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Exerpts from Project Paper
Niger River Basin Development Planning

FY 77 Project

B. Description of the Project

This project represents an interim "start-up" phase of a long-term multi-donor assistance effort, designed to support the institutional development of the River Niger Commission (RNC) and the preparation of a plan and investment program for the comprehensive development of the water, land and human resources of the Niger River Basin. The project is a multi-donor activity which, in this interim phase, involves the close coordination of donor contributions from the United States (AID), Canada (CIDA), France (FAC) and the United Nations (UNDP).

The River Niger Commission (RNC) is a regional organization of nine West African countries within whose boundaries the Niger River, its major tributaries and drainage basin are located. Its functions include, among others, the coordination of basin related development efforts among the member states to assure the most effective use of basin resources and the design and preparation of long-term development plans through the execution of general and project-specific studies.

Following a request to the international donor community by the RNC for assistance in the elaboration of a comprehensive "Indicative Plan" for basin development and the related development of the technical capabilities of the RNC Executive Secretariat, the United States, Canada, France and the United Nations responded by indicating their interest in participating in a 5-year program of data generation, study, and pilot project experimentation. The program would culminate with the preparation of a comprehensive basin development plan and investment program. A major effort would also be made to strengthen the institutional capability of the River Niger Commission to enable it to effectively mobilize resources and coordinate execution of the plan.

However, basic data are presently insufficient for the elaboration of the detailed terms of reference for such a long-term Action Program. The RNC and donors agreed that it would be desirable to initiate this long term project on a phased basis.

The first phase, or "start-up" project, as presented in this Project Paper, has been designed to produce the required information to precisely elaborate the long-term Action Program and associated costs as well as take the first steps in strengthening the institutional capability of the River Niger Commission's Executive Secretariat. The Project will thus:

(1) Gather and analyze available information on all aspects of the Niger River Basin through a comprehensive Diagnostic Study and on the basis of this analysis delineate the terms of reference and budgetary requirements for the second phase Action Program;

(2) Provide the initial expatriate technical advisory assistance required for the RNC Executive Secretariat to carry out the Action Program and provide advice, guidance and on-the-job training to the indigenous staff of the RNC;

(3) Initiate short and long-term academic training for member state nationals on the permanent staff of the RNC, and;

(4) Provide technical equipment, logistics support and architectural designs for the physical plant of the RNC required for efficient execution of the Action Program.

Although each donor will be responsible for the execution of its individual inputs the UNDP will assume responsibility for overall coordination and direction.

The Diagnostic Study will include surveys in the following areas:

Agriculture (AID, CIDA)
Water Resources (CIDA, FAC)
Engineering (CIDA, FAC)
Topography, Mapping and Remote Sensing (AID, FAC)
Education and Training (AID)
Environment/Health (AID, CIDA, UNDP)

Social Survey Research (AID)
Legal and Institutional (UNDP)
Integration of Study Components and Preparation
of Diagnostic Study, Atlas and Action Program
Reports (UNDP)

The expatriate advisory staff will include the following technicians assigned to the RNC on long-term contracts:

Senior Advisor Coordinator (UNDP)
Water Resources Planner (AID)
Regional Economist (CIDA)
Hydrologist (CIDA)
Civil Engineer (FAC)
Agriculturist (FAC)
Soils Scientist (AID)
Forecasting Hydrologist (UNDP)

The AID contribution will additionally fund (1) long-term, academic participant training (in conjunction with CIDA) for the initially identified technical staff requirements of the RNC Executive Secretariat, (2) short-term observational tours of river basin development projects in the U.S., (3) short-term, third country training for documentalists of the RNC's documentation center, (4) contract services with a local or third country architectural design firm for the preparation of plans for the physical plant requirements of the RNC Executive Secretariat, (5) consulting services to determine the feasibility of establishing in the RNC a social and economic survey research unit and (6) limited logistical support to the RNC.

The end result of this interim project would be the elaboration of a five year Action Program which would provide the detailed basis for long-term multinational support to the RNC, the existence of an expatriate staff capable of assisting the RNC in the implementation of the Action Program, and completion of initial efforts to strengthen the technical and managerial capability of the RNC to enable it to assume major responsibility for the execution of the Action Program.

PART II - PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. Background

1. Project Area, Population and Ethnic Countries

The Niger River Basin is shared by nine countries -- Guinea, Mali, Upper Volta, Ivory Coast, Niger, Chad, Cameroon, Benin, and Nigeria. A tenth country Algeria, shares a portion of the basin's watershed area, but all of the Algerian portion lies within the Sahara desert and is therefore not included for active consideration in the basin development program.

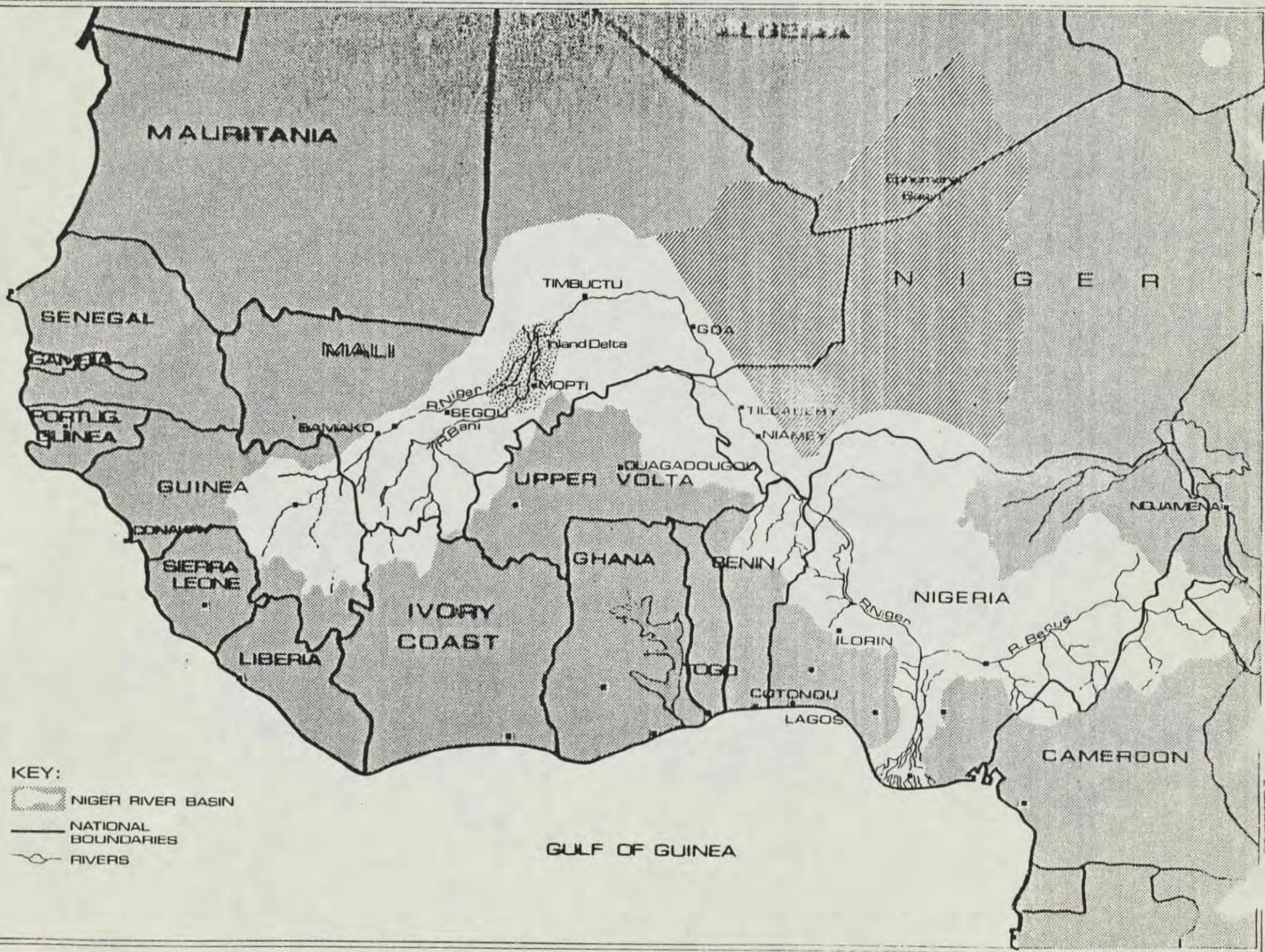
The physical basin has a total area of about 2,000,000 km², of which roughly 741,000 km² is an area of ephemeral drainages from which virtually no runoff occurs (see map). The ephemeral area comprises a large portion of the basin in Mali and Niger and all of the basin in Algeria. The mean annual rainfall in the ephemeral area is less than 5 inches. For agricultural development purposes, the ephemeral area has limited production potential. Given the absence of agricultural potential in the Algerian portion of the basin, Algeria chose not to join the Niger River Commission when it was organized in 1963.

The following is a tabulation of the watershed area (ephemeral area not included) by country and the percentage of each country located in the watershed. The figures are approximations and provided only for comparative purposes.

	<u>km²</u>	<u>Percent</u>
Guinea	103,600	42
Mali	336,700	23
Ivory Coast	23,300	7
Upper Volta	90,700	33
Niger	114,000	9
Benin	38,800	34
Nigeria	492,100	53
Cameroon	77,700	16
Chad	18,100	1
	<u>1,295,000</u>	

Guinea, Mali, Niger, Benin and Nigeria have major riparian interest in the mainstream, while the Ivory Coast, Upper Volta, Cameroon and Chad interests are solely limited to development of certain tributary areas. Four of the countries -- Chad, Mali, Niger, and Upper Volta -- are part of the land-locked Sahel-Sudano Region and, with the exception of Upper Volta, encompass both Sahara Desert as well as adjacent sub-Saharan and semi-desert savannas. The others extend to the coast and have more humid, tropical climates.

Agriculture is by far the most important economic activity within the River Niger Basin. Even in Nigeria, where oil production and other forms of industry are growing, agriculture is of prime importance. Agricultural production within the basin is of the subsistence type characterized by primitive methods, with only limited use of draft animals. Shifting agriculture is commonly used, a practice which allows crop land to return to its natural cover



- KEY:**
-  NIGER RIVER BASIN
 -  NATIONAL BOUNDARIES
 -  RIVERS

GULF OF GUINEA

when the fertility of the soils has been depleted. Only a small fraction of production, primarily in the coastal countries, is oriented towards a market economy.

In the Sahelian countries and some northern portions of the coastal countries, the chief crops are sorghum and millet generally produced under rainfed conditions. Rice and wheat are grown where irrigation is available. Peanuts, some cotton and cow-peas are produced for export. In the more tropical regions, production expands to include cocoa, oil palm, rubber, tobacco, and sugar cane. In the northern countries livestock is produced generally for export to the urban areas. Livestock production in the coastal countries is minimal because of the existence of the tsetse fly. There is substantial fishing in the Niger River in both Niger and Mali.

No figures are available on the population within the boundaries of the basin. The total 1976 population of the nine countries which share the basin, however, is estimated at more than 106 million, with more than half living in Nigeria. The estimated 1976 population by country is as follows:

(in millions)

Upper Volta	6.2	Ivory Coast	6.9
Mali	5.7	Benin	3.2
Niger	4.7	Nigeria	64.9
Chad	4.1	Guinea	4.5
Cameroon	6.5	TOTAL	106.7

Approximately ten percent of the people of the Niger Basin are transhumant herdsman. In the upper and middle basin another ten percent live in urban centers, although the proportion is higher in Nigeria which has a long history of urbanization that precedes the colonial era. In the Sahelian countries this urban population can be expected to double by the year 2000 while the proportion of nomads can be expected to fall to approximately six percent. The balance of the population, still over seventy percent, will continue to remain in the agricultural sector.

Though concentrated in nucleated settlements, farmers within the basin are also actively involved in seasonal and longer term migrations which take them primarily to the cities and farms in the coastal countries. During the dry season absentee rates among men aged fifteen to forty-four can range from approximately twenty percent to over fifty percent.

Though primarily circular through the mid 1970s, labor migration does lead to permanent emigration to urban centers, the growth rates of which are influenced more by migration than by natural increase of existing residents. Even fishermen are involved in migratory movements with the Sarkawa, for example, extending their operations from northeastern Nigeria as far upriver as the inland delta in Mali and downriver to the conventional delta. Hence migration is a major feature of life in the Niger River Basin and has been throughout history. Planning for basin development must be cognizant of this situation, which will obviously be a major complicating factor associated with any attempt at large scale development of sedentary farming based on irrigated agriculture.

Ethnically, the population of the Niger River Basin is very complex as partially suggested by Figure 1. Not indicated are the Peul (Fulani) herdsmen who move throughout the area with their cattle in search of pasture, water and markets. For example, the Mopti region of Mali which straddles the inland delta of the Niger, contains over a million cattle and two million small livestock. The herdsmen are 90% Peul and constitute over one-third of the area's population which also includes Bozo (who farm the inland delta), Dogon and other nucleated farming communities. Similarly Figure 1 does not indicate the large number of small groups which inhabit many areas. For example, in the Kainji Lake Basin are not just the Busa and the Kamberi but also Paul, Hausa, Lopawa, Laru, Gungawa, Shangawa, Dakarawa, Dukawa, Nupe and Kebbawa.

2. River Basin Characteristics and Agricultural Practices

The Niger River Basin has an area of about 2,000,000 km² (see map). The mainstream is approximately 4,000 km long, but the width of the basin is only between 300 and 500 km. The source of the river is an area of very high rainfall (50 to 100 inches per year) in the Fouta Djallon Mountains of Guinea within about 300 miles of the Atlantic Coast. The river flows northeasterly deep into the heart of West Africa to the southern edge of the Sahara where it then makes a looping 90-degree turn and travels in a southeasterly direction until it empties into the Gulf of Guinea. The lower basin situated in the country of Nigeria is also a region of high rainfall.

One of the most distinctive characteristics of the Niger River is the large inland delta located in Mali immediately above the river's turn to the southeast. The delta is actually fed by two rivers, the Niger and the Bani, which pass through the delta via many small channels with a single outlet (the Niger) near Timbouctou. The delta is composed of many small lakes and swamp areas which are replenished by annual flood flows.

There is presently little development of water resources in the basin. Of an estimated 2.7 million ha. of irrigable land, only about 252,000 ha. are under controlled irrigation, flood recession cropping and controlled flooding. The only large scale irrigation projects are in Mali. The largest of these is the Office du Niger. Initiated about 50 years ago by the French Colonial Government, the project covers approximately 45,000 ha. devoted to sugar cane and rice with the sugar cane residue supporting cattle. Smaller scale irrigation projects can be found in Mali, Niger, Upper Volta and Nigeria.

The land and water use systems of the people are not only complex, utilizing a wide range of strategies to exploit the full range of available resources, but they are also intricately interrelated. As elsewhere in the upper and middle portions of the Niger River Basin, the Peul are encouraged to graze the stubble left in the fields after the cereal harvest so that the farmers can benefit from whatever manure is deposited. When farmers build up their own herds, the Peul also serve as herdsmen. As the dry season progresses and the Niger flood recedes they drive their cattle into the swamps that border the river or cross the river channels to feed on the Echinocloa and other grasses that provide ample grazing during most years.

The Gungawa are irrigation farmers, although some Shangawa, Dukawa, Kamberi and Lopawa (see Figure 1) have taken more recently to irrigation, showing that local peoples are quite willing to experiment with new economic activities. Agricultural systems are complex with guinea corn, millet, legumes and a variety of other crops interplanted in upland gardens during the rains, and rice planted in wet spots closer to the river. Near the river itself two crops are planted annually with maize and early maturing millet planted at the start of the rains. After the harvest, onion seedlings are transplanted into these gardens with irrigation, using manual lift methods, begun after the rains stop and the flood waters arrive. Though onions are the main cash crop, other vegetables are grown. Subsidiary activities include fishing and a variety of other occupations including crafts.

Three distinct types of fishing activity are practiced along the Niger River. These include, (1) a low grade, primarily upland creek pattern; (2) a more advanced and intense Niger River marginal swamp pattern; and (3) a professional, river and swamp, pattern. Each of these has changed noticeably in the last twenty years with the advent of cheap and easily available nylon gillnets and machine made hooks, again showing the propensity for change when opportunity arises. The main professionals are the Sarkawa, and Kyedyawa who are a subgrouping of the Nupe. Respected as cooperative and productive fishermen, they present little competition to the farmers for land and minimal competition with the established patterns of fishing in upland creek and swamp areas.

The kind of land and water use systems found in the Kainji area (Nigeria) prior to dam construction are analogous to those carried out on a far greater scale in the inland delta of the Niger. Estimates of flood water farming upriver from Benin in a model year range from 15,000 ha. in Niger and 20,000 in Guinea to 130,000 in Mali of which by far the greatest amount is in the inland delta. In the Mopti area, the inland delta also supports over a million cattle and twice that number of small stock during the dry season when over a third of a million Peul utilize the area. As for fishing, up to 200,000 tons were estimated to have been caught along the Niger during 1970 with approximately half of that yield from Mali. The greatest proportion of the Mali catch comes from the inland delta which supports some 80,000 fishermen. Mainly Bozo and Somono, they form a well-structured social group with uncanny knowledge of their physical environment and a large range of traditional means to control their fish production. They have a large variety of gear, such as seines, catch nets, dragged mesh nets and barrages.

Flood water farming is most highly developed in the inland delta where two crops per year are produced by utilizing both the rising (crue) and falling (decrue) floodwaters. The African rice (*Oryza glaberrima*) was first domesticated in this region over three thousand years ago, the first cultigens being floating varieties which adapt to the rising waters by lengthening the stem. In the inland delta local farmers still sow "floating" varieties in their dry lower gardens just prior to initial flooding in September. Non-floating varieties are sown at a later date in the upper gardens where the depth of the floodwaters is less and are harvested after the floodwaters recede, unlike the floating varieties that may be collected from canoes while

the flood, though receding, is still high.

The flood recession cycle, which has a much wider distribution along the major rivers and their tributaries throughout the arid and semi-arid areas of Africa, begins once the floodwaters have peaked and begun to recede. The main crops are pearl millet and sorghum. The total acreage sown in each species varies from one year to another depending on the nature of the flood. Pearl millet, being the most drought resistant, is sown first, especially in the sandier soils which tend to predominate on the upper garden slopes.

The Niger has begun to be used for power generation. Plants exist at Sotuba (near Bamako); Markala near Segou; and Kainji, Nigeria. In advanced planning stages are the Selingue Dam on the Sahkarani in Mali (45 MW), the Kandadji about 100 km upstream of Niamey in Niger, a run-of-river project of 24 MW at the Park W in Niger, a dam on the Mekrou in Benin, and two additional large projects in Nigeria (Jebba 300 MW and Shiroro 80 MW).

Much of the interest to date in using Niger River water has been for inland water transport in various reaches of the mainstream from Kouroussa to Bamako, from Koulikoro to Bamako, from Koulikoro to Amsongo through the inland delta, and from Tillabery, Niger, to Yelwa, Nigeria. The other reaches are not open to navigation because of rapids and the Niamey to Yelwa reach is obstructed by the Malanville-Gaya bridge which only has a 0.6 m clearance at normal high water.

3. Potential for Future Development

There is an urgent requirement for expansion of agricultural development in the River Niger Basin to meet the needs of the rapidly increasing population, reduce reliance on agricultural imports, and increase exports. The recent drought in the Sahel, only the latest in the regularly recurring cycle of droughts, emphasized the precariousness of the food situation. Despite millions of dollars of relief efforts, thousands starved, livestock herds were decimated, and life cycles of much vegetation permanently destroyed. Although more dramatic in the Sahelian countries, the vagaries of rain also cause droughts in the coastal countries of the basin and often reduce crop production drastically below normal. Even in normal rainfall years, locally produced feed supplies barely meet local subsistence requirements and diets are deficient, particularly in proteins, vitamins, calcium and iron.

The World Bank, FAO and most other donor evaluations recognize that in the higher rainfall areas, rainfed agricultural production must be expanded to assist in meeting the food requirements of growing populations. Also substantial areas of irrigation will be needed over the long range of time to produce both additional food crops to stabilize overall production and irrigated crop residues for supplemental livestock feed. With high evapotranspiration rates and severe variability of rainfall, very low yields of under 400 kg/ha. of cereals such as millet are presently obtained on rainfed lands. While some improvement of these yields is feasible through better practices and the use of modern inputs, the ultimate potential from rainfed production remains probably no more than the 1000 kg/ha. now realized in the higher rainfall areas of the region. By comparison yields with irrigation could be expected to reach at least 2,500kg/ha. for rice.

Numerous obstacles remain in the way of irrigation development. Primary deterrents are the deficiencies of soils for agricultural production and the prevalence of vector-borne and macroparasitic diseases (malaria, trypanosomiasis, schistosomiasis, and onchocerciasis) which often occur where water is present in the basin. Added to these is the lack of **an extensive** irrigated agricultural tradition among basin farmers and a lack of capital to finance improved practices. A further complication is the fact that since all of the riparian states have been independent for less than two decades close coordination among the riparian states has been difficult as the newly independent governments have correctly focused on building national institutions and have not fully developed the institutional capability required for effective regional cooperation.

In addition to agriculture, many uses, some of which are mutually exclusive are competing for the available water supply. These include production of hydroelectric power, maintenance and improvement of fisheries, navigation and flood control. These potentialities are faced with such the same obstacle as agriculture.

Before final decisions are made on priority assignments for water utilization, a number of basic studies and policy decisions are necessary. Among these are: the quantity and quality of groundwater and its relationship to the Niger and its tributaries; a full understanding of the existing riverine regime, including likely maximum and minimum flows; knowledge about the life cycles of commercially important fish and the effects upon them of changes in the river regime; full awareness of mineral deposits - location, availability, and quantity - to both avoid flooding them and to establish hydropower priorities vis-a-vis other water uses; the role of water transportation, both in light of other complementary and competing modes and of competing water uses; and the likely effects on disease vectors and other environmental impacts on both changes in the river regime and the introduction of large-scale year-round irrigation. Above all, a great deal of research, supported by pilot project experimentation, needs to be undertaken to insure development of methods to introduce improved irrigation practices to the local population with as little disruption as possible.

D. River Basin Studies

1. Niger River Commission

In an effort to harness the resources of the Niger River and to assure the necessary regional coordination and cooperation required for the effective planning and implementation of development activities, the nine African countries of the Niger River Basin formed the River Niger Commission (RNC) in 1963. The stated purpose of this organization is to promote and coordinate studies and programs for exploitation of the Niger River Basin resources. The RNC was officially brought into existence by the "Act of Niamey" (1963). Its composition, mandate and legal functions were more specially delineated in the agreement concerning the River Niger Commission and the navigation and transport on the River Niger (1964 as amended 1966, 1970). These documents are attached as Annexes C and D.

The RUC is governed by a Council of Ministers, composed of representatives from each member country, whose policies are implemented by an Executive Secretary with an office and staff in Niamey. The Council is, in turn, advised by a Committee of Experts which is composed of member country representatives.

The Executive Secretary has an office and a small administrative staff (Secretariat) in Niamey. He is presently assisted by a technical adviser provided by USAID. However, the present staffing pattern of the Secretariat is insufficient, lacking in both technical and managerial expertise, to allow it to perform its mandated functions. Exclusive of the Documentation Center, the available permanent staff consists only of an accountant, translators, secretaries, typists, messengers, etc.

The Documentation Center of the RUC was established in January 1971 with assistance from UNDP and counterpart contributions from the member states. This center is an integral and important element in the structure of the RUC. Its function is to collect all documents and information concerning the exploitation and development of the resources of the basin and to classify, analyze and disseminate these documents and information to member states. It is presently staffed with a Director, three documentalists, two archivists, one analyst and one assistant librarian.

Since its formation in 1963, the Commission has sponsored the following studies:

a "Niger River Commission Study" by Holmes and Narver, Inc. - a general study of the river, its hydrology and development potential, 1966, financed by AID;

b A report on the Integrated Development of the Niger River Basin by UNDP/FAO Interdisciplinary Mission of 1968 - a study of the prospects of and constraints on the development of the basin.

c Navigation Study of the River Niger between Tossaye (Mali) and Yelwa (upstream end of Kainji reservoir) - carried out by UNDP/FAO 1970

d The setting up of the Documentation and Analysis Centre at Niamey in 1971 with the assistance of UNDP/FAO,

e A Study Programme to Determine the Causes of the Anomalies in the Flood Regime of the Niger by UNESCO of Paris. This study, now underway, will provide an analysis of the flood regime in the inland delta of Mali.

At a meeting in February 1974, the Council of Ministers approved a number of additional projects:

- Adoption of the principle of an Indicative Plan for the Water Resources Development of the Basin; it entrusted the Executive Secretary to seek financial support from international agencies for its preparation;

- A Stream Flow Simulation Model for which assistance has been requested from CIDA;
- The extension of the UNDP/WMO Flood Forecasting and Warning System to the downstream sector of the river;
- Adopted the General Regulations on Navigation, drafted with the assistance of the Economic Commission for Africa.

Despite the start that has been made in setting up the basic institutional framework for regional planning and coordination, the expansion of irrigation and intensification of land and water use has been slow in the Niger Basin.

As the above studies suggest, planning over the years since the Commission's inception has been piecemeal and ad hoc in nature. What planning has taken place has been the result of specific and uncoordinated interventions by various bilateral donors. While this uncoordinated donor support was well intentioned, the usefulness of the various studies is of limited value since they have been carried out without benefit of an overall, goal oriented planning framework and systematic process of study.

2. Organization of a Multi-Donor Assistance Program for the Niger River Commission

The RNC Council of Ministers recognized in 1974 the inadequacy of the Commission's previous planning efforts and accordingly charged the Executive Secretary with responsibility for securing the necessary donor assistance required to prepare an indicative plan for the development of the water, land and human resources of the basin.

In response to subsequent RNC requests for assistance the Canadian International Development Agency (CIDA) sent a technical mission to Niamey to determine the long-term planning requirements for the basin and make recommendations for their provision.^{1/} A similar study mission, although less exhaustive, was carried out at RNC request by the World Bank.^{2/} Almost simultaneously, AID was in the process of preparing its "Proposal for a Long-Term Comprehensive Development Program for the Sahel"^{3/} and included an analysis of the requirements for a long-term plan of action in support of the RNC and Niger River Basin development planning.

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- ^{1/} "Assistance Needs for Developing the Niger River Basin", Canadian International Development Agency, Francophone Africa Division, May 14, 1976.
 - ^{2/} "Development of the Niger River Basin", International Bank for Reconstruction and Development, June 5, 1975.
 - ^{3/} "Proposal for a Long-Term Comprehensive Development Program for the Sahel," Report to the U. S. Congress; Agency for International Development, July, 1976.

At the June 1976 meeting of the RNC Council of Ministers these reports were examined. The Council of Ministers adopted the CIDA report as the basic working document and advanced and approved the idea of a multi-donor conference to prepare a common approach and multi-donor assistance project for the preparation of the Indicative Plan.

Through a series of meetings (September 1976 at UNESCO Headquarters in Paris, October 1976 in Niamey, and January 1977 at Paris) with the RNC and various interested donor countries and institutions, a broad general plan of study and institutional support has been developed for the Niger River Basin and is estimated to cost in the range of \$27-30 million dollars over a five year period. The goal of this Action Program is to produce an indicative plan and investment program for the development of the water, land and human resources potential of the Basin simultaneous with a concerted effort to strengthen the RNC's technical and managerial capacity to enable the RNC to effectively plan and coordinate the development of the basin overtime in conjunction with member states.

While it was possible to lay out the broad outline and order of magnitude costs associated with a five year Action Program, both the RNC and the donors, early on in the negotiations, recognized that insufficient information existed on which to formulate and precisely cost out a definitive five year Action Program. Accordingly, it was determined that a "start-up" assistance project covering a twelve-month period was necessary to precisely define, cost and prioritize the study requirements of the five year Action Program. As agreed with the RNC and the initial contributing donors (France (FAC), Canada (CIDA) the United States (AID) and the UNDP), the "start-up" project would include a diagnostic multi-sector study of the basin including the preparation of a five year Action Program, the recruitment of a full-time expatriate "core" staff of technical specialists for the RNC Secretariat, the initiation of a short and long term training program for future African staff members of the RNC, the provision of necessary technical and logistics equipment, and the design of physical plant facilities to accommodate the expanded requirements of the RNC Secretariat headquarters. This Project Paper covers the planned A.I.D. support for the "start-up" project and outlines the balanced contributions to be made by the three other participating donors, UNDP, France and Canada, which are necessary to insure successful completion of the first phase assistance project. Assuming successful completion of the first phase A.I.D. intends to prepare an expanded project to cover a reasonable portion of the technical and financial requirements of the five year Action Program. In addition to the clear articulation of a five year Action Program, two principal conditions will govern A.I.D. participation in the execution of the Action Program. These conditions are: (1) that future assistance requirements be drawn in a coordinated manner from as wide a range of donors as possible and (2) that the RNC member states fully support the RNC Secretariat. Evidence of this support will be the degree to which member states meet the budgetary and staff requirements necessary for proper and efficient execution of the Action Program.

C. Detailed Project Description

1. Project Goal

The goal of this multi-donor project is to assist the River Niger Commission design and undertake a coordinated program for the development of the land, water and human resources of the Niger Basin for the benefit of the basin population. Attainment of this goal is dependent on realization for two project sub-goals:

- formulation of an internationally recognized Indicative Basin Plan and Investment Program which will insure the rational development and utilization of basin resources for the benefit of the resident population;
- establishment of an institutional structure with sufficient technical and managerial capability to mobilize necessary resources and assist member states in the future implementation of the basin plan and supporting investment program.

2. Project Purpose

The purpose of this "start-up" assistance project is to:

- establish the analytical base (Diagnostic Study) and planning framework (Action Program) required for the preparation of the indicative basin plan and investment program.
- commence the process of strengthening the institutional capability of the RNC to carry-out an effective program of planning and development for the Niger River Basin overtime.

3. Project Outputs

The output of this multi-donor "start-up" project will consist of the following two main elements:

(1) Diagnostic Study and Action Program

The purpose of the Diagnostic Study is to collect and evaluate all existing data and to prepare a detailed 5-year Action Program leading to an Indicative Plan and Investment Program for the basin through beneficial use of the basin's land, water and human resources. The Diagnostic Study will conclude with the publication of three separate, but related documents. The first document will consist of a multi-volume compilation and analysis of all relevant existing information on the land, water and human resources of the River Basin. This document will facilitate the preparation of the five-year Action Program discussed below. The second document, which will synthesize relevant information from the basic study discussed above, will be an Atlas of the Land, Water and Human Resources of the Niger River Basin. This Atlas will be modeled after the "Atlas of Physical, Economic and Social Resources of the Lower Mekong Basin," financed by A.I.D. and prepared under UNDP auspices by the Tennessee Valley Authority and the U.S. Army Corps of Engineers. The final report to be produced under the Diagnostic Study will be the detailed five year RNC Action Program which will set the stage and delineate the study

priorities for the second phase of the multi-donor assistance project.

The diagnostic study will include eight components which are summarized below. Complete terms of reference for these component studies are attached as Annex B. 1. All of the study components will involve desk reviews of existing data dispersed in several countries as well as visits to the field. In addition to the inventory and analysis to be undertaken in each sector assessment, the consultant will prepare a recommended five year Action Program for the sector. The UNDP management consultant who will be responsible for overall study management and coordination, will draw on these sector Action Programs in presenting the overall five year Action Program for consideration by the RNC Council of Ministers.

- Agriculture

This component will include an assessment of land and water suitability for crop, livestock, fishery production and forestry, including a descriptive analysis of major existing farming systems; demand and supply analysis for food and fiber; an assessment of agricultural service institutions covering such factors as marketing, credit and storage. It also will include studies of potential costs and returns to various agriculture farming systems, with and without irrigation and an analysis of member state marketing and price policies. This component will be undertaken by AID and CIDA.

- Water Resources

This component will cover studies of meteorology and climatology, surface water hydrology, hydrogeology and groundwater, and water supply demands. It will be undertaken cooperatively by CIDA and FAC. CIDA will be responsible for the meteorology/climatology aspects and report preparation. Responsibility for the other aspects will be shared and the report issued jointly.

- Engineering

This component will include identification, location, and evaluation of existing hydraulic structures on the river system and potential storage sites, with emphasis on water supply, construction materials, and access. CIDA and FAC will share responsibility. FAC will participate primarily in dam site studies in the Franco-phone portion of the basin and provide participation of EDF and OSTROM as sources of information. CIDA will take responsibility for dam sites in the Nigerian portion of the basin, studies of construction materials and access, overall coordination of work, and preparation of the final report.

- Topography, Mapping, and Remote Sensing

This component will include inventory and evaluation of existing topographic maps, imagery control, and special purpose thematic

maps as well as preparation of contract specifications for issuance to obtain needed geodetic control and topographic mapping data. The most useful maps along with tabular data will be compiled into a thematic atlas. Responsibility for this component will be assumed jointly by AID and FAC.

- Education and Training

This component will include estimates of RNC requirements for professional staff over the short, medium and long term and an analysis of RNC member states' capability to supply required training, including recommendations for training to be carried out by RNC member countries. The study will outline programs of professional training to be carried out in donor countries as well as training programs to be jointly conducted by professional institutions in Africa and selected institutions from various donor countries. USAID will carry responsibility for this component.

- Health and Environment

This component will include a comprehensive survey of existing environmental and health conditions in the Niger River Basin. It will determine major areas of potential environmental impact resulting from implementation of the types of activities which would be identified under the five year Action Program. The consultant, working in conjunction with other sectoral teams, would prepare guidelines and terms of reference for environmental/health studies which would be carried out during future project specific investigations. The UNDP will assume responsibility for this component. A.I.D. and C.I.D.A. will provide partial financing by individual contributions of one-third of the total cost to a Funds in Trust account of the UNDP which will match an equivalent in-kind or cash contribution by the UNDP.

- Legal and Institutional

This component will include an analysis of the existing RNC management system and the overall organization structure required to execute the Action Program, including division of planning and implementation responsibilities between the RNC and member states. Also a legal analysis of property rights relating to land and water use for the basin will be undertaken, with specific reference to the externalities which are likely to occur in international basin development, particularly with regard to water rights allocation.

- Integration of Study Components and Preparation of Diagnostic Study, Atlas and Action Program Reports

The UNDP management consultant will be responsible for the overall leadership and coordination of the various sectoral teams and for preparation of three reports which will conclude the diagnostic

phase of the project (i.e. the descriptive Diagnostic Study and Atlas and the prescriptive Action Program for the RNC). In addition to integrating the various findings of the sectoral teams and publishing the results, the UNDP consultant will be responsible for conducting a number of analyses not covered by the various teams. Specifically the UNDP consultant will analyze existing national plans and conduct demographic analyses of the basin population. This information will be provided to the various teams for their use.

(2) Institutional Development

a. Expatriate Advisory Team

After extensive discussion with the RNC Committee of Experts and interested donors, complete agreement has been reached on the assignment of an interdisciplinary team of technicians to support and facilitate the work of the RNC during the "start-up" phase. The role of this expatriate assistance team will be to:

- provide necessary technical support and on-the-job training to the RNC technical staff;
- facilitate liaison between the RNC technical staff and the diagnostic study teams; and
- provide ongoing planning continuity between the Diagnostic Study and the resulting five year Action Program.

To insure continuity between the Diagnostic Study and the Action Program, the interdisciplinary technical assistance team will be retained for a 24 month period, with an option to extend for a second 24 month period subject to performance and subsequent donor/RNC agreement on the extension. The expatriate advisory team as well as the RNC technical staff will function as special members of the various Diagnostic Study teams during the initial 12 months of the project. Recruitment of the technicians to be provided by A.I.D. will commence upon project approval. Complete job descriptions are attached as Annex B. 2.

The specialists and the donors who have assumed responsibility for providing them are listed below:

1. Senior Advisor and Coordinator (UNDP)
2. Hydrologist for Flood Forecasting (UNDP)
3. Water Resources Planner (AID)
4. Soils Scientist (AID)
5. Regional Economist (CIDA)
6. Hydrologist (CIDA)
7. Civil Engineer (FAC)
8. Agronomist (FAC)

The expatriate staff positions are considered to be minimal requirements at the present time. At the end of the "start-up" phase and following a

C. Social Soundness Analysis

1. AID's Participation

The attractiveness of the RNC Diagnostic Study and of AID's participation in it, as elaborated in this Project Paper, is that social soundness analysis is being built into the initial studies to be carried out under the auspices of a revitalized Niger River Commission. Hence, the possibility exists of providing information that will increase the chances of success of subsequent development strategies, and of specific programs and projects, more directly involving local populations. On the other hand, AID will need to follow the situation very closely as it develops since subsequent policy decisions may not be in the interests of local populations. A case in point is the development strategy currently followed in Upper Volta for settling sparsely occupied or unoccupied river valleys in the onchocerciasis control program area. Though the advice of sociologists involved in the initial UN feasibility studies in 1971 and 1972 was to concentrate on a relatively low cost approach to settlement which would pinpoint areas for the provision of wells and feeder roads along with a unified extension service, and hence reach large numbers of spontaneous migrants (while directing their flow), the actual strategy chosen emphasized the settlement of small numbers of people in capital-intensive, and closely controlled, agricultural settlement schemes in which the settlers are relatively passive recipients of government expertise.

Obviously, the involvement of social soundness analysis in the initial stages of planning in no way guarantees that subsequent plans will in fact be socially sound. While AID's present involvement in the Diagnostic Study is socially sound, this conclusion must not be extrapolated to subsequent AID projects within the Niger River Basin, each of which must be separately appraised.

2. The Niger River Commission and the Diagnostic Study

The Diagnostic Study comes at a critical time in the history of the Niger River Basin. To date, development of the basin has emphasized the generation of hydroelectric power for urban and industrial development, hence, subsidizing urban populations at the expense of rural residents. The early history of the heretofore inactive Niger River Commission was also primarily preoccupied with water resource development. The Commission was established primarily as a result of the initiative of Niger whose President saw it as a mechanism for improving Niger River transportation. This emphasis was still apparent in 1976 when the Commission sought international assistance for institution building, including an active training program and a greatly enhanced capacity to carry out studies. For example, the initial list of disciplines (subsequently under revision) for the first twelve trainees, who would form the core staff of the Commission, omitted disciplines which are necessary for the study and evaluation of socio-economic data relating to the rural inhabitants and their systems of production. On the contrary,

the large majority were exclusively concerned with water resource evaluation or with structures to manage water flows.

In recent months, however, the Niger River Commission appears to have broadened its focus to include the human resources of the Niger River Basin. On the one hand at least, one member of the Council of Ministers has emphasized the need for the Commission to play a major role in the integrated rural development of the basin while the Commission's Committee of Experts has recommended and secured Ministerial approval, for an organizational structure under the Executive Secretary which will include a Division of Agriculture, Fisheries, and Livestock. The Executive Secretary himself has also expressed a desire for a wider mix of staff, has requested advice on how to enhance the Commission's role as a rural development agency, and has asked AID to draw up the terms of reference for a rural sociologist to be recruited among the first twelve trainees. Since AID and CIDA will be financing this training program, there is every reason to believe that the opportunity exists to add additional fellowships for trainees in agricultural economics, fisheries, livestock development, the behavioral sciences, and other fields relevant to rural development.

As a twelve-month study, the Diagnostic Study should play a major role in focusing attention on the human resources of the Niger River Basin, and on influencing future development strategies as they relate to these resources. Since AID and CIDA are responsible for the survey components dealing with Agriculture and Water Resources, respectively, and will be jointly financing with UNDP, the Environmental/Health Sector Survey, there is every reason to believe that the human element will be properly addressed. Since Agriculture is defined to include fisheries and farm enterprises, including livestock, AID has the opportunity to survey the current land and water-use systems of the local populations and on the basis of those surveys to make recommendations for further research which will provide information for involving the local people more actively in the development process.

3. Consideration of Existing Lifestyles

Development in the Niger River Basin should include strategies which take existing lifestyles, with their attendant production systems, as a starting point, and then proceed to enhance them. To date, the design of mainstream and tributary dams for the Niger River has yet to be used as a mechanism to involve local populations in the-development process. Even worse, potential impacts of dams on downstream users have been largely ignored. This point is emphasized by Adeniyi (1973) in his review of the "Downstream Impact of the Kainji Dam." Concentrating on three villages, with a total population of somewhat over 12,000 people, and located 70, 114, and 186 miles below the dam, he noted declines in floodwater cultivation (fadama) during the dry season of 70, 44, and 53 percent, respectively. Since over

2000 acres were lost to cultivation in these three villages alone, the total loss below the dam must amount to tens of thousands of acres. These cannot be cultivated by customary means simply because they are no longer flooded during the dry season because of flood retention in the Kainji reservoir. Furthermore, "In addition to loss of fadama as a result of decreased flooding, yields of swamp rice at Rabba went down from an average of 1,650 pounds paddy rice per acre to an average of 1,300 pounds, a decrease in yield of eighteen percent as a result of moisture shortage and loss of fertile alluvial sediments usually brought down by the Niger while in flood every year." Reduced flooding also adversely affected the downriver fisheries. According to Adeniyi's research, the income of fishermen in the above three villages decreased 73, 60, and 47 percent following dam construction, while actual catches monitored by the FAO-Nigerian Government Kainji Lake Research Project at one landing point dropped over fifty percent.

Because approximately sixty-five percent of the flood waters of the Niger are "lost" in the interior delta, some planners obviously will attempt to "capture" some of this for other uses through the construction of regulatory dams like Kainji, and channelization and other mechanisms in the interior delta itself. Unless the needs of existing populations who use the delta are taken into consideration, the results could be far more catastrophic than in the Kainji case, not just because a far greater number of people and livestock are involved, but also because alternate resources are less available. Though governments obviously will build into their plans gravity-fed and pump-fed irrigation projects, these, as in the Kainji case, cannot be expected to come on-line until years after the initial regulatory structures in the form of dams and barrages are built. In the meanwhile, what are the local people to do who lose their livelihood as soon as the annual flood is reduced through regulation? Because of the cost of irrigation (estimated by the World Bank at about \$7,000 per hectare in 1975 for pump schemes in Niger) alone, which reduces drastically the total number of people who can be involved, and because of the difficult physical and economic problems associated with existing projects (like the Office du Niger), a careful study of current uses of the natural flood for floodwater farming, grazing, and fishing must be completed before development strategies are designed. Quite possibly, as the 1975 IBRD Mission to Niger believes, perennial and flood water irrigation in the inland delta of the Niger are not "mutually competitive." In terms of socio-cultural feasibility, spread effects and beneficial impacts, the initial enhancement of the latter makes the most sense since it will reach a larger number of people in a shorter period of time.

4. Constraints to Development as They Relate to Local Populations

The capacity of the local population to participate in future Niger River Basin development will obviously depend on the nature of the development strategies followed and on the type of programs and projects

implemented. The local farmers, herdsmen, and fisherman are the most important development resource in the basin, and they are members of relatively dynamic, relatively open-ended systems. They are susceptible to change, indeed have frequently changed in the past as new opportunities have appeared. While specific socio-cultural constraints to development can be expected to arise in specific cases, which will require identification and careful handling, there is no evidence to suggest that local populations are unresponsive to new ideas and technologies as such. The principal constraints to development presently known can be summarized as follows:

a. The development from above syndrome, the very nature of which makes it difficult to involve local populations in the planning, implementation, and evaluation of development, and to use their existing socio-cultural systems (and especially their highly adaptive land and water use systems) as a basis for development. Obviously, it is not possible to facilitate local initiatives and enhance existing systems of production, if planners are ignorant of both these initiatives and these systems. The solution to the problem is to improve our understanding of the nature of these initiatives and systems through research and then to design appropriate development strategies to incorporate them. The surveys to be conducted under this "start-up" assistance project, particularly the agricultural, water resources, and environmental/health surveys, will add substantially to our knowledge of existing farming systems and will also begin to layout alternative development strategies for consideration which build on the existing agricultural systems.

b. The general inability of hierarchial and highly centralized governmental structures to reach the rural producer through such mechanisms as an active unified extension service, and suitable feeder roads and waterways for marketing purposes; and to actively incorporate rural populations into influential decisionmaking bodies at the local level.

c. The existing price structure, which continues to favor the urban consumer, representing less than 10 percent of the total population (except in Nigeria), at the expense of the rural producer, whether farmer, herdsman or fisherman. Niger River Basin development, to date, has continued this bias through an overemphasis on hydropower generation. As a result, rural residents follow the transmission lines to their urban and industrial destinations, a logical response to national development strategies which do not favor rural areas.

d. High labor migration rates, which themselves are a reflection of the existing price and opportunity structure, and hence cannot be legitimately viewed as just a local constraint. Indeed, the impact of labor migration must be carefully evaluated in each case since there are

always important tradeoffs involved. Provided opportunities exist, labor migrants may be a major source of capital for rural development as has been demonstrated in East and Central Africa.

5. Social Soundness

Guidelines for A.I.D. Support to the RNC

a. Through its involvement in the Diagnostic Study, AID will continue to emphasize its previously stated conviction that the local farmers, herdsman, and fishermen are not only the primary resource for development, but also should be actively involved in the development process.

b. Following from (a) and the Congressional Mandate, AID will use the Diagnostic Study as a mechanism to study the existing land and water-use systems of the local people through the Niger River Basin. These systems will be mapped and assessed in sufficient detail to provide information for the design of subsequent research and action programs.

c. The Agency should anticipate the need for more detailed studies of selected land and water-use systems following the completion of the Diagnostic Study. To provide the information for generating specific development interventions, these studies should combine two research strategies. One would emphasize short-term studies to provide highly specific information which can be gathered at particular seasons. The other would emphasize long-term studies (fifteen months) which cover a complete annual cycle with six weeks at either end to establish and terminate field operations. Several such studies might emphasize flood-water farming in different ecological zones, although attention must be paid to the entire range of strategies used by the different ethnic groups in the area. These include rain-fed agriculture, livestock management, fishing, local crafts, trade and wage labor, both within and without the area, and the relative importance of each shifting from year to year, and from household to household owing to variations in ecological and economic conditions, and factors relating to local preferences. Without detailed information on labor profiles for different activities and on how and why heads of households and other production units allocate labor for economic purposes, it will not be possible to design realistic development programs for increasing production and the standard of living of the local people.

During each fifteen-month study, information should be systematically gathered on the following topics:

- (1) The social organization of production units, including their actual composition, and their relationship to absentee members (especially labor migrants), other

kin and neighbors in terms of capital inputs (remittances especially), and labor.

- (2) The systems of land tenure, including detailed maps of all gardens controlled (whether in use or not) by members of the study community, assessment of water rights, and of the implications of population trends, and of systems of inheritance as they relate to resource availability.
- (3) The systems of land and water usage, including agriculture, livestock management, and fishing.
- (4) Labor profiles (including the division of labor between male and female members of production units) and labor availability, information to be gathered on a weekly basis at least.
- (5) The economics of production, information to be obtained through the weekly recording of income and expenditures from a carefully selected stratified sample of production units. As with social organization, a special effort should be made to include resources, such as remittances, brought into the community from the outside. Study of income and expenditures should be combined with a study of food consumption within the production unit. While such consumption surveys provide useful information on nutrition, their main purpose is to provide a reliable mechanism for identifying the range of foodstuffs available and for tracking the use and distribution of locally produced commodities within community. Special attention should also be paid to the extent to which women benefit, or do not benefit, from the increased demand on their labor that the introduction and development of cash cropping often involves.
- (6) The storage and processing of local produce.
- (7) The price structure in reference to potential and actual cash crops, including the relationship of this structure to other options (such as labor migration out of the country or to urban centers).
- (8) The marketing system within the community, the Niger River Basin, and adjacent areas as it relates to local produce.
- (9) The comparative advantages and disadvantages of local systems of production to relevant government irrigation projects.

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d. In planning future support to RNC, AID should consider the possibility of utilizing one, or possibly two, of the fifteen-month studies mentioned under (c) as a "baseline" for a longitudinal research program, which, in effect, monitors how the people respond to subsequent development interventions, and their decisionmaking and coping mechanism in general. Though they have very important implications for evaluating specific development programs and for formulating a broader range of development strategies, few such studies exist.

e. In working closely with the Niger River Commission during the years ahead, the AID should endeavor to ensure (1) that the proper type of studies are carried out as they relate to a program of integrated rural development, and (2) that the results of such studies are built into specific development programs and projects. In this regard, AID intends to work closely with the Commission to expand the scope of its professional staff to include key staff members trained in such disciplines as rural sociology, social anthropology, social psychology, cultural geography, agricultural economics, livestock management, and fisheries development. The training of such staff, however, also requires that the RNC have the organizational capacity to use them effectively. One mechanism which deserves serious consideration is the creation of a social and economic study and evaluation unit within the Commission which is responsible for providing whatever information is necessary for involving local populations more actively in the river basin development. Since it relates to the capacity of the RNC to use and build upon whatever results are produced, the feasibility of establishing such a unit will be undertaken by AID as part of the Diagnostic Study.¹

D. Economic Analysis

One of the purposes of this "start-up" project is to provide the necessary data and information which will allow the member states of the RNC and the international donor community to thoroughly analyze future requirements for the comprehensive planning of the Niger River Basin development program and determine the level of investment which can be rationally justified on the basis of expected benefits resulting from the execution of planned development activities.

¹A.I.D. has successfully sponsored a similar unit (The Social Survey Research Unit of the Bicol River Basin Development Program); see Bicol River Basin Development Program; Department of Public Works, Transportation and Communication, Republic of the Philippines, February, 1973, p. 121, and Bicol River Basin Prop; Annex #1; USAID/Philippines, May, 1973.

DIAGNOSTIC STUDY OF NIGER RIVER BASIN

TERMS OF REFERENCE

FOR

AGRICULTURE

Diagnostic Study of Niger River Basin

Terms of Reference

Agriculture

I. Introduction

A. Study Objectives:

The objectives of the diagnostic study of agriculture of the Niger River Basin are:

1. To document and evaluate available data and information in terms of their utility, completeness and quality;
2. To document existing land and water use systems used by Niger Basin residents, with special emphasis on their potential for development; quantify available agricultural and land resources;^{1/} identify the local and national constraints to improving agriculture in the basin; estimate production potential under different development strategies with and without water control and other inputs; and isolate and define immediate and mid-term development opportunities that are consistent with the objectives outlined in the basic Project Document.^{2/}
3. To prepare a five-year Action Program which defines the analytical, research, field studies and pilot projects required for development of a comprehensive plan and investment program for the Niger River Basin to be undertaken by the Niger River Commission (NRC), and member states as appropriate.
4. To identify available data and information that will be required during the course of the five-year Action Program, determine feasible means of

^{1/} The land resources of the Basin must be evaluated in liaison with the consultant for the "Water Resources" component of the Diagnostic Study.

^{2/} UNDP, CIDA, USAID, IBRD & FAC, "Development of the Niger River Basin Technical Preparatory Meeting of the Meeting of Donors," Paris, 12 pages with Annex I of 33 pages, 6-8 September, 1976.

transferring needed data and information to NRC Headquarters (Niamey, Niger), and elaborate on equipment, facility and manpower requirements for the storage, processing and handling of data and information in Niamey.

II. Study Area and Scope

With a length of over 4000 km, and a basin area of 1.9 million km², the Niger is one of the world's great rivers. The Upper Niger flows into the agriculturally-valuable and hydrologically-complex Interior Delta of Mali and the Lower Niger, which emerges as a much smaller river from the Interior Delta, flows through the desert, and is then joined by successively larger tributaries until it reaches the Bight of Benin via a second conventional delta in Nigeria.

For the purposes of this study the agricultural analysis will be limited to the area contained within the watershed of the Basin. Also for this study, agriculture will be defined to encompass land and water resources, fisheries, farm enterprises, both crop and livestock, and will cover rainfed, flood recession, natural submersion and controlled irrigated agriculture.

III. Scope of Work

The contractor shall, drawing mainly from existing information supplemented by necessary field inspection, perform the following services:

A. Agricultural Resources

1. General

Provide an assessment of land and water suitability for crop, livestock and fisheries production in the Basin, giving full consideration to the technical, agronomic, biological, economic, social and environmental considerations which constrain existing or may constrain future production and of marketing potential.

2. Land & Water Suitability

The contractor should locate, map and assess the following agricultural lands:

- a. Potential arable lands;
- b. Existing lands under dryland farming, including a descriptive analysis of existing dryland farming systems and their potential for development;
- c. Potential dryland farming areas;
- d. Existing irrigated lands, including a descriptive analysis of existing irrigated agricultural farming systems and their potential for development.

For the potential arable lands and the existing irrigated lands, the contractor should assess the suitability of the potential on existing water supply source. This assessment will be made in close cooperation with the consultant conducting the Water Resources component of the Diagnostic Study.

In assessing the suitability of land and water resources of the Basin, the contractor is to pay attention to those factors affecting crop development. For the potential arable lands and the existing irrigated lands, particular consideration should be directed to appraising the characteristics and conditions of:

- low gradients
- topographic lows
- windfall and river flooding
- salted land
- depths to and fluctuations of water table
- surface and sub-surface drainage

- soil factors including depth, permeability, iron oxide crusts and pans
- salinity and acidity
- low cation exchange capacity and base saturation
- moisture retentivity

The contractor should conduct field appraisal to determine land characteristics, conditions, use and management in order to identify constraints and development opportunities.

In conducting the assessment of existing irrigated agricultural systems, the contractor will determine present production levels and identify constraints that retard increased output. The contractor will evaluate each system in terms of the adequacy and quality of support services available to project area farmers including, but not limited to provision of inputs, and extension services. Special attention is to be directed to the adequacy of system operation and maintenance capability and the role project beneficiaries play in operating and maintaining projects works. The consultant will draft recommendations including detailed Terms of Reference for follow-on actions that will improve project output, including rehabilitation of project works and provision of necessary support services including formation or strengthening of irrigation associations.

3. Present Agricultural Situation: Constraints, Opportunities and Alternatives

a. Present Technology

Describe, by major farming systems, techniques (e.g. planting arrangement, date of planting, method and frequency of weeding, disease and pest control measures, inorganic and organic fertilizer application, power sources used, etc.) currently used in the Niger River Basin by farmers in terms of crop enterprises under both irrigation and dryland conditions. An analysis of existing livestock systems is also to be made with special reference to the

interrelationship between crop and livestock systems. With respect to irrigated agriculture the analysis of existing practices should differentiate between flood recession, natural emersion, and crop production with partial water control and crop production with full water control.

b. Factors Affecting Agricultural Development

Assess the existing constraints and problems faced by farmers in the River Basin (e.g. disease problems, pest problems of rice eating fish, low yields, water use compared with water requirements, lack of market access, etc.). Likewise, identify and describe those factors favoring agricultural development in the Niger River Basin.

c. Available Technology

Assess the availability of technology to overcome the constraints and problems, outlined in 3b. above. As far as feasible, assess appropriateness of available technology in terms of its technical feasibility, economic profitability and social acceptability to the individual farmer and its compatibility with existing farming systems.

4. Agricultural Development Zones

On the basis of the information provided by the surveys carried-out under Sections III. A. 1, 2, and 3, the contractor will identify and subsequently divide the Basin, based on factors which include the development potential of existing production systems as well as on agronomic, climatologic, hydrologic and/or other relevant factors into agricultural development zones.^{3/}

^{3/} Two studies have attempted to sub-divide the Basin into zones. See: "Niger River Commission Study"; Holmes and Narver, Inc., 1968 (financed by U.S.A.I.D.); "Potential Areas for the Development of Large-Scale Irrigation in the Upper Valley of the Niger", May, 1974, by J. Argouillon; published in L'Agronomic Tropicale.

The contractor will present the analysis of constraints and potential of the agriculture sector in terms of these agricultural development zones. Based on this analysis, the contractor is to rank order each zone on the basis of the zone's agricultural development potential (high to low). The contractor is to present the data for each agricultural development zone and for the Basin as a whole in the form of small scale (1:1,000,000) maps supported by appropriate quantitative analysis and written narrative.

B. Cost and Returns in Agricultural and Livestock Production

Provide detailed quantitative descriptions of the major farming systems in the Niger River Basin. In particular construct household budgets (farm management type) for representative farming systems in the various Agricultural Development Zones. Farming systems should be defined to include the following:

- Crop enterprises on dryland, flood recession, natural subemersion, irrigation with partial water control and irrigation with full water control.
- Livestock enterprises.
- Off-farm enterprises (e.g., trading, forestry, manual labor.

Adequate attention is to be given to the variations between farms within each representative system. Full attention is to be given to the following:

1. Land
 - Land area controlled and percent farmed and fallow by household
 - Area devoted to alternative crops and livestock
 - Land development cost for irrigated land: cost of development to be classified by type of land prior to development and level of final development. Land development

costs to handle on-farm water delivery systems i.e. farm ditches, laterals, bunds and heat gates; and surface and subsurface drainage systems.

2. Water

- Assess crop water requirements, rate and frequency of application
- Cost of water, e.g. fees paid to water authority, on farm costs of pumping water, etc.

3. Livestock

- Type and value of livestock owned and age/sex distribution; use for animal powered equipment
- Productivity and performance of the livestock, i.e. growth, calving and mortality rates, etc.
- Livestock husbandry techniques and costs.

4. Capital

- Quantity and value of fixed capital, i.e. buildings, machinery and equipment, including animal power equipment.

5. Labor

- Stock of labor in the household, including age/sex distribution, educational level, division of labor as it relates to different economic activities; distribution of projects among household members, with special reference to the extent women benefit from agricultural development.

C. Food and Fiber Demand and Supply Situation

1. Assess and update present and likely future demand for food crops, livestock and fish produced in the Niger River Basin. Particular attention should be paid to crops likely to be produced under irrigated agriculture, e.g. rice, sugar cane, cotton, wheat and vegetables. Demand is to be broken down into the domestic demand of each country as well as regional (West African) demand and if possible by agricultural development zone as outlined in Section II.A.4.

2. Assess the present and future supply situation if present policies including projects already close to execution are implemented for the crops, livestock and fisheries as mentioned above.

3. A special effort should be made by the consultant to liaise with the working groups of the Club des Amis du Sahel dealing with markets and price policy, irrigated and dryland agriculture, livestock and fisheries. These groups are in the process of making similar assessments on a country basis for RNC riparian states who are members of CILSS, i.e. Mali, Niger, Chad, Upper Volta.

D. Agricultural Service and Development Institutions

1. Market and prices: Evaluate the functioning of market institutions for agricultural inputs and output with special attention to food crops. Examine the traditional and formal (State) marketing institutions and their effect on price determination. Identify bottlenecks in the marketing system and price structure that are likely to hamper the development of the identified agricultural development zones.

2. Credit: Examine existing agricultural credit programs and determine their effectiveness in encouraging agricultural development, particularly irrigated agriculture.

3. Storage: Briefly describe the different types of farm and non-farm storage facilities used in the identified agricultural development zones. Assess storage costs including the amount of loss in each system. Identify likely bottlenecks in storage facilities in the agricultural development zones.

4. Research: Briefly describe the applied research institutions responsible for agriculture in each member country with special emphasis on food. Describe the research underway or completed that would be of value to the NRC and outline programs of future research which would be of mutual value to national research efforts as well as the planning work of the NRC. Assess the availability and reliability of data on the yield increases to be expected from adoption of improved practices, especially irrigation.

5. Extension: Describe the organization of the agricultural extension system in RNC member states. Outline major constraints by country in improving extension efficiency and effectiveness, particularly in priority agricultural development zones, with emphasis on extension activities to farmers in irrigated areas and extension support to water-user organizations.

E. Fisheries

The contractor shall conduct a comprehensive analysis of the existing studies and information, augmented by limited field inspection, on two aspects of fisheries development:

- (1) captive fisheries in the Niger River Basin and
- (2) fish farming.

The assessment of the fishing industry will include documentation of the present

fishing catch by species groups, methods used, numbers of boats and fishermen, and history of the fishing industry. Tabulation of catches by country will be required as well as a record of historical catches and international exchanges of fishery products. Data on non-fish species such as frogs, turtles, shrimp, snakes or shellfish should be included if possible.

The analysis of previous studies of the fishing industry in the various countries will include lists of the recommendations and findings of previous study teams. Where recommendations were not carried out, the reasons should be studied and if projects resulted from these recommendations the reasons for success or failure of the projects should be evaluated.

The fishery management organizations of the respective countries should be described as well as any international organizations and international fisheries agreements pertaining to the Niger River. The fishing regulations of each country should be described, the ability of the countries to enforce the regulations evaluated, and international conflicts or disagreements documented.

Marketing and processing procedures for fish should be described. Demand and price structure for the various types and qualities of fishery products both in urban and rural areas should be analyzed.

An analysis of the natural fisheries resources of the River Basin should be conducted including some rough estimates of abundance of various species or potential production of the species. Meteorological and man-caused environmental changes affecting fish production should be noted.

The analysis of fish farming to the extent that it exists while parallel in some aspects to the study of fisheries, will also have important distinctions.

Present fish farming activities should be described in detail with data on harvests by country and species.

Methods used, sources of fingerlings, feeds used, and manpower involved should also be documented.

An appraisal of resources available for use in fish farming should be conducted. These resources will include water supplies, soils, land not suitable for agriculture, feeds, organic agricultural wastes and manures, and labor. The potential for construction of small and large reservoirs which could serve multiple uses including fish production should be examined.^{1/}

A review of previous studies of the potential for aquaculture will be made, including a summary of the conclusions, recommendations, resulting action, successes, and failures emanating from these studies. Reasons for failures should receive special attention.

Market demand for cultured fish species, and procedures for preservation and distribution of products should be described.

The five year action program for fisheries will include recommendations for the provision of additional studies required to fill noted information gaps as well as the terms of reference for studies, pilot projects and research, to test or develop methods for improving the harvest of fishery resources through better management, improved methods and the identification and development of new activities relevant to the development of fisheries in the Niger River Basin.

The contractor will also list and inventory all available studies, information and data on fisheries and the fishing industry in the Niger River Basin and make arrangements or recommendations for its transfer to the Documentation Center of the River Niger Commission.

^{1/} This aspect of the study must be carried out in close consultation with the contractor responsible for the water resources component of the diagnostic study.