Sahelian countries involved. In addition, AFR, in its regular bilateral consultations with other donors (FAC, FED, etc.), will inform them of the progress and results of Phase I and elicit their interest in collaborating in the project. Donors in a position to provide major financing include FAC, FED, UNDP and possibly the IBRD. Donors interested in providing technical assistance could include WMO, FAO and FAC.

Previous and ongoing activities that will be reviewed in the Phase I study will include the hydrologic meteorological data-gathering work of the French/African organizations including ASCENA (Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar), ORSTOM (Office de la Recherche

Scientifique et Technique Outre Mer), IRAT (Institut de Recherches Agronomiques Tropicales et Culture Vivrieres) and CTFT (Centre Technique Forestiere Tropical) as well as the AID-assisted CIEH (Conseil Inter-Africain d'Etudes Hydrauliques). In addition, such national projects as the UNDP-financed project to assist the Senegalese Meteorological Service, and a smaller UNDP project in Mauritania, will need to be taken into consideration.

Since a multi-donor program is contemplated for Phase III, it is planned to arrange for continuing consultations between NOAA, AID and other donors on meeting the financial, training and technical requirements of implementing the total program. A consortium headed by a single donor (WMO, IBRD, FED, AID) may be organized or close collaboration could proceed on a more informal basis. In addition, it is anticipated that, following completion of the project and its turnover to the Africans, the donor group may wish to continue to convene from time to time/^{to}consult on the results and operations of the system, and to consider further assistance to the Africans should problems develop or new requirements materialize.

VIII. Financial Plan (Phase I)

The Phase I feasibility study will involve the collection and analysis of existing reports and data; consultation by a NOAA team with donors and, possibly, Sahelian officials in the U.S., Europe and Africa; and preparation of a final report for AID which describes present needs and opportunities, and sets forth recommendations for future AID actions. The costs to be incurred are comprised of: (1) salaries for NOAA in-house experts; (2) consultant fees for outside experts; (3) domestic and international travel; and (4) report compilation and printing, and are estimated as follows:

(a) Data Gathering

NOAA Salaries (3mm @ \$2,500)*	\$7,500
Travel	2,500
Per Diem	<u>1,750</u>
	\$11,750

(b) Preliminary Analysis

NOAA Salaries (2mm @ \$2,500)*	\$5,000
--------------------------------	---------

(c) Follow-up Visits (if needed)

NOAA Salaries (1mm @ \$2,500)*	\$2,500
Travel	1,500
Per Diem	<u>735</u>
	\$4,735

(d) Completion of Analysis and Documentation

NOAA Salaries (5mm @ \$2,500)*	\$12,500
NOAA Salaries (2mm @ \$4,000)*	8,000
Miscellaneous (Printing)	<u>2,000</u>
	\$22,500

(e) Outside Consultants (to be spread over items a-d)

Fees - 3 non-government experts for 150 days each	\$20,700
Fees - Government, 20 days effort @ \$4,000/mo.	2,670
Travel and Per Diem	<u>8,250</u>
	\$31,620

(f) Task Management

NOAA Salaries (2mm @ \$3,000/mm)	<u>6,000</u>
TOTAL COSTS	\$81,605

IX. Project Development Schedule

The project will be developed on the basis of the Phase I study which will be carried out by an inter-disciplinary team managed by NOAA. In addition to meteorological talent, the team would include a ground water hydrologist, a livestock specialist and an agronomist, the latter three prefer-

*Two principal NOAA experts are recent retirees. Cost to AID will be the difference between last salary and annuities now being received, or \$2,500 per month. Other NOAA in-house personnel will receive current salaries, estimated at \$4,000/month, including overhead.

ably with previous experience in the Sahel or similar areas. AFR would assist NOAA in the recruitment of the latter specialists.

Upon signing of the PASA with NOAA and the formation of the team, the following tasks would be carried out:

1. Review earlier and recent reports by WMO, FAO, French agencies, etc., on hydrological/meteorological needs of Sahel countries and present capabilities.

2. Consult with development agencies and Sahel country officials on needs and present capabilities of the region, plus ongoing and proposed activities of other donors (with emphasis on potential utility of a regional data network for agricultural development in the Sahel and manpower training requirements in relation to creation of a regional training center).

3. Prepare report to AID which presents results of tasks 1 and 2 and makes specific recommendations on: (a) critical needs of the region; (b) the feasibility and utility of designing and implementing a regional data network; (c) training needs and the possible role of a new regional training center; and (d) the future role for U.S. (AID) in relation to the programs and desires of other donors and the Sahel countries. (For further details on the content of the Phase I report, see Section III above.)

The duration of Phase I (dependent on the quality and scope of the recent FAO/WMO analysis of this area) would be approximately six months and would therefore be completed by mid-summer 1975.

The Phase I report, together with the recommendations of the Project Committee, would be the basis for an AFR/ECPR review which would furnish the guidelines for further action on the proposed project. Should the ECPR review be favorable, a PP would be prepared for Phases II and III. Preparation of the PP may involve further consultations with other donors and the

Sahelian governments, to clarify or firm up collaborative arrangements for the coordinated planning and implementation envisaged for Phases II and III. The PP for the project should be completed and acted upon by the ECPR well before the end of the second quarter of FY 1976.

X. Analysis

The PP will contain the material collected in the Phase I report as evaluated and modified in the process of AFR reviews and, if required, subsequent consultations with other donors or Sahelian countries. It is expected that NOAA staff and the members of the inter-disciplinary team responsible for the Phase I report will be available to the Design Coordinator for assistance in providing information for PP drafting purposes.

PROJECT DESIGNA. GOAL

1. Goal Statement: To increase agricultural and livestock production and individual standards of living in the Sahel through improved planning and management of available water resources.

2. Measures of Goal Achievement:

(a) Expanded production of food and livestock on a per capita basis.

(b) Ability of area to withstand periodic drought without extensive human suffering and loss of productive natural resource base.

(c) Increased amount of acreage under irrigation.

(d) Existence of strong natural water resource agencies which are influencing Government policies and programs in agriculture and livestock.

3. Means of Verification:

(a) Government records on food and livestock production yields of region.

(b) Amount of external aid and relief required by drought impacted region.

(c) Size and budgets of water resource agencies and involvement of personnel on national policy-level bodies and in international and regional activities.

4. Assumptions for Goal Achievement:

(a) Lack of proper water management is a limiting factor for food and livestock production in the Sahel.

(b) There are opportunities for strengthening indigenous institutional and manpower capabilities with respect to water management.

(c) Countries will participate meaningfully in regional water resources programs.

(d) Sufficient donor support for equipment and instrumentation can be attracted.

B. PURPOSE

1. Purpose Statement: To increase Sahelian country capabilities to manage available water resources in support of agricultural, livestock, and rural development through the design and implementation of a regional water resources data collection network.

2. Conditions Expected at End of the Project:

(a) Improved capacity of Sahel governments to predict and monitor occurrence and impact of water shortages; and to provide early warning of crop failure.

(b) Restructuring and upgrading of national agricultural weather services.

(c) Hydrological-meteorological data collection proceeding on a vastly upgraded basis in accordance with a detailed, integrated plan for the region that optimizes collection and minimizes costs.

(d) Countries and donors are investing in water resources equipment and instrumentation with much clearer appreciation of needs and options.

(e) Operation and integration of new data collection methods taking place (e.g., satellite systems, rain gauges).

(f) LDC institutions collecting and processing data in more efficient and effective manner.

(g) Increased number of trained LDC hydrologists and meteorologists employed by government agencies.

(h) Regional Sudano-Sahelian Meteorological Center and Regional Training School in operation, partially supported by AID funds.

3. Means of Verification:

- (a) Increase of weather services provided by national and regional authorities, including maps and forecasts.
- (b) Size and viability of national water resources and meteorology agencies.
- (c) Sharing of data collection and analysis systems, and amount of data exchange, among Sahel countries.
- (d) Review of holdings and analytical capabilities of national and regional data collection centers.
- (e) Assessment of amount of new systems and equipment used by indigenous resource agencies.
- (f) Numbers of newly trained and employed Sahelian hydrology-meteorology experts.

4. Basic Assumptions for Achievement of Purpose:

- (a) Political, economic and techno-scientific climate in West Africa lends itself to regional approaches to water resource data collection and management.
- (b) Cooperation of international organizations and other donors can be obtained (e.g., French, UNDP, WMO).
- (c) LDC institutions are capable of participating in the design and implementation of a network.
- (d) There is an unfilled demand for trained water resource experts within the country which can be identified and filled by funding of training programs.
- (e) U.S. technical resources (employed through NOAA) are available and will be welcomed by the Sahelian countries and other donors.
- (f) The financing of costs for maintenance of the completed network can be met by a combination of local and external support.

C. STATEMENT OF PROJECT OUTPUTS

1. Outputs and Output Indicators:

(a) Hydrology-meteorology data collection network for West Africa Sahel region designed and agreed to by African and donor institutions.

(b) West African governments and institutions have sharper focus on specific data and institutional needs, and mix of systems and stations which should be utilized.

(c) An improved LDC capability for water resources planning, management and investment (by virtue of Sahel country collaboration on the network design, and associated formal training of planners, managers and operators).

(d) Better state-of-the-art analyses of the use, limitations, costs and sources of optional data collection and analysis techniques and systems.

(e) Strengthened U.S. capability (in NOAA) to provide development assistance in this field, including assistance to AID in proposal evaluation and project design.

(f) Improved basis for U.S. and AID to make investments in water resources data collection and manpower training in Africa (including provision of technical support under the WMO-NOAA Voluntary Assistance Program - VAP).

2. Magnitude of Outputs

(a) Three-four optional regional data networks designed and evaluated by end of year-2; one best alternative selected and being implemented by end of project.

(b) Approximately 12 Sahel hydro-meteorologists trained in new techniques and methods of data collection and analysis, by end of project, with others receiving training at regional center.

(c) Twelve-fifteen U.S. experts (from NOAA and sub-contractors) familiar with Sahel hydrology and meteorology problems and needs, and actively

engaged in providing advisory services to Sahel countries and AID.

(d) AID personnel directly involved in review of Sahel country requests (through WMO to NOAA and State Department) for assistance under the Voluntary Assistance Program.

(e) Expanded water data holdings and knowledge of state-of-art on part of African regional water resources organizations (especially the CIEH and Niger River Basin Commission).

(f) Series of state-of-the-art reports, in English and French, on hydrology-meteorology data systems and network design for use by African countries.

3. Verification of Outputs

(a) AID discussions with country officials involved in program.

(b) Assessment of relation of equipment requests and emplacement to network design.

(c) Number of new LDC hydro-meteorologists participating in program.

(d) Consultations with WMO, FAO and the French, and degree of cooperation and related capital and technical assistance forthcoming from these potential donors.

(e) AID analysis of evolution of involved national agencies, CIEH and Niger River Basin Commission, plus growth and impact of regional training center.

4. Assumptions for Achieving Outputs:

(a) A regional approach to network design is practical for the Sahel, and will be supported by the countries of the region.

(b) Cooperation by the French, WMO and FAO will be forthcoming.

(c) WMO or some other appropriate donor will gain sufficient support to establish a regional training and data coordination center for the Sudano-Sahelian region.

(d) There is sufficient supply of persons capable of being trained to become experts and knowledgeable and interested planners in the Sahel to provide the necessary local management and operational skills for the project after external assistance has phased out.

(e) Many of the newer technological innovations in water resources data collection and analysis are adaptable and relevant to the Sahel.

D. STATEMENT OF PROJECT INPUTS

1. Inputs and Input Indicators

(a) AID support (\$1-2 million over 4-year period) for involvement of 12 NOAA and other U.S. experts; training costs for LDC participants in network design; selected equipment costs; and production, translation and publication of state-of-the-art reports.

(b) AID support (\$1-3 million over 3-year period beginning in FY 1976) for regional water resources training and data coordination center if the donor community agrees to establish one.

(c) Problem analyses, guidance and technical and capital assistance (estimated at up to \$8 million) by WMO, FAO, the French, and other donors.

(d) NOAA special intellectual and operational capabilities developed to meet LDC needs through its management of such inputs as the U.S. weather satellite series.

2. Verification of Inputs:

(a) AID monitoring of project with assistance of advisory committee.

(b) Review of contribution of other donors toward implementation of national data networks and regional data and training center.

3. Assumptions for Providing Inputs:

(a) NOAA can provide relevant experts to assume leadership role on the U.S. side.

(b) Other donors are sufficiently aware of Sahelian needs, and complementary contributions that they and the U.S. can make, to work cooperatively with AID and NOAA in this project.

(c) Initial feasibility study will indicate that U.S. investments as proposed can make a valuable contribution toward improved water management in the Sahel.



ANNEX VI

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

Date : March 12, 1976

Reply to Attn. of: W11

To : John Blumgart, AFR/DS, AID
State Department

From : *Gerald A. Petersen*
Gerald A. Petersen, W11
National Weather Service, NOAA

Subject: Sahel Water Data Network Project - Technical Assessment

Based upon the NOAA Team's review of related documentation, discussions with representatives concerned with the Sahel in Geneva, Rome, and Paris, and the on-site survey conducted in the Sahelian countries, the necessary engineering and financial planning has been completed for the provision of U.S. assistance in support of an improved agrometeorological and hydrological program in the Sahel. More specifically, we believe that the:

1. WMO/UNDP/CICSS document circulated at the July 1, 1976, donor's meeting in Geneva presents a sound and reasonable financial plan for proceeding with the technical aspects of the project.
2. Request from Dr. D. Rijks, Program Coordinator of the WMO projects in the Sahel, represents a worthwhile and appropriate approach for initial U.S. funding support (see attachment).

In summary, the degree and extent of the planning effort has reached the point where action should begin. Cost estimates are as firm as can be attained in a changing economic world and the technical and engineering components are reasonable and focussed on the agricultural needs of the Sahel.

Attachment

cc:

- B. Zavos, W13
- C. Cartwright, EM2

ATTACHMENT

SAHEL PROJECT
U.S. CONTRIBUTION FOR FISCAL YEAR 76

The list below represents our recommendations for carrying out the initial efforts described in the material forwarded by Dr. D. Rijks. We have made some changes predicated mainly on normal delays associated with shipping equipment and experience with doing contractual work in the Sahel.

1. Up to 50 Leeds & Northrup Solar Radiation Recorders with digital integrators at an estimated cost of \$3,000 each (defer expert support until FY77)	=	\$150,000
2. Publications	=	10,000
3. Telecommunications Study Contract	=	30,000
4. NOAA Services		
a. Accompany telecomms expert to Geneva and Dakar	=	2,500
b. Accompany AID Delegation to Committee meeting in Geneva	=	1,500
c. NOAA charges including one man-month of direct support	=	<u>6,000</u>
SUB-TOTAL	=	\$200,000
5. Agricultural Equipment including irrigation equipment and WMO charges	=	<u>60,000</u>
TOTAL		\$260,000

Delivered by Loren Young 8

Opening Remarks by U. S. Delegation
(For Presentation at the Donor's Meeting for the
Agrometeorological Programme in the Sahel, Geneva
January 8-9, 1976)

Mr. Chairman:

I want to say first of all how much the U. S. Delegation appreciates WMO's invitation to participate in this meeting and how pleased we are to be here. The U. S. Government as well as the American people have felt a deep concern--a concern which we know has been shared in other countries and by the entire international community--about the recent tragic events in the Sahel and we wish very much to participate in international efforts which are designed to strengthen the ability of the Sahelian governments to mitigate the consequences of such calamities in the future. We entirely agree that the agro-meteorological and hydrological problems in the region must be addressed on a comprehensive basis. We are also pleased to note the priority accorded to this activity by the Sahelian governments has again been emphasized at last month's heads of state meeting in Nouakchott.

Today's meeting will give us a timely opportunity to review the progress that has been made in the program since our initial meeting last July and to discuss the other organizational and programmatic matters which are on the agenda. We

- 2 -

hope that by the conclusion of our discussions tomorrow evening we will have given a significant impetus to further progress in developing and implementing this activity.

I wish to reiterate at the outset the U. S. Government's strong support of the CILSS/UNDP/WMO program as it has been elaborated to date and to reconfirm our readiness to seek up to 4.26 million dollars for the program over the next seven years. The specific levels of disbursement will of course depend on the programming decisions we will be arriving at jointly over the coming years and on the availability of funds. I should add in this connection that for the present fiscal year we have informed our Congress and have included in our budget a first increment of \$260,000.

As we see it, one of the important purposes of this meeting is to discuss and reach agreement on the program's basic organizational structure and the mechanisms for financing from time to time the various program components which have become ripe for execution. We do not desire to comment in detail at this time on the concrete organizational proposals contained in document 2 but will of course give our view in the course of our subsequent discussions. For now I only wish to indicate that the United States hopes to be able to make its contribution to the program, to the largest practical extent, through the provision of specific goods and services such as equipment and experts. We believe this method would be completely appropriate

- 3 -

in achieving our common program objectives. We look forward to having a more detailed discussion on these aspects when we consider the organization and method of work of the Financial Management Committee. Let me just add though that we are prepared to also make cash contributions to finance activities which clearly could not be carried out in another way, for example a portion of the local construction costs of the regional center.

The foregoing, Mr. Chairman, is about all that our delegation wishes to say by way of general introductory remarks. Before concluding, however, I do wish to offer a few comments on the NOAA Report. We regret we were unable to make it available to the participants at an earlier date. An English edition of the report has been sent to all interested parties and a French edition will be circulated within a month's time.

This Report is intended to strengthen and to complement the program recommended in the original WMO/FAO study. While the U. S. Government has not yet adopted a formal position on the Report--and indeed we are most interested in hearing your comments on it--our initial reaction is that it has in fact enhanced the original study in a very useful way. There are a few points in the report which we believe merit special emphasis. I would like to briefly mention some of these, leaving a more detailed elaboration for our discussions later today or tomorrow.

- 4 -

These points are:

(1) It is essential to plan for the practical interpretation and use of the meteorological and hydrological data which are to be collected. I don't need to belabor this point, since we all recognize that the predominant purpose of the entire activity should be conceived as one of increasing the productivity and well-being of the farmers and herders who should be regarded as the main beneficiaries of this effort.

In this connection, I would like to draw attention to the recommendation made on page 15 of the NOAA Report. It calls for a prototype user services experimental facility at Niamey, to develop methods and techniques for formulating and disseminating water resource data in terms that are meaningful and relevant to the needs of agricultural and livestock producers in the region. The U. S. would be happy to assist in the planning and design of such a facility--as well as to assist with other planning aspects which may be appropriate--through the provision of a multi-disciplinary team, at an ~~appropriate~~ time, if this were seen as desirable by the governments concerned and by the proposed Financial Management and Technical Committees. It is clear, particularly in view of the recent CILSS Ministerial decision, that planning for the data dissemination and utilization aspects of the program must be given high priority.

- 5 -

(2) Another aspect highlighted in the NOAA Report relates to the use of modern technology to enhance the accuracy and timeliness of data collection and forecasting.

(3) Lastly, we believe that the concern expressed in the NOAA Report with respect to the need to begin planning for the long-term financial viability of the program merits careful attention. We think it essential that plans be developed for the gradual assumption of responsibility for financing the agro-meteorological and hydrological program by the Sahelian governments themselves. We are pleased to note, in this connection, that the Program's Technical Committee will be charged with the responsibility for elaborating a funding formula which would enable the CILSS governments to plan for financing the local and operating costs of these activities over the long run.

Let me conclude, Mr. Chairman, by reiterating our pleasure at being in attendance at this meeting. We have come here without preconceptions and are prepared to listen carefully to what others have to say and to engage in a frank, open and cordial discussion. Being motivated as we all are by a shared concern and sympathy for the people of the Sahel, I'm sure that we will find little difficulty in reaching agreements that will serve the common purposes we have come here to promote.

ANNEX VIII

WORLD METEOROLOGICAL ORGANIZATION

=====

DONORS' MEETING FOR THE
WMO PROGRAMME IN THE SAHEL

Geneva, 8 - 9 January 1976

SUMMARY REPORT

- 1 -

The Donors' Meeting for the WMO Programme for Strengthening the Agrometeorological and Hydrological Services of the Sahelian Countries held its session in the WMO Secretariat in Geneva, on 8 and 9 January 1976. The list of participants is attached as Appendix I to this report.

1. ORGANIZATION OF THE MEETING

1.1 Opening of the meeting (Agenda item 1)

Mr. R. Schneider, Deputy Secretary-General of WMO, welcomed the participants to the meeting, on behalf of the Secretary-General. He pointed out that the scope of the WMO Sahelian Programme was so large that support had to be obtained from the UNDP and also contributing countries and organizations, and that the purpose of the meeting was to establish a structure which would facilitate the management of the resources put at the disposal of WMO to implement the programme. He offered the fullest co-operation of the Organization and wished the meeting a successful session.

His Excellency, Mr. M. Bayere, Minister of Rural Economy and Climatology of Niger and Co-ordinator of CILSS, thanked the Secretary-General of WMO for the invitation. He emphasized the high priority given to this programme by the CILSS countries, as well as the contributing countries, and expressed the wish that the meeting would confirm the financing of the whole programme, a large part of which consists of counterpart contributions from the participating countries. The Minister thanked the UNDP and WMO, as well as the Resident Representative of the UNDP in Niger and the WMO programme co-ordinator for the efficiency which they have shown in starting the programme. He observed that the Niger Government has already shown its support to the programme and will continue to give the maximum possible support. He pointed out that, while the international community has responded very well to the emergency needs of the Sahelian countries, medium and long-term programmes have more difficulties in finding adequate financing. In particular, he noted that many projects prepared by the CILSS, as from its first meeting in Ouagadougou, have not yet found a source of financing, and kindly requested the donor countries present at this meeting to give particular attention to these projects.

Mr. I. Coker, of the U.S.A. Agency for International Development, thanked the WMO for its invitation to participate in the meeting. He expressed the deep concern of the U.S.A. about the recent tragic events in the Sahel, reiterated the U.S.A. Government's plans to support the programme to the extent of 4,26 million dollars over the next seven years, with the first instalment of \$260,000 planned for the year 1976, and pointed out that this contribution would, to a large extent, be made through specific goods and services, such as equipment and experts.

1.2 Nomination of the chairman (Agenda item 1)

Mr. Schneider mentioned that the normal policy of the WMO was to have a chairman elected amongst the members of the delegations. He noted that in this particular meeting, however, requests had been made that the chairmanship be taken by WMO. In the absence of any nominations from the floor, Mr. R. H. Foote, Director of the Technical Co-operation Department of WMO, was designated chairman for the meeting.

2. ADOPTION OF THE AGENDA (Agenda item 2)

The chairman first mentioned some discrepancies in the title given to the meeting in the different documents. In view of the hydrological implications, the abbreviated title of the meeting should read: "Donors Meeting for the WMO Programme in the Sahel". Considering views expressed by some delegations, a revised agenda was proposed and adopted; the agenda, as adopted, is reproduced in Appendix II to this report.

3. REVIEW OF DEVELOPMENT IN THE IMPLEMENTATION OF THE PROGRAMME (Agenda item 3)

3.1 The WMO programme co-ordinator reviewed the progress made, both of the centre project and of the seven country projects, approved under UNDP financing. He outlined the training activities starting at the centre, and indicated the preparations made for the construction of the building for the centre, for which multilateral donations are being utilized. The meeting noted with satisfaction the progress made so far.

3.2 The WMO Secretariat provided information on the overall scope of the WMO activities in the fields of agricultural meteorology and hydrology on the African continent which relate to the programme in the Sahel. The meeting was informed of the various studies under execution or planned, as organized under the WMO regular programme or in collaboration with other UN agencies and donor organizations. A brief review was also given of existing and planned WMO/UNDP hydrological projects in the Niger River basin, as well as in other areas.

3.3 Concern was expressed by one donor country regarding the availability of students and regarding the timely construction of buildings to house the headquarters of the meteorological services in individual countries. The programme co-ordinator noted, however, that there were more candidates for training than the facilities available could accommodate; he observed also that Upper Volta had made an encouraging progress in approving funds for the construction of a building for its meteorological service.

4. IDENTIFICATION OF PRIORITY PROGRAMME TO BE FINANCED FROM RESOURCES OTHER THAN UNDP (Agenda item 4)

A provisional plan of expenditures from bilateral donations for the next six months was presented by the WMO programme co-ordinator, with a further tentative outline of expenses for the construction of the centre building only for the next 24 months. The expenditures up to June 1976 were estimated to be \$253,000, while the first indication of expenditures through January 1978 was \$1,654,320.

5. LONG-TERM PLAN AND FINANCIAL AND MANAGEMENT IMPLICATIONS (Agenda item 5)

A long-term plan for the programme is available in the project document for the centre component and also indicated in the brochure "Programme for the strengthening of the agrometeorological and hydrological services in the Sudano-Sahelian zone", prepared by WMO for the UNSO Donors' Meeting of July 1975. Several donor countries expressed different philosophies as to how the programme should be managed. One donor country representative expressed great concern that the arrangements proposed in the documents to the meeting would prove insufficient in the long term. He considered necessary to raise, at this meeting, the problem of the consolidated structure of the programme for the long term. He developed the arguments for this consolidation to take place in due course in the form of an international institution provided with necessary funds on an annual basis. This institution would be administered by a council gathering with high-level representatives of the contributing organizations and countries, together with the user organizations and countries. The paper, presenting this proposal in more detail, is attached as Appendix III to this report.

Another donor country, however, felt that given existing realities, it was best, at this time, to go forward with arrangements, as presently envisaged, leaving possible further evolution in the programme and in its conception to the future.

The third donor supported the Administrative Council idea and felt that the president of the Council might be the appropriate person to raise additional bilateral donations to complete the required funds. It also felt strongly that WMO should be the manager of the project. The representative of the CILSS suggested that the WMO programme might eventually be integrated into the "Institut du Sahel".

The UNDP representative expressed the opinion that, in dealing with an ongoing project, it might be better to accept the traditional concept. He proposed a three-fold arrangement: board of directors of the technical services of the recipient countries, a financial management committee in which CILSS would be represented and, thirdly, a scientific council, as advisory body, which would ensure the establishment of institutional links between the programme and centres of excellence, both in the developed and developing world, to ensure the exchange, at the highest scientific and technical level, of information, scientific concepts and scholars. He recommended that the work programme be reviewed to include the activities under bilateral finances, and that a table should be prepared of the joint financing.

There was, nevertheless, a consensus that some agreement should be reached to find a working mechanism for the short-term arrangements with present staff and funds, which could lead into something more elaborate in the long range. It was accepted that the Administrative Council concept could not be brought into existence at this moment. It was further realized that the programme co-ordinator had had informal contacts with the international consortium for agriculture to ascertain whether additional finances could be found. One donor country felt, however, strongly that the Executive Agency should be responsible for the management of the funds and that the proposed committees should be under the guidance of WMO/UNDP. It was agreed that the concept of establishing two committees, one for the co-ordination of and advice upon the international inputs and one technical committee could be accepted.

Regarding the remark of various delegates that efforts should be made to raise additional bilateral funds, the role of UNSO in this context was explained, and the UNSO delegate assured the meeting that his organization is continuing efforts to obtain additional funds. Nevertheless, various delegates suggested that additional efforts to fully acquaint other potential donors with the programme, with a view to enlisting their participation and support, be undertaken by UNSO in co-ordination with WMO at the earliest practical date.

The meeting agreed that the funds that will be provided by the donors should also be used to ensure the continuation of the activities by WMO with respect to reinforcement of the hydrological services in the CILSS countries, and the programme to be undertaken by the centre, after the termination of the sub-contract with ORSTOM.

6. REVIEW OF THE TERMS OF REFERENCE OF THE PROPOSED COMMITTEES
(Agenda item 6)

There was considerable discussion on the title of the committee. An agreement was finally reached on the title "Co-ordinating and Advisory Committee". The meeting reviewed the terms of reference for the committee proposed by WMO and specific modifications proposed by representatives of several donors. The revised terms of reference agreed upon finally are attached as Appendix IV to this report.

It was agreed, subject to the formal approval of the authorities concerned, that the first meeting of the Co-ordinating and Advisory Committee will be held at a time and place indicated in the report under agenda item 9 of the agenda. The meeting agreed that, until such time that the committee has been formally established at the first session, WMO should take all actions and decisions necessary for the smooth implementation of the programme. It is particularly to be noted that the meeting felt that in the beginning of the project, meetings more frequently than once a year would be necessary.

Regarding the functions of the committee, it should be noted that the UNDP representative wishes to be put on record that the normal UNDP procedures of financing should be maintained with reference to the WMO/UNDP projects. The

meeting proposed some additional functions for the Co-ordinating and Advisory Committee and, in particular, suggested that technical advisory panels be established to deal with specific questions, such as equipment criteria and dissemination of data, and that the advice of other agencies, such as FAO, be sought in relevant cases. In respect of the cost of the meetings, it was accepted that contributing organizations should charge the cost in accordance with established procedures and, in particular, that the cost of attending of the UNDP representative and WMO co-ordinator should be charged to the programme.

The meeting also reviewed the terms of reference of the so-called "technical committee" aiming at making recommendations which should be forwarded by WMO to CILSS. There was some discussion on the title of the committee. It was generally felt that the word "technical" should be kept in to ensure the appropriate participation of technicians in the committee. There was a final agreement to recommend the title "CILSS Technical Co-ordination Committee." The terms of reference, including suggested revisions, are attached as Appendix V. WMO will discuss with CILSS the changes proposed, but will not do so before receiving UNDP comments.

7. ESTABLISHMENT OF PROCEDURES FOR UTILIZATION OF BILATERAL DONATIONS
(Agenda item 7)

Draft procedures for the utilization of financial and other donations prepared by WMO were discussed by a small working group. It was agreed that the revised version worked out by WMO will be sent to the donor countries for further comments and be discussed again at a forthcoming meeting of the Co-ordination and Advisory Committee.

8. OTHER BUSINESS (Agenda item 8)

The meeting understood that inputs resulting from contributions in funds or in kind, provided by the donor governments and organizations, would fully benefit from the relevant provisions of the Convention on Privileges and Immunities of the Special Agencies, adopted by the General Assembly of the United Nations (Resolution 22(I)(D) applicable to all WMO operations financed from its Trust Funds.

A brief discussion on the NOAA report, entitled "Sahel water data network and water resources management project" took place, and the U.S.A. delegation requested that participants to the meeting send comments to WMO or NOAA within thirty days.

9. DATE AND PLACE OF NEXT MEETING (Agenda item 9)

It was agreed that the next meeting, that is the first meeting of the Co-ordinating and Advisory Committee, would take place from 24 to 26 May 1976, in Geneva. It was further agreed that a representative of WMO would discharge the functions of chairman until the first meeting of the committee is convened.

10. CLOSURE OF THE MEETING (Agenda item 10)

The meeting was closed on 9 January 1976, at 6.25 p.m.

Appendices: 5

LIST OF PARTICIPANTS

- CILSS H.E. Mr. Bayere, Minister of Rural Economy and Climatology,
Niger, Co-ordinator of CILSS
- Mr. Yaya Idrissa, Division des projets et programmes
- UNSO Mr. P.A. Plaktor, Deputy Director, Ouagadougou
- UNDP Mr. A. Rotival, Resident Representative of the UNDP in Niger, Niamey
- BELGIUM Prof. E. Bernard, Représentant l'Administration générale de la
Coopération, Ministère des Affaires étrangères
- Mrs. J. Harroy, Attaché, Mission permanente, Genève
- Mr. J.L. Van Hamme, Météorologiste, responsable de la Section
Prévisions, Institut royal météorologique
- NETHERLANDS Mr. J.F. van Dunné, Ministry of Foreign Affairs, Directorate for
Financial and Economic Development Co-operation
- Mr. B.M. Kamp, Head of the Bureau for External Affairs of the
Royal Netherlands Meteorological Institute
- Mr. F.P.R. van Nouhuys, First Secretary of Embassy, Permanent Mission,
Geneva
- U.S.A. Mr. I. Coker, AID, Washington
- Mr. J. Blungart, AID, Washington
- Mr. D. Gates, AID, Washington
- Mr. G. Peterson, NOAA, Washington
- Mr. G. Klein, Permanent Mission, Geneva
- Mr. G. Cartwright, Permanent Mission, Geneva
- WMO Mr. R. Schneider, Deputy Secretary-General
- Mr. R.H. Foote, Director, Technical Co-operation Department
- Mr. D.H. Nijhoff, Chief, Division for Africa, Technical Co-operation
Department

WMO Mr. B. Lagarde, Division for Africa, Technical Co-operation Department

 Mr. N. Veranneman, Director, Meteorological Applications and Environment
Department

 Mr. D. Bargman, Meteorological Applications and Environment Department

 Mr. E. Davy, Consultant, Sahelian Studies, Meteorological Applications
and Environment Department

 Professor J. Nemeč, Director, Hydrology and Water Resources Department

 Mr. W. Klohn, Hydrology and Water Resources Department

 Mr. A. Weber, Chief, Finance and Budget Division

 Dr. D.A. Rijks, Programme Co-ordinator

AGENDA

1. OPENING OF THE MEETING AND NOMINATION OF CHAIRMAN
2. ADOPTION OF AGENDA
3. REVIEW OF DEVELOPMENT IN THE IMPLEMENTATION OF THE PROGRAMME
4. IDENTIFICATION OF PRIORITY PROGRAMME TO BE FINANCED FROM RESOURCES OTHER THAN UNDP
5. LONG-TERM PLAN AND FINANCIAL AND MANAGEMENT IMPLICATIONS
6. REVIEW OF THE TERMS OF REFERENCE OF THE PROPOSED COMMITTEES
7. ESTABLISHMENT OF PROCEDURES FOR UTILIZATION OF BILATERAL DONATIONS
8. OTHER BUSINESS
9. DATE AND PLACE OF NEXT MEETING
10. CLOSURE OF THE MEETING

NEED FOR A LONG-TERM CONSOLIDATED STRUCTURE
OF THE PROGRAMME IN THE FORM
OF A SUITABLE INTERNATIONAL INSTITUTION

Summary of the statement made by
E. BERNARD, Principal Delegate for Belgium,
on Agenda Item 5

Document (2), submitted by WMO "Establishment of a Financial Management Committee" although achieving useful progress in co-ordination in the short-term, i.e. until the completion of the first phase of the project, is not appropriate for long-term requirements.

When the project enters the operational phase it will be necessary to follow and forecast: the course of the weather, the distribution of monsoon rainfall, the course of changes in river discharges. It will then be necessary to issue advice to farmers in order to assist them in making the best use of the water resources and in organizing their farming activities.

This is a long-term task and, due to the extent of the territory to be covered, the lack of knowledge as regards tropical meteorology and the present inadequacy of the fourteen national services concerned (meteorology and hydrology), the scientific and technical scope is enormous.

In order to build up a system for these fourteen national institutions and in order to make the Centre at Niamey the focal point of the system it would be necessary to consolidate this centre as an International Centre or Institute of Applied Meteorology and Hydrology, with the emphasis on applications to farming.

In order that this centre should become permanent and efficient, it should be staffed by a highly qualified international team of experts, undertaking operational work and improving methods, together with African experts detached from the national services. The most up-to-date meteorological equipment should also be available for data collection, data-processing, forecasting and the dissemination of advice or alerts.

The centre should also be a meeting place for professors or scientists specializing in the tropical meteorology of the Sahel or West Africa. For, due to the nature of the problems, the geographical entity involved is in fact West Africa together with the vast area of the Atlantic where the monsoon originates.

In order that it may function efficiently and in order that it may be provided with the necessary funds each year (provisional estimate, of the order of \$2 000 000 per annum) the structure of the centre should be based on the experience of the project for the prevention of onchocercosis and on the experience of the international research institutes for tropical agronomy.

The structure proposed by the Belgian delegation, as a basis for further thought and discussion, is as follows:

- (a) An Administrative Council consisting of high-ranking representatives of donor countries and bodies and of the African countries concerned (CILSS).

The chairman of the Administrative Council should be a person of high reputation, in particular, making contacts to ensure the collection of funds.

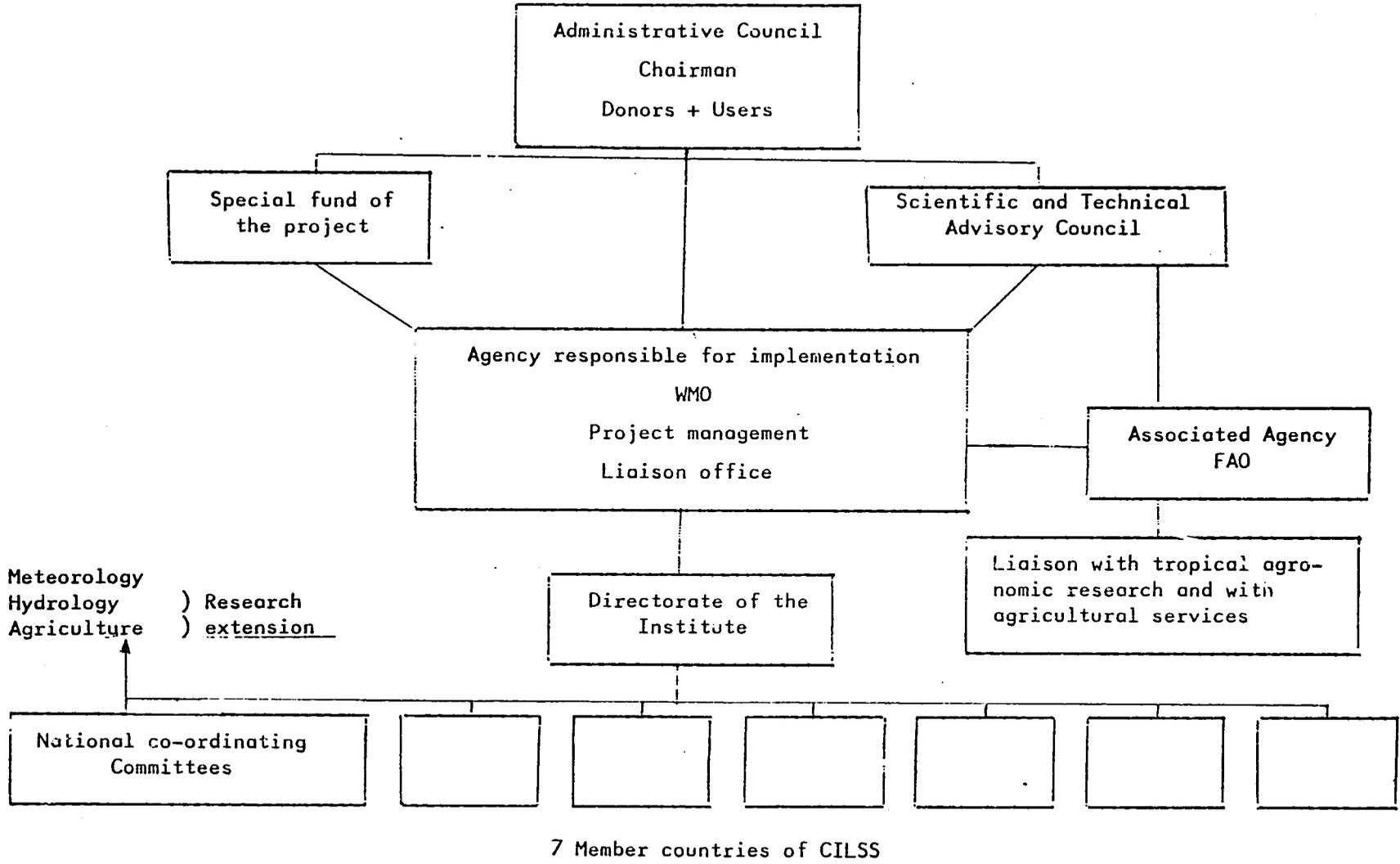
- (b) Two bodies to assist the Council, the first being financial, the Special Fund for the Project, and the other being scientific and technical, the

Scientific and Technical Advisory Council, consisting of high-ranking specialists, whose role would be to design the programme and its annual phases with the assistance of national committees (e).

- (c) At the centre of the arrangement, the executing Agency, WMO would assume a role of direction by the Secretariat, and of liaison. A Project Manager paid from the funds for the project, would be responsible for these tasks. Due to the importance of liaison with tropical agronomic research it is necessary that FAO should be the Agency associated with WMO.
- (d) In Africa, a Director of the Institute with international and African experts would ensure the implementation of the programme.
- (e) National Co-ordinating Committees (meteorology, hydrology, agriculture) would ensure the national implementation of the programme. They would give details of new problems arising, in order to determine the overall programme periodically.

The Belgian delegation expresses its conviction that in uniting the concentration of facilities, quality and continuity, by introducing such a structure, the project could be viable in the long-term, ensuring that the financial aid granted by the donor countries and bodies is well worth-while for the countries of the CILSS.

The annex summarizes diagrammatically the proposed consolidating structure. The Belgian Delegation considers that it is realistic, since it measures up to the difficulties to be overcome, and since it is based on experience.



TERMS OF REFERENCE, RULES AND PROCEDURE FOR
THE "CO-ORDINATING AND ADVISORY COMMITTEE" FOR THE
PROGRAMME FOR STRENGTHENING THE AGROMETEOROLOGICAL AND HYDROLOGICAL SERVICES
OF THE SAHELIAN COUNTRIES AND ESTABLISHMENT OF A CENTRE FOR TRAINING AND
APPLICATIONS OF AGROMETEOROLOGY / OPERATIONAL HYDROLOGY

CHAPTER I - PURPOSE

Article 1

The Co-ordinating and Advisory Committee shall have a co-ordinating and advisory role relating to international financial and other inputs to the execution of that part of the Programme which is financed by contributions from contributing Governments or Organizations.

CHAPTER II - ORGANIZATION

Article 2

- (i) The Committee shall consist of one representative each from the United Nations Development Programme, the United Nations Sahelian Office, the Permanent Inter-State Committee for Drought Control in the Sahel, the World Meteorological Organization and any government or organization which is financially contributing or made a commitment to so contribute to the programme administered by the World Meteorological Organization as the Executing Agency; specialized agencies whose advice might benefit the Programme will also participate in the meetings;
- (ii) The chairman of the CILSS Technical Co-ordination Committee will be an ex-officio member of the Co-ordinating and Advisory Committee;
- (iii) WMO can invite by itself or at the suggestion of one or more of the other members such other persons to meetings, as required.

Article 3

CHAIRMAN:

One member of the Co-ordinating and Advisory Committee will be elected by the Committee at the end of the last meeting of a year to be chairman for the coming year.

Article 4

SECRETARY:

The secretary of the Co-ordinating and Advisory Committee shall be designated by the World Meteorological Organization.

Article 5

- SESSIONS:
- (i) The Co-ordinating and Advisory Committee shall meet in principle at least once per year at a time to be decided by the Committee or at any intervening time during the year if so requested by WMO or at least three of its members;
 - (ii) Meetings shall be held either at the World Meteorological Organization or at the Programme Headquarters;
 - (iii) The agenda will be prepared by the secretary in consultation with the chairman and shall be submitted to each member of the Committee at least one month before the date of the meeting;
 - (iv) The reports of each session as approved by the chairman shall be distributed to members of the Committee no later than 30 days after the end of the session.

CHAPTER III - FUNCTIONSArticle 6

The functions of the Co-ordinating and Advisory Committee will include:

- (i) Advise on the necessary financial and other procedures for the handling of the funds and contributions made available by the contributing governments and organizations;
- (ii) Reviewing the reports submitted to WMO by the CILSS Technical Co-ordination Committee on the counterpart contributions to the Programme;
- (iii) Reviewing the financial implications raised by the recommendations to WMO of the CILSS Technical Co-ordination Committee;
- (iv) Reviewing the reports submitted by the World Meteorological Organization on the execution of the Programme and the utilization of the different financial and other inputs;
- (v) Reviewing the proposed plan of action and the budget for the coming year as prepared by the World Meteorological Organization for the implementation of the Programme;
- (vi) Considering such other matters relating to the carrying out and the financing of the Programme as may be referred to the chairman by any member;
- (vii) Reviewing the proposed plans by WMO and UNSO for obtaining additional donations for the Programme;
- (viii) Advise on establishing and financing technical advisory committees.

CHAPTER IV - COST OF MEETINGS

Article 7

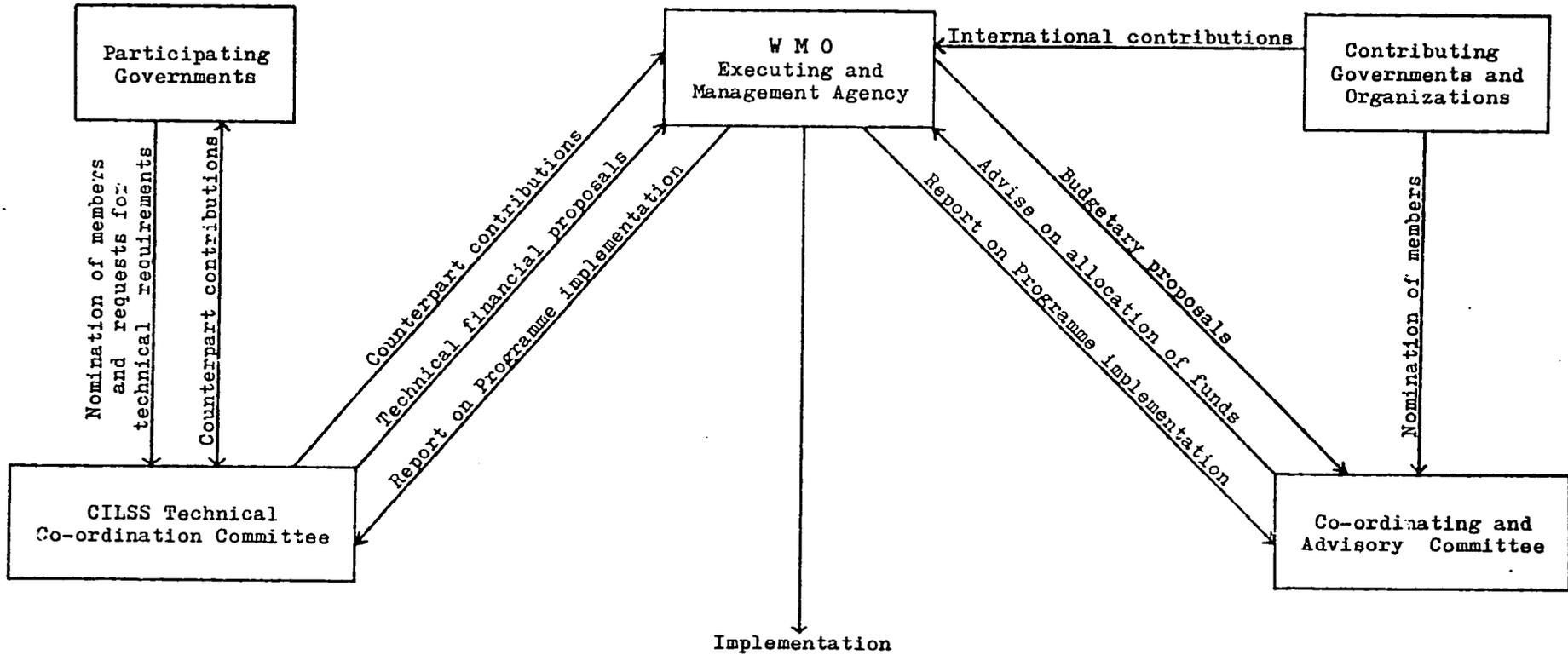
Each contributing government shall bear the cost of expenses incurred by its representative to the Co-ordinating and Advisory Committee in attending meetings of the Committee. In respect of contributing organizations, such costs will be financed in accordance with the established procedures between WMO and these organizations.

CHAPTER V - GENERAL PROVISIONS

Article 9

The Co-ordinating and Advisory Committee may propose to WMO any additions or changes to these terms of reference that may be deemed necessary. WMO shall consult the CILSS Technical Co-ordination Committee before making such changes as agreed upon.

PROGRAMME MANAGEMENT DIAGRAM



TERMS OF REFERENCE, RULES AND PROCEDURE FOR
THE "CILSS TECHNICAL CO-ORDINATION COMMITTEE" FOR THE
PROGRAMME FOR STRENGTHENING THE AGROMETEOROLOGICAL AND HYDROLOGICAL SERVICES
OF THE SAHELIAN COUNTRIES AND ESTABLISHMENT OF A CENTRE FOR TRAINING AND
APPLICATIONS OF AGROMETEOROLOGY / OPERATIONAL HYDROLOGY

CHAPTER I - PURPOSE

Article 1

The CILSS Technical Co-ordination Committee shall have overall responsibility for the participating governments participation in the execution of the Programme as laid down in the project documents, and will act as the Co-ordinating and Advisory Committee for the governments with the World Meteorological Organization as the executing agency.

CHAPTER II - ORGANIZATION

Article 2

MEMBERS:

- (i) The Committee shall consist of the directors of the meteorological services and the hydrological services of each of the countries participating in the Programme;
- (ii) The WMO Programme Co-ordinator, the WMO representative and the chairman of the Co-ordinating and Advisory Committee will be ex-officio members of the CILSS Technical Co-ordination Committee;
- (iii) The CILSS Technical Co-ordination Committee and the WMO representative shall have the power to invite such other persons to the meetings, as required.

Article 3

CHAIRMAN:

The chairmanship of the CILSS Technical Co-ordination Committee shall rotate by countries in the French alphabetical order and be held for a period of one year.

Article 4

SECRETARY:

The director of the centre of the Programme shall be the secretary of the CILSS Technical Co-ordination Committee.

Article 5

SESSIONS:

- (i) The CILSS Technical Co-ordination Committee shall meet every six months and at any other time at the request of at least three of the members;
- (ii) Meetings will normally be held at the Programme Headquarters or at any place in the participating countries as agreed by the CILSS Technical Co-ordination 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 date of the meeting;
- (iv) The reports of each session as approved by the chairman shall be distributed to members no later than 30 days after the end of the session.

CHAPTER III - FUNCTIONS

Article 6

The functions of the CILSS Technical Co-ordination Committee will include:

- (i) Considering the technical proposals of the participating governments and make the necessary recommendations to the World Meteorological Organization;
- (ii) Ensuring that participating governments contributions are made as scheduled, and that buildings, equipment and facilities listed as counterpart contributions in kind in the project documents are available as needed;
- (iii) Reporting to WMO on the counterpart contributions;
- (iv) Establishing standards for the training of counterpart staff to enable the director of the centre (secretary of the Committee) to approve and forward candidatures for fellowships to the World Meteorological Organization;
- (v) Advise the World Meteorological Organization on any UNDP or external financial input deemed necessary for the proper implementation of the Programme.

Article 7

The CILSS Technical Co-ordination Committee will in addition:

- (i) Review the reports submitted by WMO on the progress and advise on the future operations of the Programme;
- (ii) Submit for approval of the governments the annual and supplementary counterpart budgets, as appropriate, prepared in accordance with the project documents, and in consultancy with WMO and review the expenditure;
- (iii) Recommend to governments, rules, terms and conditions of secondment of counterpart staff assigned to the Programme;
- (iv) Approve on behalf of the governments the candidatures of international staff to be assigned to the Programme by the World Meteorological Organization;

- (v) Make any reallocation of funds as necessary within the approved annual counterpart budget;
- (vi) Establish the necessary financial procedures for the handling of the counterpart funds made available by the governments in accordance with the project documents;
- (vii) Advise on such other matters as may be appropriate for the purpose of the Programme.

CHAPTER IV - DIRECTOR OF THE CENTRE

Article 8

The director of the centre appointed by the participating governments in accordance with the project documents shall be the secretary of the Committee.

Article 9

In discharging his duties, the director will:

- (i) Be responsible to the CILSS Technical Co-ordination Committee for the administrative supervision of counterpart professional and auxiliary personnel assigned to the Programme;
- (ii) Report quarterly to the CILSS Technical Co-ordination Committee on the administrative, financial and technical aspects of the participating governments contribution to the Programme;
- (iii) In his capacity as secretary, prepare the draft annual counterpart budgets and supplementary estimates as necessary for consideration by the CILSS Technical Co-ordination Committee;
- (iv) Submit proposals to the CILSS Technical Co-ordination Committee concerning the furtherance of the Programme;
- (v) As and when required, be delegated by the CILSS Technical Co-ordination Committee to represent it in matters relating to the Programme;
- (vi) Undertake such other work in connexion with the Programme as may be decided by the CILSS Technical Co-ordination Committee.

CHAPTER V - REPORTS

Article 10

- (i) Progress reports prepared by the secretary shall be submitted at each meeting of the CILSS Technical Co-ordination Committee;
- (ii) Annual reports of the CILSS Technical Co-ordination Committee shall be submitted to the participating governments and WMO not later than three months after the close of the year of operation;

- (iii) Special technical reports may be published by the CILSS Technical Co-ordination Committee as necessary.

CHAPTER VI - COST OF MEETINGS

Article 11

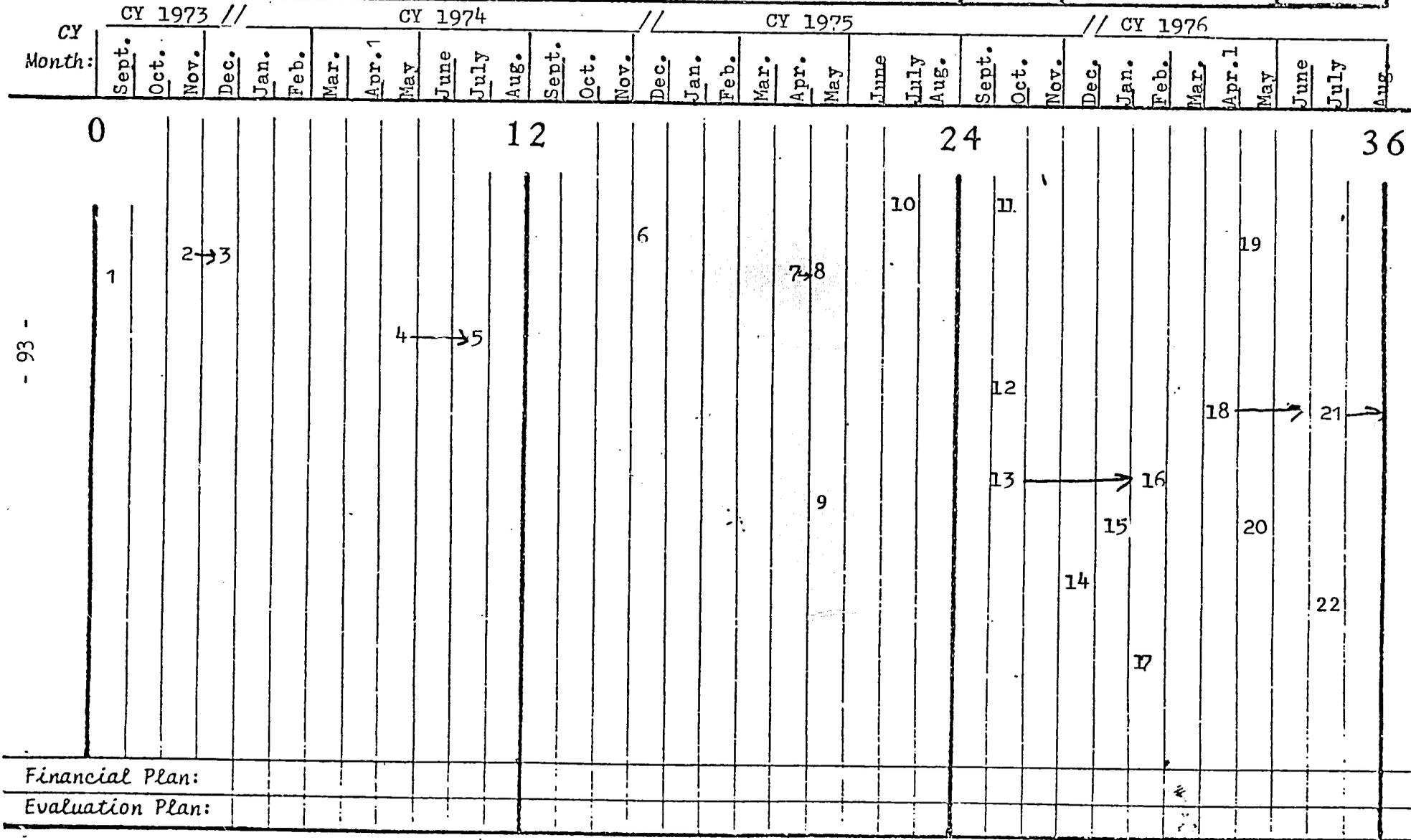
Each government shall bear the cost of expenses incurred by its representative to the CILSS Technical Co-ordination Committee in attending meetings of the CILSS Technical Co-ordination Committee. Cost of attendance of the director and his staff will be charged to the counterpart budget.

CHAPTER VII - GENERAL PROVISIONS

Article 12

The CILSS Technical Co-ordination Committee may amend or add to these terms of reference, rules and procedures with the approval of the respective governments and WMO. WMO shall consult the Co-ordinating and Advisory Committee before finalizing on these changes.

Country: Sahel	Project No: 625-11-120-917	Project Title: Sahel Water Data Network and Management	Date: 4/76	/ x / Original / / Revision #	PPT appr
-------------------	-------------------------------	---	---------------	----------------------------------	----------



- 93 -

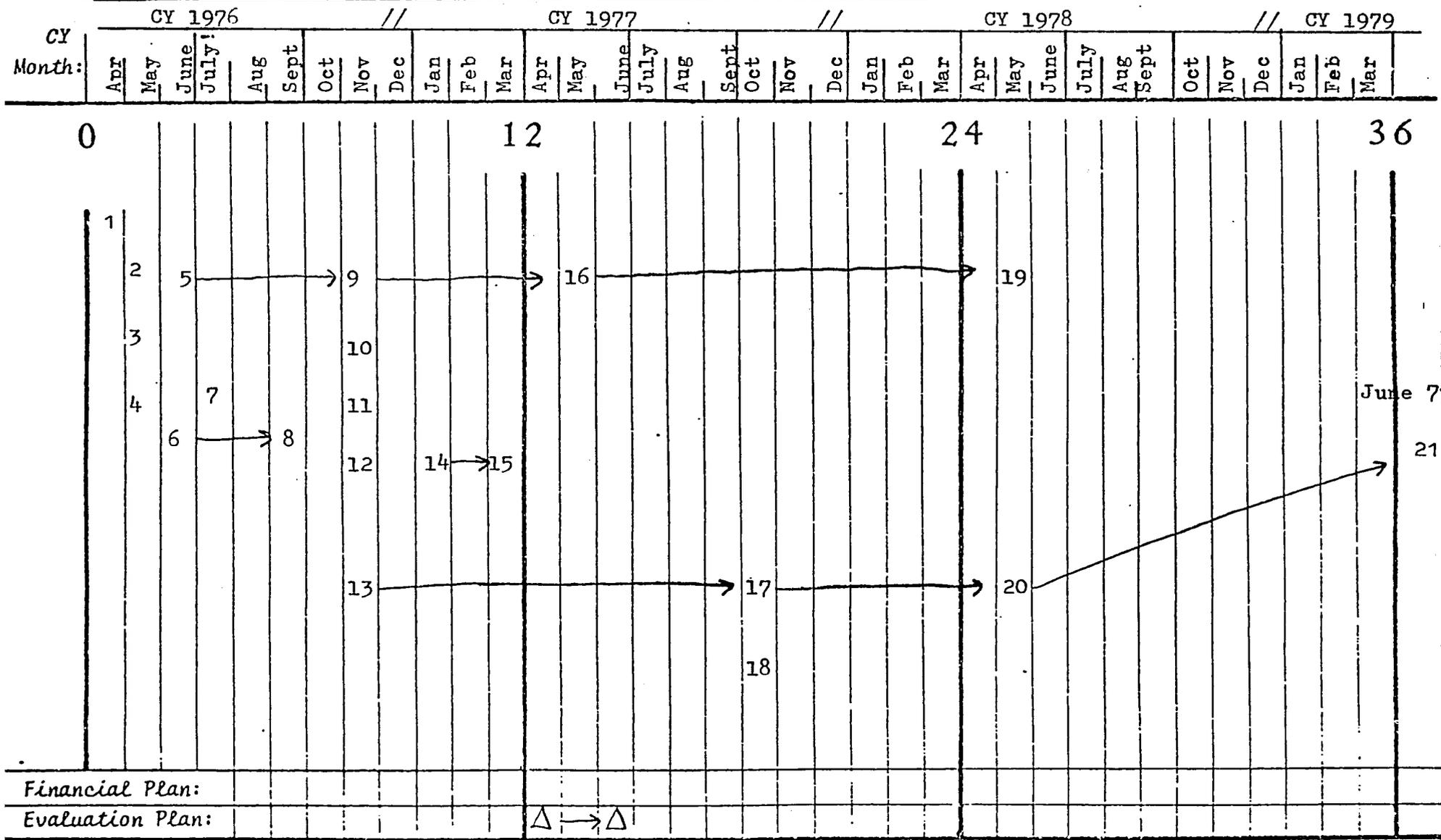
Country: Sahel	Project No: 625-11-120-197	Project Title: Sahel Water Data Network and Management	Date: 4/76	/x/ Original / / Revision #	Apprvd:
<u>CPI DESCRIPTION</u>					
<p>1. September 1973; request by CILSS Ministers and Chiefs of State.</p> <p>2 and 3. November - December 73; WMO survey mission</p> <p>4. and 5 May - July, 74; WMO/FAO survey mission</p> <p>6. December, 1974; CILSS Conference at Banjul; CILSS endorses program and agrees to locate Regional Center at Niamey</p> <p>7. and 8.; April - May, 1975; NOAA survey mission</p> <p>9. May 7-9, CILSS Niamey Conference; agreement to initiate program with UNDP financing; architect hired to draw up plans for Regional Center; WMO initiates program preparation activities in Niamey.</p> <p>10. July; Donors conference at Geneva; U.S., Belgium and Netherlands agree to participate and contribute.</p> <p>11. October, Programme Coordinator starts work at Niamey.</p> <p>12. October; first two year course for Class III agrometeorologists initiated.</p> <p>13. and 16; October, 1975 - February 1976; hydrology and meteorology experts posted in all CILSS countries except Mauritania which under recruitment.</p> <p>14. December; first two year course for Class III hydrologists initiated.</p>			<p>15. January 8-9, 1976. Donors conference at Geneva, basic organizational arrangements established.</p> <p>17. February 27-28; first meeting of CILSS Technical Coordinating Committee in Niamey.</p> <p>18. April; Approval of plans for Niamey Center; initiation of final design.</p> <p>19. May; WMO/AID agreement signed for U.S. for FY 1976 contribution.</p> <p>20. May 24-26; Donors meeting, Geneva</p> <p>21. July; Completion of final plans and design for Regional Center.</p> <p>22. July; Telecommunications and data processing report presented to WMO.</p> <p>23. October; Analysis of bids for construction, Niamey</p> <p>24. October; Courses for Class II agrometeorologists and hydrologists initiated; additional courses for Class III specialists in both fields initiated.</p> <p>25. November; WMO/AID grant amendment signed for FY 1977 contribution.</p> <p>26. November; NOAA initiated procurement of telecom, data processing and air conditioning equipment.</p> <p>27. December; Award of contract for construction of Regional Center; initiation of construction.</p>		

NARRATIVE DESCRIPTION OF PPT NETWORK

Country: Sahel	Project No: 625-11-120-197	Project Title: Sahel Water Data Network and Management	Date: 4/76	X / Original / / Revision #	Apprvd:
<p><u>CPI DESCRIPTION</u></p> <p>28. December; donors meeting; additional donors join program.</p> <p>29. and 30.; January - March, 1977; project design team for Niamey prototype data dissemination facility completes work</p> <p>△ April - June; WMO/UNDP/CILSS evaluation of program; renewal of UNDP funding for Center staff; ORSTOM contract reviewed.</p> <p>31. July; donors meeting; funding secured for 1977 - 79 segment of program.</p> <p>32. and 33.; October renewal of ORSTOM contract and for contracts for national meteorological experts for two additional years.</p> <p>34. October; Initiation of second round of courses for Classes II and III agrometeorologists and operational hydrologists; supplementary training for Class I specialists initiated.</p> <p>35. October; telecom, data processing and air conditioning equipment arrives Niamey; installation of items for Center begins.</p> <p>36. December; Construction completed on Regional Center.</p> <p>37. January, 1978; Training program begins at Regional Center; data processing and dissemination functions begin.</p>			<p>38. January; donors meeting; funding for operational costs of Center reviewed.</p> <p>39. May; Telecommunications and data processing equipment for national projects installed; Sahel data network begins providing data in "real time"</p> <p>40. May; Niamey prototype user facility begins disseminating data to Nigerien farmers and herdsmen.</p> <p>41. May; donors meeting; funding secured for long term operational costs of Center.</p> <p>42. and 46.; June-November; Niamey prototype dissemination facility disseminates planting, flood warning and flood recession information to Nigerien agriculturalists and herdsmen.</p> <p>43. October; initiation of third sequence of training courses at Center (see item 34).</p> <p>44. October; initiation of second user dissemination and application facility in a second CILSS country, following lessons of Niamey prototype.</p> <p>45. October; initiation of Center's research program on crop/weather correlations, historical climatological studies, etc.</p> <p>47. January, 1979; Donors meeting; funding of 1979-1981 tranche of program reviewed.</p> <p>48. June; Sahelians trained in maintenance and repair of telecommunications, electronics and air conditioning equipment.</p>		

Country:	Project No:	Project Title:	Date:	/x/ Original / / Revision #	Apprvd:
Sahel	625-11-120-197	Sahel Water Data Network and Management	4/76		
<u>CPI DESCRIPTION</u>					
<p>△ April - June; second overall evaluation of program by donors in collaboration with WMO and CILSS.</p> <p>49. and 53. June-November, 1979; Niamey and second dissemination facility transmit planting, flood recession, etc. data to agriculturalists.</p> <p>50. July; donors meeting; evaluation reviewed; funding for 1980-81 segment of program arranged.</p> <p>51. September; ORSTOM and national experts contracts renewed for 1979-81 segment of program.</p> <p>52. October; initiation of fourth sequence of training courses at Center (see item 34).</p> <p>54. January, 1980; donors meeting; arrangements for final phases of program reviewed.</p> <p>55. and 57.; June - November; initiation of third user dissemination and application facility in a third CILSS country (see item 44).</p> <p>56. October; initiation of fifth sequence of training courses at Center (see item 34)</p> <p>58. January, 1981; donors meeting, final arrangements made for permanent funding of Center and provision for remaining user dissemination facilities.</p> <p>59. and 61.; June-November; initiation of fourth user dissemination and application facility in a fourth CILSS country (see item 44).</p>			<p>60. September; turnover of national projects to host CILSS governments; departure of expatriate experts.</p> <p>62. November; Regional Center transitions to permanent "center of excellence" for data processing, dissemination, flood and drought warnings, and research, in close relationship to international agricultural institutes.</p> <p>△ November-December; final evaluation.</p>		

Country: Sahel	Project No: 625-11-120-91	Project Title: Sahel Water Data Network and Management	Date: 4/76	/ x / Original / / Revision #	PPT appr
-------------------	------------------------------	---	---------------	----------------------------------	----------



NARRATIVE DESCRIPTION OF PPT SUBNETWORK - U.S. Contributions, FY 1976-77

Country:	Project No:	Project Title:	Date:	x / Original / / Revision #	Apprvd:
Sahel	625-11-120-197	Sahel Water Data Network and Management	4/76		
<p><u>CPI DESCRIPTION</u></p> <p><u>Prior Action:</u> Initiation of telecommunications and computer survey prior to PP approval.</p> <ol style="list-style-type: none"> 1. Project Paper approved. 2. Signing of AID/WMO Grant Agreement, obligation of FY 1976 funding, amendment of PASA with NOAA. 3. Transfer of funds to WMO for Niamey training farm. 4. Donors meeting, 24-26 May, FY 1977 contribution firmed up. 5. NOAA initiates procurement of solar radiation units and publications. 6. and 8.; Niamey Center procures and installs experimental farm training equipment. 9. Solar radiation units arrive Niamey. 10. Solar radiation technician arrives Niamey. 11. WMO/AID grant agreement amendment signed for AID's FY 1977 contribution. 12. AID transfers \$500,000 to WMO for Niamey Center construction. 13. NOAA initiates procurement for FY 1977-funded items: telecommunications, data processing and air conditioning equipment; publications. 			<ol style="list-style-type: none"> 14. and 15. Project design team for prototype activity in Niger carries out assignment. 16. All solar radiation units assembled, calibrated and installed. △ U.S. participates in WMO/UNDP/CILSS evaluation of program. 17. All telecommunications, data processing and air-conditioning equipment arrives Niamey. 18. Electronics engineer arrives Niamey; initiates supervision of installation and maintenance training program. 19. Sahelians trained in solar radiation maintenance calibration and repair procedures; regular maintenance and recalibration schedule established. 20. Telecommunications, data processing and air conditioning equipment installed and functioning. 21. Sahelians trained in maintenance and repair of telecommunications, electronic and air conditioning equipment. 		

ANNEX X

LOGICAL FRAMEWORK

A. Program Goal

To help achieve a higher and more secure standard of living for the people of the Sahel by increasing agricultural production.

Objectively Verifiable Indications

1. Increased agricultural productivity.
2. Increased purchasing power.
3. Reduced rate of out-migration from country side.
4. Higher levels of health.
5. Improved capability for maintaining way of life during periods of stress due to climatic factors.

Means of Verification

1. Agriculture ministry statistics.
2. National accounts.
3. Census figures and studies.
4. Health studies.
5. Sample surveys conducted as part of program evaluations.
6. Reduced per capita requirement for emergency assistance.

Important Assumptions

1. Markets and supplies are available to the farmers and herders.
2. Farmers and herdsmen are inclined to maximize economic returns.
3. Climate will not significantly change from the current norm.

B. Program Purpose

1. Establish and/or strengthen the capacity of the meteorological and hydrological services in the seven original CILSS members to provide timely and accurate hydrologic, climatic and weather data.

2. Establish a Regional Training and Data Applications Center at Niamey to train the national cadres and to provide forecasting, data processing and research services for the region.

End of Project Status

1. Seven fully staffed and equipped national networks, capable of providing daily accurate water and weather data to national headquarters.
2. Seven national headquarters capable of recording, processing and disseminating the data in terms meaningful for agriculturalists and herders.
3. A regional center capable of meeting the national program needs in training and data coordination, and providing regionally significant services such as longer range weather forecasts, "early warning" on droughts and floods, and research findings on weather/crop relationships.

Means of Verification

1. Reports of national headquarters and regional center.
2. Accurate weather forecasts.
3. Periodic program evaluations.

Assumption for Achieving Purpose

1. Hydrological and meteorological services coordinate data acquisition and processing.
2. Agricultural services participate in formating and interpreting the date in terms meaningful to agricultural conditions and practices of the locations.
3. Media agencies cooperate in disseminating the data on daily basis and at times when can best be utilized by producers.
4. Additional donors contribute to un-financed balance of program.
5. Borrower and CILSS countries arrange to meet long-term operational costs of Niamey Center.

C. Outputs

1. 100 additional observation stations are equipped and functioning.
2. Radio communication network is functioning.
3. National headquarters are properly housed and equipped.
4. Professional personnel at all levels are staffing the national networks and headquarters.
5. Weather and water information is being disseminated to farmers and herdsmen.
6. Regional center constructed and equipped.
7. Professional personnel are staffing regional center.
8. Personnel and facilities are available for equipment and maintenance.

Magnitude

1. 100 additional agro - and hydro-met stations reporting in "real time."
2. Network connecting observation stations with headquarters.
3. Seven national headquarters meeting national data reception, recording, processing requirements.
4.

<u>Per Country</u>	<u>Agro-Met</u>	<u>Hydro-Met</u>
Class I	1	1
Class II	5	5
Class III	30	20
5. Once or twice daily broadcasts or bulletins.
6.
 - a. Facilities for teaching/research in agro-met, hydrology and
 - b. Classrooms, library, dorms, etc. for 50-100 students.
 - c. Data reception and transmission capability.
 - d. Computer for data storage and processing.
 - e. Sample farm plots for irrigated and rainfed crops.
7.
 - a. Two agrometeorologists and two operational hydrologists to teach training programs.
 - b. Two-three agriculturists and climatologists for data processing and research programs.

Magnitude (continued)

- 8. a. Observation station equipment - 1 technician.
 - b. Data processing equipment -)
 - c. Single side band radio network -)
-) 1 technician

Means of Verifying Outputs

1. Regular reports by WMO Programme Coordinator.
2. Regular reports by CILSS Director of Center.
3. Periodic evaluations by donors.

Assumptions for Achieving Outputs

1. Continued interest and cooperation of national governments,
other donors and A.I.D.
2. Political stability in the region.

D. InputsU.S. Inputs1. Technical Services

Electronic/Telecommunications Engineer	1 man X 3 months
Electronics/Telecommunication Engineer	1 man X 3 years
Solar radiation equipment Specialist	1 man X 1 year
Project Design Team - Prototype	4 persons X 3 months
Air Conditioning Engineer	1 man X 3 months
Short-term Applications Specialists (Agronomists, Sociologists, Range Specialists, Media Experts)	4 persons X 6 months

2. Training

Agrometeorology, climatology, hydrology	7 man years
---	-------------

3. Commodities

Solar radiation units	50
Air conditioning equipment	1 system for center
Data processing equipment	6 mini computers for national headquarters; larger computer for center
Telecommunications equipment	100 single side band radios

4. Other costs

Contribution to construction of Center	
Contribution to training farm	
NOAA and WMO administrative costs	

UNDP/CILSS/Other Donor Inputs

(See Tables 1-6)

Means of Verification

Reports of WMO Programme Coordinator.

Reports of CILSS Center Director.

Evaluation Reports.

Assumptions

1. Rapid clearance of commodities through customs.
2. Spare parts available on a timely basis, whether locally or imported.
3. Qualified candidates are available for training.
4. Required technical experts can be recruited for project.