

PDBAY 1087

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET		1. TRANSACTION CODE <input checked="" type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete	Amendment Number _____	DOCUMENT CODE 3
2. COUNTRY/ENTITY Zaire		3. PROJECT NUMBER 660-0098		
4. BUREAU/OFFICE AFRICA		5. PROJECT TITLE (maximum 40 characters) Agricultural Marketing Development		
6. PROJECT ASSISTANCE COMPLETION DATE (PAGD) MM DD YY 07 31 94		7. ESTIMATED DATE OF OBLIGATION (Under 'B' below, enter 1, 2, 3, or 4) A. Initial FY 84 B. Quarter 4 C. Final FY 86		

8. COSTS (\$000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total	2,400		2,400	8,000		8,000
(Grant)	(2,400)	()	(2,400)	(8,000)	()	(8,000)
(Loan)	()	()	()	()	()	()
Other U.S.						
Host Country		30	30		5,000	5,000
Other Donor(s)						
TOTALS	2,400	30	2,430	8,000	5,000	13,000

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN	130			0	0	2,400	0	8,000	0
(2)									
(3)									
(4)									
TOTALS				0	0	2,400	0	8,000	0

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each) 060 063				11. SECONDARY PURPOSE CODES			
12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each) A. Code -- B. Amount							

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of this project is to reduce the economic distance between the food crop producers in central Bandundu and commercial markets.

14. SCHEDULED EVALUATIONS Interim MM YY MM YY Final MM YY 06 86 01 88 06 94				15. SOURCE/ORIGIN OF GOODS AND SERVICES <input checked="" type="checkbox"/> 000 <input type="checkbox"/> 941 <input checked="" type="checkbox"/> Local <input type="checkbox"/> Other (Specify) _____			
--	--	--	--	---	--	--	--

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY	Signature: 	18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY
	Title: Mr. Arthur S. Lezin Acting Director	

ACTION MEMORANDUM FOR THE MISSION DIRECTOR

From: John Wiebler, PRM

Subject: Project Authorization - Agricultural Marketing Development (660-0098)

Problem:

Your approval is required to authorize a grant of \$8,000,000 from the Agriculture, Rural Development and Nutrition Appropriation to the Government of Zaïre (GOZ) for the Agricultural Marketing Development Project (660-0098), subject to the availability of funds in accordance with the USAID OYB allotment process.

Discussion:

A. Project Description

The purpose of this project is to reduce the economic distance between the food crop producers in central Bandundu and commercial markets. To achieve this purpose, the project will bring about a decrease in the unit cost of operating in-land and river vehicles and a net increase in the effective supply of transport. This project will be tightly linked to the companion Area Food and market Development (660-0102), which will focus on increasing the yields of food crop by its fifth year of operation.

The project will consist of four related interventions:

1) Assistance to the Waterways Administration (Régie des Voies Fluviales) to survey, mark, and regularly maintain the region's waterways; 2) assistance to the Bureau of Roads (Office des Routes), which will subcontract to local construction companies to improve river crossings and slopes; 3) assistance to private sector boat builders to expand industry skills and improve wooden boat and barge design and construction and to those missions which provide transport services to local farmers and merchants; and 4) a baseline study to determine the relative costs of river and road transport, the effects of technical innovation in the river transport subsector, and the rate of adoption of new technology.

B. Financial Summary

The total USAID contribution to the ten year life of the project cost is \$8,000,000. The Government of Zaïre will contribute the equivalent of \$5,000,000 in local currency for personnel, facilities and other operating costs. The USAID/GOZ life-of-project cost is approximately \$13,000,000.

C. Implementation

The GOZ implementing agencies will be the Bureau of Roads (OR), the Waterways Administration (RVF) and the Department of Plan.

D. Committee Action and Congressional Notification

The Project was reviewed by the Project Committee. As there were no unresolved issues, the Project Committee concluded that the project should be forwarded to you for authorization. A Congressional Notification was submitted and cleared Congress on June 29, 1984.

Recommendation

That you sign the attached Project Authorization and thereby authorize the Project.

Drafter: T ^{TB} Born

Clearances: DEO: H.L. Braddock ^B
CONT: R. King (DR 887)

Date 7/30/84

^B

Project Authorization

Name of Country: Zaire

Project Name: Agricultural
Marketing Development

Project Number: 660-0098

1. Pursuant to the Foreign Assistance Act of 1961, as amended, I hereby authorize the Agricultural Marketing Development Project with the Government of Zaire involving planned obligations of not to exceed \$8,000,000 in grant funds over the planned life of project of ten years from the date of initial obligation subject to the availability of funds in accordance with the AID OYB/allotment process.

2. The project will reduce the economic distance between the food crop producers in central Bandundu and commercial markets, by improving river and road transportation in the project area.

3. Source and Origin of Goods and Services

Goods and services, except for ocean shipping, financed by AID under the Project shall have their source and origin in the United States except as AID may otherwise agree in writing.

Ocean shipping financed by AID under the Project shall, except as AID may otherwise agree in writing, be financed only on flag vessels of the United States or the Republic of Zaire.

4. Covenant

The cooperating country shall covenant:

to make available all necessary budgetary and human resources needed by the GOZ's participating organizations in a timely fashion.


Arthur S. Lezin
Acting Mission Director
USAID/Zaire

7/30/84

TABLE OF CONTENTS

	Project Authorization	1
PART I:	PROJECT SUMMARY	1
PART II	PROJECT RATIONALE AND LOCATION	2
	A. Project Rationale	2
	B. Project Area	5
PART III	PROJECT DESCRIPTION	9
	A. Project Goal	9
	B. Project Purpose	9
	C. Project Elements	10
	1. Assistance to River Transportation	10
	2. Assistance to Road Transportation	11
	3. Project Monitoring and Evaluation	12
	D: Project Outputs	14
PART IV	PROJECT ANALYSES	15
	A: Technical and Institutional Analysis.....	15
	1. Introduction	15
	2. Description of Technical Inputs	15
	a. Assistance to River Transportation	15
	(1) Assistance to <u>Régie des Voies Fluviales</u> ...	18
	(2) Design of Wooden Boats and Barges	22
	(3) Construction of Metal River Boats and Barges	25
	b. Assistance to Road Transportation	30
	(1) Stabilization of Slopes	31
	(2) Improvement of Water Crossings	32
	(3) Location of Surfacing and Materials	33
	c. Project Impact Monitoring and Evaluation	34
	B: Financial Analysis	37
	C: Economic Analysis	45
	1. Macro-Economic Analysis	45
	2. Benefit-Cost Analysis	52
	3. Non-quantifiable Benefits	58
	D: Social Analysis	60
	1. Socio-Cultural Context and Feasibility	60
	2. Equity Considerations	67
	3. Impact on the Rural Standard of Living	68
	E: Energy . .alysis	73

PART V : **IMPLEMENTATION PLAN74**

A: Administrative Arrangements74

B: Implementation Schedule82

C: Performance Monitoring Plan84

D: Impact Monitoring and Evaluation Plan86

ANNEXES :

1. PID Approval Message

2. PID Issues

3. Logical Framework Matrix

4. Project Element Appraisal Matrix

5. Statutory Checklist

6. Host Government Requests for Assistance

7. FAA 611 (a) and 611 (e)

8. Boat Design Specifications

9. Additional Project Possibilities

10. Computer Requirements and Specifications

PART I: PROJECT SUMMARY

This project is designed to contribute to AID's central objective of meeting the needs of the poor majority through sustainable and broadly based economic growth. It will be sited in Bandundu, one of nine regions in Zaire. Central Bandundu is one of the two areas of concentration for USAID's development assistance to production in Zaire.

The goal of this project is to raise the standard of living of the rural population of central Bandundu. It shares this goal with the companion Area Food and Market Development Project (660-0102) planned for initiation in FY 1985.

The purpose of the project is to reduce the economic distance between food crop producers in the project area and commercial markets. The project area is located in central Bandundu, both north and south of the Kasai River. It is, by African standards a densely populated area (26 people per km², on average) which is agriculturally very productive. The main cash crops are food crops: manioc, corn, peanuts and rice. Other crops include coffee, palm nuts, fibers and rubber.

The area is linked to commercial markets in the west and the east by both road and river networks. River transportation is less costly and more fuel efficient than road transportation but, because of long delays in transit and high losses due to theft and damage, it is underutilized. The rural roads leading to the ports or to market roads lack adequate water crossings and are often impassable after rains because of hazardous and slippery slopes.

The project will improve navigation conditions on the Kasai River and selected tributaries, will increase the river transportation fleet, and will improve rural road and bridge access to ports and to market roads.

The project will work with and through the national Bureau of Roads and the Waterways Administration as well as with local private sector organizations in the project area. It includes specific attention to institution building, in both public and private sectors, to technology transfer, and to broadening the opportunities for private initiatives in economic development.

The total cost of the project is estimated to be \$13,000,000, of which \$8,000,000 will be financed by AID grant funds. The project's foreign exchange will finance both long and short term technical assistance, training and commodities.

The project is exploratory and innovative in several aspects. Although the length of the project will be ten years, the basic project elements are scheduled for completion within four years. This will allow an interim appraisal of the effectiveness of the various elements and of the appropriateness of their continuance or expansion, and will permit the possible addition of other components not included in the plan for the first four years.

PART II: PROJECT RATIONALE AND LOCATION

A. Project Rationale

In the past decade, the Government of Zaire has embarked upon a series of programs to improve the agricultural sector. The Agricultural Recovery Plan, aim of which is to increase food production to attain nutritional self-sufficiency, recognizes that the success of this Plan depends on the improvement of the rural transportation and marketing systems. To highlight this, the Government, in collaboration with the Food and Agriculture Organization, sponsored a donor round-table on transportation problems in June 1983. The meeting underlined the generally decrepit condition of the transportation system and the importance of maintaining river, road and rail networks.

The Government of Zaire has given priority for investments in the transport sector to the rehabilitation and maintenance of the existing infrastructure since this is expected to yield the earliest returns to the economy at the lowest cost.

The Bandundu region is one of the most agriculturally productive regions of Zaire. Its geographical relationship to Kinshasa and to secondary cities in the two Kasais and Shaba facilitates the marketing of its surplus production towards these urban demand centers. The marketing system which links producer and consumer is based on both road and river transportation. The deteriorated state of both transportation networks has become a serious constraint.

USAID concentrates its development assistance to Zaire in those priority sectors where it can make the most significant contribution, especially agriculture, health, nutrition and population. In the Bandundu region these activities are linked through the concept of area development in such a way that they are mutually supportive and cumulative in impact. This project will provide the marketing infrastructure required for the planned Area Food and Market Development Project (660-0102). It will complement and expand the infrastructure development undertaken under two earlier Agricultural Marketing Development Projects (660-0026 and 660-0028) concerned with upgrading regional priority roads and with port construction on the Kasai River. It will support activities undertaken under the Basic Rural Health Project (660-0086), the Area Nutrition Improvement Project (660-0079), the Applied Agricultural Research and Outreach Project (660-0091), the Private Voluntary Organization Economic Support Project (660-0097), as well as other development initiatives by USAID, other donors, and the Government in the region.

The activities to be undertaken under this project will be coordinated with other donor activities in the area and particularly with CODAIK, the Kwango-Kwilu Integrated Agriculture Development Company, which is the authority responsible for coordinating the agricultural, rural and economic development of the Kwango and Kwilu sub-regions of Bandundu.

The goal of the project is to raise the standard of living of the rural farming communities in central Bandundu through the improvement of the transportation and marketing system for surplus food and other produce. This

goal is central to USAID's development strategy in Zaire as well as to the Government's development objectives.

The experience of USAID in Zaire has been that, with the repair of roads and the building of bridges, merchant competition for food and other crops increases markedly with a consequent rise in prices to the farmers. This increase in incomes along with production has a positive impact on household food and cash availability thus reducing vulnerability to malnutrition and to financial contingencies. In this way the quality of rural life is improved.

Central Bandundu contains one of the densest surface transport networks in sub-saharan Africa, comprised of several thousand kilometers of dirt and paved roads and navigable waterways. Indeed there are few points in the entire area bounded by Bandundu city, Kikwit, Idiofa and Dibaya-Lubwe which are more than 10 kilometers from a road or what was once a road. Perhaps half of the area is similarly situated with respect to waterways. This is not to say, however, that every point is within an economic distance of a market, that being a distance within which it pays a farmer to sell or a trader to buy and move goods. This distance will increase as farm and transportation and marketing costs fall or farm prices rise, and will decrease when the converse is the case.

The retail price of a good is the final determinant of economic distance, for the consumer must in the last analysis pay full cost. The principal market for commercialized food crops is Kinshasa, a market of large appetites and relatively small disposable incomes. Kinshasa presently consumes approximately 750,000 tons of manioc annually, but it can afford to pay only a few zaires per kilo. Low price elasticities prevail on both the supply and demand sides, reflecting a largely subsistence production system on the one hand and consumer poverty on the other.

The market margin separating producer and consumer is large. Studies suggest that farmers may get as little as 20% and no more than 40% of the retail price for their manioc. Preliminary analysis goes on to suggest that market power on the part of merchants and traders plays little or exceptional roles in explaining this spread; rather high costs of transport augmented perhaps by poor if rational business practices, appear to be responsible.

Despite the density of the transport networks, physical access to markets is difficult. River and road transport networks exist, but at any one time only one system functions more or less effectively. During the rainy season, when river levels are high, the unpaved rural roads are passable only with difficulty and long delays. During the dry season, the road network is generally passable while river transport is limited by the shallow depth of the rivers.

The cycle of crop marketing in Bandundu overlaps both seasons (Table 1). The agricultural food marketing campaign, which is the official selling season for maize, peanuts, rice and gourd seeds, normally begins in early April during the height of the second rainy season. The campaign continues into the dry season and has slackened off when the coffee marketing season commences in June/July. Manioc (cassava) has its own seasonal cycle of production which is determined by the availability of labor and long drying periods. Peak

Table 1: Agricultural Marketing Cycle

<u>CROPS</u>	<u>HARVESTED</u>	<u>MARKETED</u>
Manioc	All year	As harvested but increases June to September
Maize	January to March	April to August
Peanuts	December	April to August
Rice	January to February	April to August
Gourd seeds	January to February	April to August
Millet	June to July	June to July
Sweet Potatoes	June to September	June to September
Bananas	January, April to June	January, April to June
Fiber	March to August	April to August
Coffee	February to May	July to August
Fish	All year	All year but increases in dry season
Palm fruits	All year	All year

harvesting periods occur during May to August and January to February. Because of these marketing cycles, both networks are essential to the transportation of surplus food production to the centers of demand.

High assembly costs, which reflect poor roads, waterways choked by neglect (and complicated by seasonal or exceptional low water levels), and the whole starved by lack of capital affect economic distances so that many producers cannot economically produce for market, and traders cannot collect produce and pay the costs, the effect being to reduce the economic capacity of Bandundu to a level substantially below its technical capability.

This project will improve navigation conditions on the Kasai River and selected tributaries, will increase the river transportation fleet, and will improve rural road and bridge access to ports and to market roads.

B. The Project Area

The project area, located in central Bandundu both north and south of the Kasai river, covers a surface area of approximately 32,000 square kilometers (Map 2) with a 1982 population of approximately 850,000 (Table 2). The landscape is rolling savannah plateaux interspersed with gallery forests in the many valleys. The forests become denser as the plateaux slope down from the south-west to the Kasai river basin. The innumerable rivers and their tributaries complicate road construction and maintenance but encourage the transport of goods by boat.

The project area includes, although it will not necessarily be limited to, the following collectivities:

Kwilu sub-region

Idiofa zone: Banga, Kapia, Kalanganda, Bulwem, Sedzo and Mateko

Bulungu zone: Due, Kilunda, Kwilu-Kimbata, Luniungu, Mikwi and Nkara

Bagata zone: Kidzweme and Manzasai

Mai-Ndombe sub-region

Kutu zone: Batere and Kemba.

This area has been defined and determined by the Kasai and Kwilu rivers and their tributaries by which there is direct access for foodstuffs to the markets in Kinshasa and in secondary cities to the east. The project area is linked to Kikwit, Idiofa and the river ports of Panu, Mangai and Dibaya-Lubwe by the roads being improved under the earlier Agricultural Marketing Development Projects (660-0026 and 660-0028), and to Kinshasa by a paved road from Kikwit.

The population density is high for Zaire, ranging from 11 to 71 persons per square kilometer in the rural areas. The average density for the project area is 26 persons per square kilometer compared with a national average of 11. The population density has increased significantly in the last decade, up from an average of 18 in 1970. Women form 53 percent of the population, although in some areas this is as high as 59 percent.

The region is ethnically diverse, more so than most other regions of Zaire. Ethnic groups in the project area include the Yansi, Mbala, Mounda, Dinga, Ngoli, Lori, Ngwi, Pende, Hungana, Pindi, Mputu, Suku, Songo and Sakata. These diverse groups speak different though related languages and have different histories, social organizations and cultural practices.

The rainfall averages about 1,400 to 1,700 mm annually with two distinct rainy seasons, October to December and March to May. There is a short dry season in between and a long dry season from June to September. Itinerant, slash-and-burn agriculture is practiced throughout the area with multiple

TABLE 2: PROJECT AREA POPULATION 1982

	M	F	TOTAL AREA (sq km)	SURFACE DENSITY	POPULATION
<u>Subregion (S/R): Kwilu</u>					
<u>Zone: Idiofa</u>					
Collectivité:					
Ranga	26,341	29,038	55,379	1,675	33.0
Kapia	24,845	28,609	53,454	1,133	47.2
Kalanganda	28,540	33,378	61,918	1,423	43.5
Bulwem	24,766	25,108	49,874	3,044	16.4
Sedzo	26,590	32,549	59,139	3,050	19.4
Mateko	25,313	28,327	53,640	1,590	33.7
Subtotal - Idiofa	<u>156,395</u>	<u>177,009</u>	<u>333,404</u>	<u>11,915</u>	<u>28.0</u>
<u>Zone: Bulungu</u>					
Collectivité:					
Nkara	30,937	34,838	65,775	1,100	59.8
Due	18,474	26,165	44,639	900	49.6
Kwilu-Kimbata	32,938	36,697	69,635	1,900	36.6
Luniungu	19,981	22,554	42,535	1,300	32.7
Kilunda	26,374	30,081	56,455	800	70.6
Mikwi	21,996	24,979	46,975	700	67.1
Subtotal - Bulungu	<u>150,700</u>	<u>175,314</u>	<u>326,104</u>	<u>6,700</u>	<u>48.7</u>
<u>Zone Bagata</u>					
Collectivité:					
Kidzweme	20,488	24,469	44,957	2,538	17.7
Manzasai	24,459	28,409	52,868	3,404	15.5
Subtotal - Bagata	<u>44,947</u>	<u>52,878</u>	<u>97,825</u>	<u>5,942</u>	<u>16.5</u>
Subtotal Kwilu S/R	<u>352,042</u>	<u>405,201</u>	<u>757,243</u>	<u>24,557</u>	<u>30.8</u>
<u>Subregion: Mai-Ndombe</u>					
<u>Zone: Kutu</u>					
Collectivités:					
Kemba	29,113	29,939	59,052	4,962 ²	11.9 ¹
Batere	<u>14,678</u>	<u>15,854</u>	<u>30,532</u>	<u>2,565²</u>	<u>11.9¹</u>
Subtotal - Mai-Ndombe	<u>43,791</u>	<u>45,793</u>	<u>89,584</u>	<u>7,527</u>	<u>11.9¹</u>
<u>TOTAL</u>	<u>395,833</u>	<u>450,994</u>	<u>846,827</u>	<u>32,084</u>	<u>26.4</u>

¹ Average population for Kutu zone; it is believed these two collectivités are ~~more~~ more densely populated.

² Estimated surface area based on collectivité population and average population density.

cropping patterns. The staple food crops, both root crops (manioc) and cereals and grain legumes (maize, rice, and peanuts), are the main cash crops and the most important source of rural cash incomes. Other cash crops include coffee, palm fruits, fibers and rubber.

The majority of the rural population is engaged in agriculture, predominantly itinerant agriculture. These small farmers are dynamic, hard-working and responsive to economic incentives. The surface area under cultivation has increased from about 6 percent in 1960 to at least 25 percent in 1984, although this figure could be much higher in parts of the project area. The fallow period has fallen from the traditional 20 years to 3 to 5 years on the savannahs and 2 to 3 years in the forests. The soils are fragile and uncontrolled bush burning and soil erosion have increased in recent years. Yields have dropped significantly according to the peasant farmers. All official production and marketing statistics are believed to be influenced by national political considerations rather than based on observed or measured phenomena.

The capital of the region, Bandundu City, with a population of approximately 100,000, is situated on the Kwango river, between the Kwilu and Kasai rivers. The largest city in the region with a population of 156,000, and its financial and commercial capital, is Kikwit, 525 kilometers from Kinshasa by paved road and 925 kilometers by river. There are numerous other small market and agricultural towns which, together with Kikwit and Bandundu provide essential administrative commercial and social services to the rural population and where a significant part of the rural population will reside for certain periods, particularly in their youth.

Rural settlement is in villages ranging in size from 20 to over 5,000 persons. Villages (officially referred to as localities) are grouped into groupements where a traditional Chef de groupement is appointed from among the Chefs de village or by other traditional means. These in turn are grouped into collectivities, the lowest level of modern administration. The Chef de collectivité and his advisory council are elected. The next levels of government are the zone, the subregion and the region, the latter of which is directly answerable to the national government in Kinshasa. Each Regional Governor is also the Regional President of the single national political party (Mouvement Populaire de la Revolution (MPR)) and the party structure extends down to the village level, with a committee in each village headed by a dirigeant. Collectivities generate their income directly through local taxation; higher levels of government receive a portion of the collectivity revenues but are mainly funded from the national budget.

Services, transport and communications are poor although in colonial times they were relatively developed. Roads and rivers are poorly maintained; the vehicle fleet has deteriorated; fuel supplies are uncertain; there is a dearth of repair and maintenance facilities; credit is scarce; telecommunication services no longer exist. The poor condition of most of the rural roads causes vehicles to depreciate very quickly, lowers vehicle utilization rates, increases transport costs and time, and leaves certain potentially productive agricultural areas without assured access. The general macroeconomic situation has greatly restricted trader/transporter access to foreign exchange for new vehicles and spare parts and to credit. River transportation is unorganized, unreliable and time consuming. All these factors constitute serious constraints to agricultural marketing in the project area.

The economic and social structures of the region, particularly in the central collectivities of Idiofa zone, were seriously damaged by the 1964 Mulelist rebellion. The 1979 "demonetization" (i.e., change in currency bills without adequate compensation to the holders of old bills) virtually wiped out any cash savings of the area's small farmers and traders. Sharp increases in population unaccompanied by improved land management and agricultural practices, adverse terms of urban/rural trade, badly deteriorated public services and the lamentable state of the transport systems have meant a lowering of the quality of rural life.

PART III: PROJECT DESCRIPTION

A. Project Goal

The goal of the project is to raise the standard of living of the rural population of central Bandundu.

There are many inter-related dimensions to people's standard of living, but for rural peasant farmers the nutritional status of an individual and his or her equitable incorporation into the cash economy are important measures.

The project will strengthen the food marketing system through improvements to the transportation system. The benefits brought about by this and by the expansion of the marketing system should increase prices paid to the farmers for their produce. This would have the beneficial effects of both increasing producer income and increasing the food available at the household level.

The success in achieving this goal will depend, inter alia, on whether the project-induced reduction in transport costs will be transformed into increased production and real incomes. This is more likely to happen if there is overall a balanced development of the region through the provision of basic rural services, through the development of financial and social institutions, through the development of secondary and market towns, and through the diversification of the rural economy.

B. Project Purpose

The purpose of the project is to reduce the economic distance between the food crop producers in central Bandundu and commercial markets.

The economic distance of a market is the distance it pays a farmer to sell or a trader to buy and move goods. The economic distance is a function of the market price of goods, the cost of production inputs, and the costs of assembly and transportation. There is an inverse relationship between these costs and economic distance. As these costs are reduced, economic distance is extended. The cost of transportation will fall during the life of the project as a consequence of the improved navigability of the rivers, more frequent river transportation service, reduced user costs on feeder roads, increased choice between transport modes, and a somewhat increased river capacity.

In order to achieve its purpose, the project must bring about a decrease in the unit cost of operating vehicles, a net increase in the effective supply of transport, and an increase in the non-agricultural use of the networks. It is assumed that the World Bank and other donors will continue to assist ONATRA and RVF to upgrade and maintain their operations and that local road maintenance arrangements will be effective. The success of this project is also dependent on the timely implementation of the companion Area Food and Market Development Project (660-0102) and on the achievement of that project's objectives, in particular, increased yields of food crops by its fifth year of operation. This should lead to increases in the volume of produce to be marketed.

C. Project Elements

The project will provide technical assistance, commodities, and training in order to improve the transportation system in the region. There are three main elements: assistance to river transportation, assistance to road transportation, and project monitoring and evaluation.

1. Assistance to River Transportation

The project area is centered on the Kasai and Kwilu rivers and their tributaries. These waterways are navigable for about 3,900 kilometers for vessels of 40 tons or more (all measurements in this paper are metric). Significantly more are navigable by smaller wooden or metal boats ("baleinières" and pirogues).

Standards of maintenance and of services on these waterways have deteriorated markedly since colonial times. There has been a notable decline in the amount of agricultural products shipped out of the region by the parastatal responsible for river transportation (ONATRA, Office National des Transports). Services in both the public and private river transportation sectors are irregular and insufficient to meet the demand for haulage.

Régie des Voies Fluviales, RVF, the parastatal responsible for river marking and maintenance, has had inadequate financial and managerial resources to fulfill its mandate. Certain rocky channels of the Kasai river, part of the nation's main transportation route for minerals, goods, produce, and passengers, have never been hydrographically surveyed. Navigation charts are out of date. Channel marking has been inadequate due to a shortage of equipment, materials, and supplies. River ports and banks remain unmaintained and uncleared. These problems have been caused in part by budgetary constraints, in part by the poor training and motivation of personnel.

The project will assist Régie des Voies Fluviales to survey, mark, and regularly maintain the waterways in the region through:

- provision of equipment and short term technical assistance to appraise and improve river marking and maintenance practices;
- provision of hydrographic equipment, supplies, and technical assistance to chart selected sections of the Kasai river;
- provision of spare parts and components, tools, supplies, and technical assistance to rehabilitate U.S.-manufactured equipment in the RVF boatyard;
- provision of an in-service training/study tour of senior personnel of Régie des Voies Fluviales and Régie des Voies Maritimes (which has responsibility for maintaining the mouth of the Zaire river) to examine river marking and maintenance procedures and equipment as well as related institutional and financial organizations in the United States.

At the conclusion of this project element, an evaluation will be made of

the efficacy of this assistance to RVF and an appraisal will be made of the ways in which further assistance could be given to assist it to discharge its responsibilities in the Kasai basin.

Apart from assistance in river marking and maintenance, the project will also help expand the river transportation fleet. Design improvements will be made to the existing small wooden boats which transport up to ten percent of the agricultural produce shipped from the region. The technical skill of the artisanal wooden boat builder will be upgraded and expanded. These wooden boats have a haulage capacity of between ten and twenty tons but, as currently designed, they are unnecessarily flimsy craft with a relatively short life span. However, they cost one-fifth or less of the price of a metal boat of similar capacity and thus allow greater ease of entry into river transportation by the small investor. Steel construction involves a level of capitalization and scope of operation beyond the capacity of the average small trader/transporter.

The gap between the present wooden boats and metal boats could well be filled by wooden boats and barges with greater capacity than the present wooden boats. These vessels could still be affordable by the small traders/transporters. Their construction could expand the present rudimentary wooden boat building industry and could substitute a locally available resource, timber, for an expensive imported one, steel.

In recent years, because of the lack of regular river transportation services, a number of church organizations in the region have begun providing transport services to local farmers and traders which are both regular and less costly. In order to expand these services USAID will increase the haulage capacity of selected missions through the provision of barges, pushers and boats.

Assistance to expand the river transportation fleet will take the form of:

- provision of technical services and materials to private sector boat builders to expand industry skills and improve wooden boat and barge design and construction; and
- construction of small wooden or metal boats and barges (15 to 40 tons) for the transportation of food.

2. Assistance to Road Transportation

The project area contains a relatively dense network of roads leading to ports or linking the area to the main marketing and transit roads. However, these roads are in poor condition and geological and other conditions make them difficult to improve or maintain: torrential rains, erodable soils, a lack of locally available surfacing materials, and the omnipresent streams and rivers.

Traffic volumes on these roads are low, particularly on the local roads of agricultural interest. Although the upgrading of these latter roads would produce an unacceptably low return on investment, they are crucial to the establishment of an adequate marketing system. The project will attempt to

ensure reasonable access during the important marketing campaign but this is complicated by the fact that the campaign overlaps both rainy and dry seasons. The main constraints to access and trade are the deteriorated state of bridges, and the clay slopes and approaches to water crossings which become slippery and dangerous after a rainfall. A general constraint on road improvement in the region is the lack of locally available sources of surfacing materials or aggregates.

Manual maintenance of the roads of agricultural interest is the responsibility of the chefs de collectivité although it will often be organized by a local trader or mission. The stabilization of slopes and provision or improvement of water crossings will give local officials and individuals the incentive to keep the connecting roads adequately maintained manually. Investment in constraint points, as distinct from overall road upgrading, will also increase the return on the project investment since more roads will be made passable and significantly more villages will become more easily accessible.

Economic considerations also dictate that the method of stabilization with the lowest cost per kilometer be chosen. There is little experience in the humid African tropics in stabilizing rural roads, however experiments currently being undertaken by Office des Routes have given initial positive results with a relatively low cost technique. This is the use of a cement-soil mixture for stabilization without adding a wearing or sealing surface of bitumen or some similar material. The project will further test this technique in the project area and, if it is economically and technically feasible, will use it in its stabilization program.

Office des Routes will sub-contract both the stabilization and the bridge building components to local construction companies. Office des Routes' research department will itself undertake the study of sources of surfacing materials.

The project inputs for this element will be:

- financial assistance to Office des Routes to stabilize slopes and approaches to river crossings on selected marketing roads in the project area;
- financial assistance to Office des Routes to provide or improve waterway crossings in the project area;
- provision of equipment, supplies, and technical assistance to Office des Routes to undertake research into sources of surfacing materials and aggregates.

3. Project Monitoring and Evaluation

The level of return to the project investment in marketing and transport cannot presently be calculated with precision. Benefits will have to be estimated in terms of extra production, income, and jobs created as a consequence of the project. Furthermore, a firm understanding will be needed

as to the volume and the costs of river and road transportation and to the state of agriculture in the absence of the project. There is little or no reliable information on this currently available. This argues for comprehensive baseline studies to be done early in the project's life. Additional information will be needed moreover in the planning for any subsequent agriculture marketing development investments, especially where they are dependent upon the successful implementation of the Area Food and Market Development Project (660-0102). The project will assist the Institut de Recherches Economiques et Sociales (I.R.E.S.) in the Faculty of Economics at the University of Kinshasa to develop the institutional capacity to carry out, computer process and analyze survey and other data. The actual baseline studies for the project and the monitoring of its impact will be carried out under the Area Food and Market Development Project. The institutional capacity developed at I.R.E.S. will be drawn upon by both projects to assist in the undertaking of the required studies.

The project will also introduce some important technical innovations: a new technique for stabilizing slopes on rural roads, a new range of wooden boats and barges, and design modifications to the present wooden boats ("baleinières"). It will be important to monitor the design and testing of these techniques and to evaluate their success. The evaluation must be socio-cultural as well as technical, that is, the social acceptability and the rate of adoption of new designs and modifications must be carefully monitored.

The financial, equipment, commodity, training, and technical assistance inputs, and their allocation to the various project elements and sites, will be monitored. The direct results on outputs such as bridges built, roads improved, boats constructed, boat designs drawn up, personnel trained, and studies completed will be recorded. Each element of the project will be separately evaluated with respect to these variables.

The achievement of project objectives in terms of benefits and costs to the project participants and beneficiaries, to the rural population, and to the society in general will also be determined. The data collected by the impact monitoring system will be analyzed to determine causal relationships which may hinder or contribute to the successful implementation of the project and to the achievements of its objectives and goals.

The project as a whole will be evaluated with respect to performance, the implementation experience, sustainability of the technical innovations, and its impact on the target groups and on the society as a whole. Particular importance will be placed on the transfer of skills, the assumption of responsibility, the sustainability of project initiatives, and the implications for future project design in this sector.

In order to establish this monitoring/information system and to evaluate the project's performance and impact, the following inputs will be included:

- provision of equipment, supplies, and technical assistance required to establish data collection and analysis unit at I.R.E.S. required for the impact monitoring information system;
- provision of training in data collection, systems analysis, and data

analysis to personnel responsible for the establishment and implementation of the impact monitoring system;

- commissioning of the required baseline, impact, and communications support studies;
- provision of technical assistance for the evaluation of project performance and impact.

D. Project Outputs

1. Improvement of navigation conditions in the Kasai River Basin;
2. Improved efficiency of RVF boat yard;
3. Development of small to medium wooden boat and barge prototypes suitable for local construction;
4. Construction of a small number of metal boats and barges for transporting produce;
5. Construction/improvement of the network of feeder roads to ports and to markets;
6. Determination of the local availability of surfacing materials for rural roads; and
7. Establishment of a capacity in I.R.E.S. to carry out, analyze and process baseline and impact studies.

20

PART IV: PROJECT ANALYSES

A. Technical and Institutional Analysis

Introduction

The project involves the improvement of land and water market routes in Central Bandundu. The project is one of a number of existing or planned projects for this region which should form a critical mass of development effort. Two of these projects, the Agricultural Marketing Development Projects 660-0026 and 660-0028, are also concerned with the improvement of road and river transport. All three projects are situated in an area of relatively low levels of traffic and economic activity where transport, though an important constraint, is not the only constraint to development.

In the rural environment, transport and agricultural production systems are interdependent. The economic merit of transport improvements in the project area will depend on whether significant increases in future economic activity occur. Such changes may or may not be exogenous to the improvements in the transport system, depending on whether transport cost savings are transformed into increased agricultural production and income.

The effective preparation of rural transport projects requires appropriate and economic engineering procedures. Engineering standards, and design, particularly for rural roads which carry low traffic volumes, must be appropriate to the level of economic activity. Reasonable access during the important marketing campaign can be the only design criterion that is economically justified for both road and river transport .

This criterion rules out the dredging of river channels during the dry season in favor of the construction of boats or barges with more shallow draughts than those currently used. The criterion also favors the use of wood, which is locally available in abundance, over imported metal, in the construction of smaller boats and barges. It also rules out the construction of ports since at the present level of economic activity, the common practice of mooring to the river bank suffices outside of the main market ports.

Another design criterion is determined by the desire to transform project-induced lower vehicle operating costs into increased agricultural production and income. This occurs where transport and marketing systems are competitive. Thus ease of entry becomes an important consideration. Emphasis will be given to broadening the base of the river transport sector through the development of a range of vessels that are individually affordable and can, if desired, be owner operated.

Description of the Technical Inputs

The project will consist of the following technical inputs:

a. Assistance to River Transportation

1) Assistance to Régie des Voies Fluviales to improve river navigation

21

conditions in the project area through:

- provision of equipment and short term technical assistance to appraise and improve river marking and maintenance practices;
- provision of hydrographic equipment, supplies, and technical assistance to chart selected sections of the Kasai river;
- provision of spare parts and components, tools, supplies, and technical assistance to rehabilitate US manufactured equipment in the RVF boatyard; and
- provision of an in-service training/study tour of senior personnel of Régie des Voies Fluviales as well as Régie des Voies Maritimes (who have responsibility for maintaining the mouth of the Zaire river) to examine river marking and maintenance procedures and equipment and their institutional and financial organization in the US;

2) Provision of technical services and materials to private sector boat builders to expand industry skills and improve wooden boat and barge design and construction; and

3) Financial assistance to local development organizations for the construction of small wooden or metal boats and barges (15 to 40 tons) for the transportation of food crops.

b. Assistance to Road Transportation

1) Financial assistance to Office des Routes to stabilize slopes and approaches to river crossings on selected marketing roads in the project area;

2) Financial assistance to Office des Routes to provide or improve waterway crossings in the project area; and

3) Provision of equipment, supplies, and technical assistance to Office des Routes to undertake research into sources of surfacing materials and aggregates.

c. Project Monitoring and Evaluation

1) Provision of equipment, commodities, supplies, and technical assistance for the data collection and analysis required for the monitoring/information system;

2) Provision of training in data collection, systems analysis, and data analysis to personnel responsible for the establishment and implementation of the monitoring system; and

3) Provision of technical assistance for the evaluation of project performance and impact.

98

a. Assistance to River Transportation

The project area is centered on the Kasai and Kwilu rivers and their tributaries. The hydrographic basin of the Kasai River covers a surface area of 904,000 km² of which 72.5 percent is in Zaire with the rest being in Angola. The principal tributary of the Kasai on the left bank is the Kwango which has as its major tributaries, the Wamba, and the Kwilu. The major tributaries of the Kwilu include the Inzia, the Lukula, the Kwenge and the Lutshima. There are three other navigable tributaries on the left bank of the Kasai in the project area: the Kamtsha, the Lubwe and the Loange. The principal tributaries of the right bank are the Mfimi which draws its waters from Lake Mai Ndombe, the Lukenie, the Sankuru and the Lulua.

The navigable waterways of Zaire are classified in four categories according to their navigability by certain types of barges for approximately 75 percent of the year.

Table 3: Navigable Waterways

<u>Categories</u>	<u>Nominal Barge Capacity</u>	<u>Draft when loaded</u>
1	1200 T 1000 T	2.00 m 1.80 m
	700 to 800 T	1.80 to 1.90 m
2	550 to 150 T	1.50 to 1.00 m
3	40 T	0.85 m
4	5 T (Metal baleinière)	0.40 m

The navigable length of the Kasai basin for vessels of 40 tons or more is 3,909 kilometers, divided as follows:

- Category 1 : 605 km (Kwa and Kasai to Ilebo)
- Category 2 : 1,281 km
- Category 3 : 2,023 km

The placement of these rivers is shown in Map 3. Significantly more is navigable by small wooden pirogues and wooden or steel baleinières (Category 4).

The Kasai between Ilebo and Malela (ex-Kwamouth) is navigable throughout the year. However there are a number of difficult passages caused by sandy shelves, moving sand banks, isolated rocks and rocky reefs. Rocky stretches are infrequent upstream but towards the mouth of the Kasai the river bed becomes very rocky and reefs covered in sand limit the draft of vessels to

23

1.3m in periods of low water. The problematic passes downstream include the Swinburne Pass (km 176), the channel from Kandolo (km 175) to Dima (km 171), the regions near Kimbambili (Km 150 to 143), Bokala (km 120 to km 115), and Mushie (km 97). Between Mushie and Lediba, the Kasai forms two large pools, the Kraal Pool (km 90 to km 65) and the Lediba Pool (km 65 to km 48), both of which are rocky areas of up to 8 kms in width with changing channels and rocky shelves. There are new channels in this section which have never been surveyed.

(1) Assistance to Régie des Voies Fluviales

Three Government of Zaire administrative units are involved in the management of the inland river transportation network:

Direction des Transports Fluviaux, Lacustres et Maritimes (DTFLM), in the Department of Transport and Communication is responsible for the control of navigation (issuing of departure and arrival permits and control of bills of lading) and the registration of boats;

Office des Douanes et Accises (OFIDA) is responsible for the control of the origin and destination of merchandise; and

Régie des Voies Fluviales (RVF) is a parastatal within the Department of Transport and Communication responsible for the establishment and maintenance of the navigation system.

Individuals or firms wishing to become river transporters must obtain certificates of tonnage and navigability for each vessel to be registered. Before they can operate the vessel they are also required to pay an annual fee to RVF for the use of the waterways.

Régie des Voies Fluviales was created by ordinance-law number 71/004 of January 28, 1971. Its terms of reference are to study the navigability and disposition of the 14,500 km of the main and secondary arteries of Zaire's inland waterways and to undertake regulatory and maintenance work on them. In order to do this, RVF must undertake:

- a. to mark the navigation channels by the placement and maintenance of buoys, beacons, signals, restrictive and axial alignments of signal lights and other navigational needs;
- b. to make depth soundings, hydrographic surveys and other studies and work required to maintain and improve secure navigation;
- c. to dredge and maintain navigation passes as well as to clean banks and river ports;
- d. to publish information relevant to navigation on the inland waterways; and
- e. to supervise the movement of aquatic plants and the cleaning of buoys.

24

Institutional Analysis

RVF has suffered from poor management of its financial, personnel and material resources since its creation. Because it has lacked an adequate administrative structure to collect the levied navigation fees and because it has no legal enforcement procedures, it has been dependent on state subsidies. Its revenues have fallen far short of its recurrent cost needs. Furthermore, the levels of competence of the personnel is wanting. In 1983, 27 percent of its personnel had had no schooling and a total of 63 percent had not gone past primary school.

The RVF boat yard does not have the technical or managerial capacity to maintain the RVF fleet. The shop equipment is only partially operational due to a lack of minor parts of spare parts, of tools and of instruction in the use and maintenance of such equipment. Much of this equipment is U.S. manufactured and was provided to RVF in 1975 in the context of an earlier USAID loan (660-0011).

Navigation conditions have seriously deteriorated. Night navigation is virtually impossible and the poor or non-existent marking of channels has led to numerous groundings or other damage. These factors have increased the cost of river transportation and have led to irregular services and increased turn-around times. River transportation has been adversely affected.

On March 10, 1983, a credit agreement was signed between the IDA of the World Bank and the Government of Zaire to provide credit for the modernization of ONATRA. A condition precedent of this loan was the reorganization of RVF and the replacement of the Director-General. A new Director-General was appointed the same year and has inaugurated a number of changes, including an effort to cover the operational costs out of the navigation fees/taxes. In April and May 1984, there was a significant increase in both revenues and operating expenses. The World Bank is financing two studies to be finished in September/October 1984 which will result in the financial, administrative and technical reorganization and restructuring of RVF. These studies are receiving the cooperation of the Director-General and his staff. They should result in the drawing up of a five year investment plan marked according to priority needs.

In order to improve river navigation conditions in the project area, the project will provide the following assistance to Régie des Voies Fluviales within the framework of its proposed five-year investment plan:

(a) River Marking Practices and Possibilities

Assistance will be given to RVF to improve river marking and maintenance practices in the project area. RVF intends to rebuild the fixed river markers in the rocky sections of the Kasai River. These markers are essential to safe passage on the Kasai. USAID will assist RVF to complete the program in a timely fashion by providing the supplies required to construct 16 fixed markers.

The communication equipment currently used by RVF to contact the various vessels and in particular the boats responsible for surveying and marking the

25

rivers in the region is inadequate and mostly worn out. USAID will provide 10 new pieces of radio communication equipment.

Assistance will also be given to RVF to undertake a reconnaissance study of the Kamtsha and Lubwe rivers. The Lubwe is navigable for at least 150 kilometers upstream from its mouth at the Kasai river. It is narrow but deep with a strong current. In the dry season, the water depth is less than 1 meter but metal boats can still navigate it carrying a load of 8 tons. The Kamtsha is navigable for at least 175 kilometers. It is wider than the Lubwe. Both rivers run through agriculturally very productive areas and both were once extensively used for the transportation of food and other crops. The Compagnie du Commerce du Bandundu (CCB) uses the Lubwe for transporting maize, fibers and palm products to Dibaya Lubwe for onward shipment by ONATRA. It has a fleet of 8 boat/barge configurations which carry 12 tons each and are used on the Lubwe. Its fleet is built and maintained at its own boat yard at Minganji on the Lubwe River. CCB cleans out the Lubwe during the dry season using one of its small boats with a team of workers with saws and ropes. Previously both Madail and the Compagnie du Kasai kept the Kamtsha clean. Short-term technical assistance (1 month) will appraise the cost effectiveness of RVF taking responsibility for ensuring safe navigation on these rivers.

(b) Hydrographical Survey

Technical assistance and equipment will be provided for a hydrographical study of the Kasai river between Mushie (km 97) and Lediba (km 48). This is a section where new channels have formed and have been put into service without any hydrographic surveys being undertaken. The United States has a number of organizations experienced in such work including the Army Corps of Engineers, the Engineering Department of West Point Military Academy and the U.S. Coast Guard. Sounding equipment for shallow waters is manufactured by U.S. firms. Technical assistance will be provided for 18 person months.

Before this study is initiated, a river navigation expert/hydrographer will be engaged for approximately 1 person-month in order to identify ways in which this assistance may strengthen the capacity of the Hydrographical Service of RVF and to establish detailed terms of reference and determine equipment needs for this assistance. It is anticipated by RVF that the equipment needs will include 6 echo-sounders for use in shallow waters and a speed boat. The speed boat will also be used for the reconnaissance study.

(c) Boat Yard

Spare parts and components, tools, supplies and 36 person months of technical assistance will be given to rehabilitate U.S.-manufactured equipment in the boat yard. Table 4 lists the large items of equipment, quantity, and their problems. There are at least another 20 small miscellaneous items unlisted.

26

TABLE 4 : BOAT YARD EQUIPMENT

ITEM TYPE	QUANTITY	PROBLEM
Horizontal Band Saw	2	Parts and Spares
W & M Brake	1	Shoes and Tools
W & M Shear	1	Tools and Small parts
Hydraulic Press	1	Wrong cycles, assembly
Mobile Crane	2	Maintenance and seals
Test Bench	2	Small motor and instr
Hyster Fork Lift	2	Maintenance, tires, overhaul
Wood Saw	1	Blades, welder parts
Fire Engine	1	Unknown, possibly new engine
Compressor	1	Parts
Engine Test Station	2	Parts and gauges
Crank Grinder	1	Motor & instruction manual
Welders (MG)	2	Overhaul
Cin. Mill	1	Mills
Wood Shaper	1	Belts and parts

Technical assistance will be provided to draw up an inventory of all parts, tools, etc., required and to order them from the U.S; to establish a catalogue and parts filing system for all equipment used; to provide receiving, inspection and acceptance of the parts; to supervise the installation of the parts; to conduct try-out tests for all equipment; to instruct RVF personnel in the proper use and care of the equipment; and to establish a correct work environment for each piece of equipment.

(d) Study Tour

Assistance will also be given for an in-service training/study tour of senior personnel to examine river marking and maintenance procedures and equipment and its related institutional and financial organization in the United States. The U.S. has many rivers with similar features and problems to those faced by both RVF and the Régie des Voies Maritimes at the mouth of the Zaire river. A joint study tour by senior personnel of these two parastatals would provide an opportunity for them to study the river marking and maintenance system practiced in the U.S., to observe the work of the U.S. Army Corps of Engineers and of the U.S. Coast Guard, and to examine relevant U.S. manufactured equipment. It is envisaged that a group of 8 senior personnel from the two agencies would participate in a 30-day study tour. Interpreters would be provided. The estimated cost is \$80,000.

At the conclusion of this project element, an evaluation will be made of the efficacy of this assistance to RVF and an appraisal will be made of the ways in which further assistance could be given to help it to discharge its responsibilities in the Kasai River basin.

27

Technical Soundness Analysis

It is anticipated that the current World Bank sponsored reorganization of RVF's personnel structure and finances together with an increased interest within the donor community to provide assistance to RVF will lead to more efficient management practices, a more highly skilled technical staff and a sounder financial basis.

(2) Design of Wooden Boats and Barges

The project area has significant timber reserves including a range of species particularly suitable for wooden boat construction. Wood with excellent working characteristics and tropical life expectancy is available at reasonable cost. Wood-working and pirogue-building skills are widely available. There is already in existence a rudimentary wooden boat construction industry which produces a single design of boat ("baleinières") along the lines of a whaleboat or dory. These boats are built by artisans at Kinshasa, Nioki, Dungu and Kutu and by builders at the timber mill at Nioki.

A Department of Transport and Communications study showed almost 700 of these small boats transporting agricultural and other products to Kinshasa in 1982-83. Annual production is around 300 boats that cost between 38,000 and 70,000 zaires (approximately \$1,100 - \$2,000) each for the basic frame, depending in part on where they are constructed. Their capacities vary from 200 70-kilo sacks for the smallest (18m in length) to 600 sacks for the largest (23m long). It takes a four-person team at least 12 work days to build a 23m boat. Labor is readily available. The construction of these boats involves minimal investment both to the builder and to the user.

A fifteen to twenty-five horsepower gasoline outboard motor costs approximately 100,000 to 115,000 zaires, and are available only in Kinshasa. The motors must be brought back to Kinshasa for all repairs and maintenance. Spare parts can be purchased only in Kinshasa.

These wooden boats cost approximately one-fifth of the price of metal boats of a similar capacity, which facilitates ease of entry of new entrepreneurs into river transportation. Wooden boats are much more easily maintained and repaired with skills and tools at hand than steel boats and their holds are less prone to the sweating and condensation that inevitably shortens the life of perishable commodities, especially manioc. Their positive design features include a very shallow draft when empty, high maneuverability, a sharp prow that makes head-on collision unlikely and a long length relative to their beam that makes them easily propelled through the water.

However, they have few of the construction elements necessary for durability, for example, no chine log, no knees, no breasthook, no stem and no heel. They are rather flimsy crafts, particularly since the size has been extrapolated beyond the reasonable capabilities of the structural elements, namely the side and bottom planking, sawn usually to approximately 35 mm thickness, and the ungunsetted or unkneed bottom and side frames. They are short-lived and easily damaged. Fully loaded the boats have a draft of 60 to

98

70cm and normal speed through the water when powered by a 15 to 20 horsepower outboard is 8 to 10 km/hour. This is little influenced by additional power since it is the hull speed.

However, the successful navigation of the complex network of waterways which make up the Kasai basin requires more than one type and size of boat. The currently employed craft, though it answers a critical specific requirement in the transport scheme, has too small a capacity and too short a useful life to make them economically attractive for long haul work.

One of the prime factors in the selection of a transport mode is the elapsed time to get to market with perishable commodities. The parastatal ONATRA barge system employs, for the most part, vessels with displacements of over 500 tons, which means that load makeup times account for far more of the total elapsed time than the actual time through the water. Thus, although the 950 km between Kikwit and Kinshasa could be accomplished in about three days of steady running, 20 to 30 days usually elapse between the deposit of goods on the Ki'wit dock and their arrival in Kinshasa.

One solution to this problem is to develop a cargo transport system with a much broader base, utilizing carefully designed vessels, of less burden than the ONATRA barges, and owned and operated by the private sector. The goal would be to increase the hauling capacity and modify the design of the present wooden craft utilizing an efficient diesel propulsion system. Diversification would fill the economic gap between investment in a wooden small boat and the current large steel vessels. Steel construction involves a level of capitalization and scope of operations beyond the realm of the average small wooden boat owner. The gap could well be filled by wooden boats or barges with larger capacities than that of the present wooden boat.

Possible Design Modifications

The present wooden boats could be improved with little increase in the initial capital outlay and with a positive economic impact on the vessel's life expectancy. This would be achieved by the incorporation of nominal strengthening features usually found in boats.

Gasoline outboards are inefficient with a high cost of operation per ton/km. A diesel outboard of between 10 and 20 hp with a relatively large propeller turning at under 1500 rpm at rated power would be a more efficient power plant. The wide range of directional control inherent in an outboard and the ability to easily transfer the engine from boat to boat, to a place of safe keeping when the boat is not being used or to Kinshasa for repairs, weigh in favor of its retention.

Diesel outboards maintain the features of maneuverability and portability, increased mileage, reduced fuel costs and use a fuel that is much safer to have on board. Few such diesel outboards are manufactured. At present only two manufacturers, one Italian and one Chinese, have diesel outboards on sale in Kinshasa.

China also produces inboard diesels in three useful sizes (11, 20 and 30 horsepower), complete with reduction and reverse gear, for about \$100/hp,

29

which is substantially below the price of any comparable engine. U.S. and European engines are at least double this price for equivalent specifications.

The existing boat could be more dramatically modified to a full barge configuration (see Annex 8) without much change in performance and a possible increase in burden by 25 or 30 percent. This could be achieved by:

- a. better design including incorporation of traditional structural members, i.e., frame, keel, etc.;
- b. better proportioning of structural elements;
- c. use of toxic preservatives or of denser local woods;
- d. use of better fastenings.

These features would extend the wooden boat life expectancy from 2 to 3 years to perhaps 6 to 9 years. The increase in cost would be offset by the increase in cargo space and carrying capacity.

Although wooden "baleinière" construction only started in Zaire in the mid-1970's, there will undoubtedly be some resistance to changing the hull design and the structure of the boat, but once the advantages of the changes are demonstrated, they may well be accepted and adopted. Before attempting to improve the design of these vessels, project personnel should spend some time on the river in existing craft and make a first-hand evaluation of the navigation hazards and the peculiarities and control problems attributable to water flow (i.e., rapids, currents, etc).

Based on experience on and around canals in the US the following configuration for a prototype is recommended:

Length:	16 to 18 meters (20 meters for 50 hp)
Material:	Local woods
Beam:	3 meters to 3 1/2 meters (probably 3.8 m for 50 hp)
Max. Draft:	80 cm to 90 cm (fully loaded)
Construction:	modified barge or scow (with nominal strengthening members)
Bottom:	5 cm plank
	Frames every 1 1/2 meters with knees and full chine log (8 cm sq)
	Fully decked with 2.5 cm planks (2 meters between sole and deck at centerline)
Topsides:	3.5 cm plank
Fuel Consumption:	4 - 5 liters/hr.
Est. Weight of boat:	6200 to 6800 kg.
Est. Load:	32-33 tons at cargo of 470 kg/m ³
Volume for cargo (80% of int. space):	70m ³
Full load displacement:	38 to 40 tons.

Existing boats of 18 to 20 ton capacity cost between \$1,000 and \$2,500 without engine. The 18 to 20 hp outboards cost \$1,800 to \$2,500 (new). A

comparison of the original and the proposed modified boats is:

<u>ITEM</u>	<u>OLD</u>	<u>NEW</u>
Length	20 m	18 m
Beam	2.8 m	3.5 m
Draft	70 cm	80 cm
Burden	20 tons	32 tons
Load vol. (80%) at 470 Kg/m ³	43m ³	70m ³
Fuel type	gasoline	diesel
Fuel cost	Z33/liter	Z10/liter
Est. range/liter	1 Km/l	2 Km/l
Fuel cost per ton km.	Z 1.75	Z .15
Est. life	2 yrs	6 yrs
Avg. est. first cost	Z150,000	Z270,000
Capital cost per ton-yr.	Z 3,750	Z 1,410

This new barge configuration could also be produced in different sizes according to the desired effective range. Generally speaking the economically effective range of a vessel is closely related to its hauling capacity. Though there are no absolutes, due to the wide variety of inputs into the equation, a fair ratio in the Bandundu region might be 20 km of working range for each ton of payload. Thus a 20-ton pay load vessel would have an economical range of about 400 km. According to this formula, a baleinière hauling 10 tons would be economical only to a range of 200 km. In fact, baleinières go many times this distance but the reasons are not always based on sound economics. At this point it appears that an intermediate-sized vessel with a payload of about 35 to 40 tons might be a worthwhile development. A second size with a useful mission in the overall transportation matrix might be a vessel of approximately one-half this burden (18 to 20 tons useful load). Thus a possible transportation matrix is shown in Table 5.

Technical Soundness Analysis

It is reasonable to assume that the present boat builders have the ability to expand their skills. Many of them were taught, when young, to build pirogues and have started building baleinières only since the mid-70's. It is also reasonable to assume that traders and new transporters are prepared to invest in new designs. This has already been observed at the Kinshasa construction sites. Experienced boat builders and marine diesel engineers are available to undertake this work.

(3) Construction of Metal River Boats and Barges

Private river transporters have increased their share of total tonnage carried from less than 16 percent in 1974 to an estimated 25 to 30 percent at present. The Study Group of the Department of Transport and Communications undertook a study of the river transport system from August 1981 to December 1982. By noting all vessels which made at least one voyage during this time, they estimated the private transport fleet, other than baleinières, to be 75 pushers, 122 unmotorized barges and 60 motorized barges. The composition of this fleet is shown in Table 6.

As of March 1983, ONATRA, Office National des Transports, the Government parastatal charged with river transportation, had a fleet composed of 133 pushers with a combined horse power of 67,095 (ONATRA uses the conversion rate of 1 horse power to 1 ton) and 413 freight barges with a carrying capacity of 230,810 tons. A significant proportion of this equipment is inoperable.

The total volume of agricultural produce shipped by ONATRA has decreased dramatically in recent years (Table 7). Moreover, fewer agricultural products are carried during the peak transport demand months of April to July, the time of the agricultural marketing campaign. The freight services that are provided by ONATRA are irregular and losses, although they have declined somewhat in recent years, remain unacceptably high. Freight haulage services provided by private river transporters are infrequent and costly. Tariffs are between 200 and 500 percent higher than ONATRA.

In recent years a number of missions in the region have begun providing transport services to local farmers and traders that are both regular and less costly. In order to expand these services USAID will increase the haulage capacity of selected missions through the provision of barges, pushers and boats. The two missions identified as recipients under this project are the Communauté Baptiste de Bandundu (CBB) which works in Mai Ndombe, Bandundu City and Bagata and the Développement Progrès Populaire (DPP) which is the Catholic development organization for the zone of Idiofa and part of Bulungu zone.

Technical Description

Two 40 ton metal barges and a pusher, two 20 ton metal barges and a pusher, a 20 ton metal boat and two 15 ton metal boats will be constructed according to design standards and requirements agreed upon by USAID, the mission and, where appropriate, the constructing firm. The barges and pushers for DPP will be commissioned from local boat yards. There are a number of private boat yards in Kinshasa with the competence and experience to build such boats.

The 15 and 20 ton metal boats will be built in the workshop of the recipient mission, the Communauté Baptiste de Bandundu (CBB). The Swedish CBB missionaries have already constructed a 15 ton wooden boat and a 20 ton metal boat. They have an adequately equipped workshop at Bosobe, Mai Ndombe, and a trained staff. Workshop equipment includes a vertical and horizontal milling machine, a tool lathe, an electric and gas welding machine, a 20-ton hydraulic press, an electric steel sheet cutting machine, a circular cutting machine for steel, and a forge. They will require the construction materials and the services of an experienced metal boat builder/welder to oversee the work.

Table 5 : RIVER TRANSPORT VESSEL MATRIX

Designation	Source	Price (complete)	Nominal Payload	Power	Length	Beam	Max Draft	Nominal Economic Range
Baleinière (Category I)	Existing	z140,000	10 tons	Gas outboard	20m	2m	0.6m	200 km
Category II	Proposed	z225,000 wood	20 tons	Diesel in- board 12-15 HP	18m	2.5m	0.7m	400 km
Category III	Proposed	z385,000 wood	40 tons	Diesel in- board 20-30 HP	20m	3.5m	0.75m	800 km
Category IV	Proposed	z640,000 wood	80 tons	Diesel in- board 50-60 HP	25m	5m	0.85m	1,600 km
Category V	Existing	z5,000,000 steel	100 tons	twin diesel (two 60 HP)	32m	5.5m	1.5 m	3,000 km

TABLE 6. COMPOSITION OF THE PRIVATE RIVER TRANSPORTATION FLEETS

<u>TYPE</u>	<u>Capacity</u>	<u>No. of vessels</u>
Baleinieres		
Wooden		861
Metal		42
Pushers		
	P 100 CV	27
	100 P 300 CV	36
	P 300 CV	12
Barges (1)		
	C 100 T	25
	100 C 300 T	63
	C 300 T	34
Motorized Barges		
	C 50 T	18
	50 C 300 T	24
	C 300 T	18

1 Including log pontoons

Table 7: ONATRA SHIPMENTS TO KINSHASA: AGRICULTURAL PRODUCE BY PORT¹

<u>YEAR</u>	<u>ILEBO</u>	<u>ALONG KASAI</u>	<u>SANKURU</u>	<u>HAUT KASAI LULUA</u>	<u>M'FIMI</u>	<u>KWILU KIKWIT</u>	<u>KWANGO INZIA</u>	<u>TOTAL</u>
1982	1448	16,208	3,003	481	3,968	34,911	1,714	61,452
1981	3471	14,033	2,024	45	4,209	44,956	2,352	71,063
1980	6595	17,780	2,114	37	5,199	38,801	2,852	73,378
1975	8614	17,847	1,373	330	7,918	57,123	5,585	98,790
1970	6906	31,190	1,870	342	6,348	83,278	9,673	139,604

1 Agricultural produce includes maize, peanuts, manioc, rice, palmiste, palm oil, cocoa, cotton, coffee, resin, fiber and animal feed.

Institutional Analysis

The Communauté Baptiste de Bandundu started work in the region in 1919. Originally its development work was focussed on health, technical and formal education and literacy training. Recently, however it has expanded into agriculture and marketing. It has introduced mills to transform agricultural produce and to lessen the household work of the women farmers. It has a mechanized well drilling program for wells of 8 to 10 meters in depth. The mission has just appointed a Swedish scientist/boat builder and a trained Zairian veterinarian to devise and run this agricultural production and marketing program.

In 1980, the mission built a 15 ton single prow wooden boat with a diesel inboard motor. This was then followed by a 20 ton metal boat, 16m x 3.2m with a draft of 0.85m. The boat has a 6 cylinder 106 horsepower diesel engine and a cabin with 3 beds. The basic frame was imported and the superstructure and all fittings were built at their workshop at Bosoba, Mai Ndombe. The boat can transport 200 tons in up to 3 barges. It cost approximately \$33,000 and has a life expectancy of 20 years.

At present these boats are being used on the smaller rivers of Mai Ndombe but the mission would like to use the large boat for long haulage from Kutu or Mushie to Kinshasa and return, and have smaller boats to transport produce, mainly rice, manioc and coffee but also peanuts, bananas, and citrus fruits, to an assembly point. They will need a 20 ton boat with a 4 cylinder engine for the Kasai since there are some difficult and swift flowing passes to negotiate, and two 15 ton boats with 3 cylinder engines for other rivers. If there is any surplus capacity, the mission will continue its present practice of renting its boats to local cooperatives and traders to transport their own produce. In 1983, the coffee marketing cooperative in Semendua transported 51 tons of coffee to Kinshasa on the rented mission boat. The cooperative was able to sell its processed coffee in Kinshasa for 40 zaires per kilogram and thus made over 2 million zaires. Before it started processing and transporting its coffee, the members of the cooperative were selling it locally for 7 zaires per unprocessed kilogram.

Maintenance and repairs of the boats can be done in the mission workshops. All recurrent costs including the training of personnel, salaries and fuel will be covered in the mission's budget.

Développement Progrès Populaire (DPP) is the private voluntary development organization of the Catholic diocese of Idiofa. It is a complex organization with a total staff of 454 of whom 45 are women. DPP works in four sectors: education, agriculture and small animal raising, large livestock, and infrastructure. An important part of its agricultural activities are centered on providing marketing services to farmers in their area of concern. To date, DPP has only used the roads to transport its freight. However with the post-devaluation increases in the cost of road transport, DPP is now exploring the possibility of changing to river transport. The Lubwe river is 35 kilometers from Idiofa, the headquarters of DPP, and is navigable to the Kasai by boats of up to 12 tons. DPP proposes to transport its goods from Minganji on the Lubwe to the Kasai by a fleet of two 12 ton barges plus pusher and from there to Kinshasa by two 40 ton barges plus

pusher. One barge will be left at the port to load while the other transports. In this way turn around time will be cut significantly. It is expected that the trip from Dibaya-Lubwe to Minganji will require one week. DPP's fleet of trucks will be used to transport purchases from village to storage in Idiofa and then to the ports at Minganji and, in the north, direct to Dibaya-Lubwe. In 1983, DPP bought about 1,200 tons of agricultural produce. If this level of purchases is maintained, an estimated 85% of this produce could be switched from road to river freight haulage, thus allowing significant savings in transport costs. On the return voyage the barges would carry cement, construction materials and manufactured goods.

DPP has an extensive repair shop with a trained staff of mechanics supervised by an engineer-mechanic. It has the competence to repair and maintain the equipment and the managerial and organizational capacity to establish and maintain a regular schedule. DPP will cover all costs involved including the training of personnel, salaries and fuel, from its regular budget.

Technical Soundness Analysis

The Communauté Baptiste de Bandundu has the equipment necessary to construct the metal boats and their staff already includes some experienced boat builders. Both CBB and DPP have the capacity to maintain the equipment. Experienced private boat construction firms exist in Kinshasa with the capacity to undertake the foreseen construction.

b. Assistance to Road Transportation

The project area is a difficult region in which to build, improve or maintain roads. This is due to a number of factors including periodic torrential rains, highly erodable soils, excessive axle loadings and a shortage of good and economically viable sources of surfacing materials and aggregates. The project area comprises about 1,150 kilometers of national and regional priority roads and at least 1,000 kilometers of roads of significant agricultural interest. These roads are outlined on Map 4. The roads of agricultural interest shown are not exhaustive but are the more important feeder roads to river ports and access roads to all weather roads in the most agriculturally productive regions.

Traffic volumes on these roads are low, estimated at approximately 100 to 150 vehicles per day on the Project 660-0028 Kikwit to Idiofa road, 5 to 40 vehicles per day on the Project 660-0026 roads and with very low daily traffic counts on the roads of agricultural interest. Most vehicles on the secondary and tertiary roads are trucks of 6 to 8 ton capacity. These vehicles, many of which are surplus European army vehicles, are well suited both for the rural roads and for the amount and type of product transported, predominantly bagged dried or damp manioc, sacked food grains, bundles of raw fibres, passengers and live small animals. On a typical village market day, 3 to 6 of these trucks might be filled.

Access to the roads of agricultural interest is most important during the marketing campaign. This overlaps with the second rainy season which

36

complicates the selection of design standards. It does not make economic sense to improve these roads even to rock bottom design standards at the present level of economic activity. This may change as traffic volumes increase with agricultural and other development. The most serious constraints to area access and trade are the deteriorated state of the bridges, slopes and approaches to water crossings, which become extremely slippery and hazardous after a rainfall.

Road maintenance in these areas is weak but improving. Many missions, chefs de collectivité, local traders and villagers have undertaken to maintain roads manually, but are unable to provide technically or mechanically complex services. By limiting its interventions to the trouble spots, the slopes and bridges, and to identifying local sources of surfacing materials, the project can significantly increase the number of villages which can be provided with improved access.

(1) Stabilization of Slopes

The road approaches to water crossings and hillside slopes constitute a serious impediment to road access during the rainy season. These slopes are steep grades often leading from the plateaux to valley river crossings. In contrast to the sandy soils of the plateaux, the slopes are often of red clay which becomes extremely hazardous when wet, particularly at grades of 7 percent and above. The loss of traction and rutting of the road virtually shuts down road travel under these conditions.

It is estimated that the slopes in need of stabilization constitute approximately 10 percent of the total road lengths, that is, approximately 200 kilometers. The work will be subcontracted out by Office des Routes to local construction companies. The estimated cost per kilometer will be \$40,000. Office des Routes will contribute up to 16 million zaires each year. An estimated 50 kilometers of slopes will be included in the project.

Economic considerations determine that the lowest cost per kilometer method of stabilization be chosen. Road base material high in sand content and low in organic matter, as in Bandundu, can be stabilized by the use of carefully proportioned and properly mixed additions of cement. This method consists of adding Portland cement to pulverized soil and allowing the mixture to harden. The factors which affect the physical properties of soil cement include soil type, quantity of cement, degree of mixing, time of curing and dry density of the compacted mixture. The procedure is extremely sensitive to rainfall and to time: the construction process must be completed within five or six hours after the cement is mixed with the soil and there can be no rain during this period.

The principal factor affecting the required quantity of cement is soil type. Table 8 shows the approximate quantity of cement required to harden several types of soils. It is estimated that between 4 and 6 percent by weight to develop a seven day compressive strength of 750 PSI minimum (53 Kg/cm²) will be required for the soils in the project area but the exact amount for the soils on each slope will be determined by laboratory tests.

TABLE 8: REQUIRED QUANTITY OF CEMENT FOR ADEQUATE HARDENING OF SEVERAL SOILS

<u>HRB Class</u>	<u>Approximate % Cement Required (by weight)</u>
A-1	3-8
A-2	5-9
A-3	5-10
A-4	7-12
A-5	8-14
A-6	9-15
A-7	9-15
Organic soils	Not suited

The benefits derived from soil cement depend to a large extent upon the degree of compaction of the mixture. To make proper use of the inherent properties of the soil cement, it should be compacted to at least 95 percent, and preferably 100 percent, of standard AASHTO density. In addition compaction must be accomplished in a minimum amount of time, before the initial set of the cement takes place, or low densities will result. It is necessary that soil cement be cured so that the hardening process takes place. Soil-cement mixtures will generally harden after a curing period of between 7 and 8 days, depending on the amount of cement which is used. During the curing process, they must be kept moist and evaporation must be kept at a minimum.

Cement stabilization is not normally used for wearing surfaces, because it may become dusty and unravel under the action of heavy traffic. It is normally sealed to withstand the abrasive action of traffic. However Office des Routes experiments with unsealed cement stabilized soil as a wearing surface indicate that this may be an appropriate design standard for rural roads with low traffic volumes.

In order to determine this, the project will initiate a definitive and fully documented test program which will include accurate accounts of all soil types used, of all proportioning, mixing and placement procedures as well as a careful description of the preparation and condition of the roadbed to which the stabilized material is applied. Six to ten difficult locations in the project area will be chosen by USAID in consultation with Office des Routes and the contracted construction firms. Full adherence to good techniques in roadway cross section, compaction and drainage will be essential for a significant test. Accurate records of materials and personnel used will be kept. The test areas will then be subjected to normal traffic for six months including months of heaviest precipitation. The test will be monitored and the procedure evaluated by project engineers. If after this period the method is considered successful, the program will be extended.

(2) Improvement of Water Crossings

The project area is drained by a series of rivers and creeks running roughly south to north. Road traffic, which generally flows east-west, is seriously constrained by the deteriorated state of the river crossings. To

date, 59 crossings in need of repair or new crossings have been identified in the project area, including 8 crossings over creeks of up to 5m, 35 crossings between 5 and 10 meters in length, 7 crossing between 10 and 20 meters, and 9 crossings ranging in length from 14 to 50 meters. The location of these crossings is marked on Map 5. The structures required range from stabilized culverts, to mixed timber and cement structures, to reinforced concrete vehicle overpasses which can act as fords during high water conditions, to open span Acrow Panel (Bailey) bridges with poured concrete piers and abutments for the larger stream crossings. Serious consideration will be given to the selection of the river crossing mode since the water navigation of streams will be severely compromised if adequate boat passage under the crossing is not allowed.

The work will be subcontracted out by Office des Routes to local construction companies. The cost will vary, depending on the type of structure, from \$10,000 for minor crossings to as much as \$400,000 for a 40 m span Acrow Panel bridge with necessary support and stabilized approaches. The number of bridges to be constructed will be determined by budgetary considerations. Sites with the greatest potential impact on traffic flow, and river crossings where the slopes are being stabilized, will be selected by USAID in consultation with Office des Routes and the sub-contracted firm.

(3) Location of Surfacing Materials

The experience of Office des Routes in the Bandundu region and of the other USAID road projects has shown that the securing of an affordable and dependable supply of surfacing materials and aggregates is essential to the success of the regional road program. There seems to be some doubt as to whether such deposits can be found in the region. There is, however, a borrow pit in Kikwit with a fairly high percentage yield of useful material that is being worked at present. Where there is one such site, more can usually be found. An aerial survey to identify likely locations would be too costly. A ground study will be made of the rivers and their shorelines, especially where deposits may have been left during flood times. Régie des Voies Fluviales undertook a study of sedimentation on the Kasai river around 1970. Their archives may be a source of useful data.

Support will be given in the form of technical assistance and equipment to the research department of Office des Routes to undertake this study.

Technical Soundness

The project's design standards for the road transportation component are practical and in conformance with sound engineering practice. The experience of Office des Routes with cement-stabilized soil traffic-bearing surfaces and in river-crossing constructions confirm this. Soil types in the project area are suitable for stabilization with cement, being predominantly sandy with relatively low proportions of organic matter. In any areas where the soils are found by testing to be unsuitable, suitable soils can be brought in from nearby at minimum cost.

Experienced construction firms exist with proven ability to produce good quality work in the relatively difficult conditions of the project area. Cost and time estimates were based on Office des Routes record.

The technical design is appropriate to the work proposed and the estimate of project costs is reasonably firm.

c. Project Impact Monitoring and Evaluation

Baseline information is required for identifying and quantifying current levels for indicators of long-term change, for identifying suitable categories for disaggregation of groups affected by project interventions, and for estimating behavioral and technical relationships to allow the development of project elements and to monitor changes. Information is also required on project effects and impacts in order to test project assumptions about technical and behavioral relationships, to quantify short-term changes by accumulating time series of indicators and measures, to quantify long term changes by relating measures of effects and impacts to baseline material, and to provide information for project planning and for project evaluation.

Table 9 shows the existing marketing, transportation and price information collection and processing systems. Clearly these do not suffice as the basis of an impact monitoring system particularly since even when data is collected it is often internally inconsistent or contradictory. Thus the project will need to establish its own baseline and impact studies. A number of governmental institutions were considered as possible subcontractors for these studies: within the Department of Agriculture and Rural Development (DARD) both the Bureau d'Etudes and the Direction des Marchés, Prix et Credits de Campaign (DMPC) collect and process data; within the Department of Public Health, CEPLANUT plans to collect data in Bandundu for a nutrition surveillance system; the Groupe d'Etudes Economique and Plannification (GEEP) in the Department of Transport and Communications collects some river transport data; the Institut National des Statistiques (INS) collects population, price and other data. These along with the Department of Plan were appraised to determine their capacity to undertake the studies required for this project and the planned Area Food and Market Development Project. It was decided however, that the Institut de Recherches Economiques et Sociales (I.R.E.S.) at the University of Kinshasa had the most extensive staff resources and experience in the kind of studies which will be required to be carried out under these studies. This project will establish a Survey Analysis and Data Processing Center at I.R.E.S. and develop an institutional capacity to carry out this work. The Area Food and Market Development Project will then establish a joint project Monitoring and Evaluation Information System, with the Center having major responsibility for the baseline and impact monitoring studies.

Table 9: Regular Information Collection and Processing Systems

<u>Topic</u>	<u>System</u>	<u>Item</u>	<u>Source</u>	<u>Frequency</u>	<u>Current Processing</u>
<u>Marketing and Transportation</u>	DMPCC Regional Office, DARD	Commercants	Not active yet	---	---
	Department of Plan, CIDA Study	Enterprises by type	---	One-time survey	---
	DMPCC Road Arrivals of Foodstuffs	Quantity Value Source Type Kinshasa arrivals	DARD DMPCC	Monthly	Computer (DARD) proposed
	ONATRA: Transportation	Quantity Type Origin/ Destination	ONATRA statistics	Monthly	Computed
	GEEP, Department of Transport: Private River Transport	Quantity Type Origin/ Destination (only Kinshasa) <u>but</u> arrivals and departures	GEEP statistics	One-time survey	Manual
<u>Prices</u>	DMPCC Regional office, DARD	Region prices Retail Farmgate Commodity	not yet active	---	---
	DMPCC Kinshasa price survey	Demi-gross Retail Commodity Source	DMPCC	Published Quarterly	Computer
	CEPLANUT	Bandundu retail prices	active	---	---
	IRES Cost of Living	Cost of Living in Kinshasa Retail prices	IRES	Daily	Manual
	Kikwit INS Retail price collection	retail prices in Kikwit	INS Kikwit	Weekly	Manual

Institutional Analysis

The Economic and Social Research Institute (I.R.E.S.) in the Faculty of Economics at the University of Kinshasa was established in 1955 as a research association for the teaching staff of the Faculties of Economics, Social Sciences, and Demography. The Institute currently has fifty research members whose disciplines include computing sciences, agricultural economics, demography, rural sociology, business administration, finance, regional planning, accounting, external trade, econometrics, financial and monetary systems and institutions, and industrial economics.

Since 1960, the Institute has collected cost of living data and published two price indices: a non-weighted market price index and a weighted store price index. A third cost-of-living index of high and low income groups was added in 1975. Since 1962, the Institute has published Cahiers Economiques et Sociaux (Economic and Social Notebooks) three times a year. This is an academically respected journal which is subscribed to by many U.S. Universities. The Institute also publishes a monthly research newsletter which contains research results of Institute members, a monthly letter on the state of the Zairian economy, as well as its monthly cost of living indices.

I.R.E.S. has also designed and undertaken research for government and outside donor organizations, including:

- The design of a monitoring and evaluation system for the East Kasai Maize Project (World Bank/IFAD)
- An agricultural production study, Bas-Zaire (GOZ)
- Petroleum price study (GOZ)
- Design of a study on the influence of sleeping sickness on agricultural production, Northern Bandundu (WHO)
- An economic appraisal of a road improvement project (GOZ)
- Household budget study (Belgium)
- Urban Indicators Study (AID/RHUDO, Abidjan)

All students in the Faculty of Economics take a mandatory course in computer science and programming and a number of I.R.E.S. members are data processing and computer specialists. Four professors have Ph.Ds in Computing Sciences. Formerly I.R.E.S. members had access to the University's IBM 360 computer, but this machine is now defunct. Many staff members have experiences in using SPSS (Statistical Package for the Social Sciences), a tabulation and statistical analysis computer software package, TSP (Time Series Processor), a package designed for analyzing time series and econometric data, and RATFOR, a FORTRAN based program generator for statistical programming.

458

B. Financial Analysis

Table 10 summarizes the project costs by category of expenditure and by source. The total cost of the project is estimated to be \$13,000,000, of which \$8,000,000 is to be financed by AID Grant Funds. The Government of Zaire will contribute the zaire equivalent of \$1,600,000 from the regular budgets of Office des Routes and Régie des Voies Fluviales and of \$3,400,000 from the counterpart Fund Account, for a total contribution of the equivalent of \$5,000,000.

Construction is the largest line item in the budget and represents 37 percent of total expenditure. Included in this category are the stabilization of slopes, construction of bridges and the construction of both wooden and metal boats.

Office des Routes will contribute 16 million zaires annually from its regular budget for the slope stabilization and bridge building programs. Counterpart funds will be used to finance local costs of the construction of the wooden and metal boats and barges.

Training has been included in the category Technical Assistance since on-the-job training is the major function of all technical assistance to Régie des Voies Fluviales and Office des Routes, to the private sector wooden boat building firms and to I.R.E.S. The Régie des Voies Fluviales study tour has been included in the Research/Study Tour category, as have also the laboratory tests for the surfacing materials study. Evaluation costs fall under Technical Assistance. Technical assistance represents about 25 percent of total expenditures.

Commodities to be purchased in the U.S. include a mini-computer and a micro-computer and the associated software, hydrographical and river marking equipment, spare parts, communication equipment and diesel sedan motor vehicles for use in Kinshasa. Waivers will be sought to purchase diesel four-wheel drive vehicles suitable for use in Bandundu and for the purchase of video equipment.

All costs associated with vehicle operation and maintenance, office rental, furnishings and supplies, renovations and other requirements for computer installation, housing and supplies are included in the Other Costs Category. Inflation has been calculated at 7 percent uncompounded since it is expected that all equipment will be purchased in the first two years of the project. Individual line items for technical assistance, salaries, operating costs and construction allow for rates of inflation appropriate to the currency.

The budgetary commitments made by Régie des Voies Fluviales and Office des Routes are within the present financial capacities of each organization. It is also reasonable to expect that sufficient counterpart funds will be available for project purposes since over the next four years the equivalent of approximately \$80 million will be generated by Title I and Commodity Import programs for the Counterpart Fund Account.

Although the length of the project is ten years, the budget has been allocated over a four year period. This will allow an interim appraisal of the effectiveness of various elements and of their appropriateness, and will permit the possible addition of other components not included in the plan for the first four years.

Table 11 gives the expenditures by fiscal year and Tables 12 to 16 give the expenditures by source, category and fiscal years for each project element.

AA

Table 10

Summary Costs and Financial Plan
Life of Project Costs by Source

	USAID (\$000)	(A) GOZ/USAID CPF (z000)	(B) GOZ (z000)	\$ equiv (A) + (B) (\$000)	Total US \$ (\$000)
Technical Assistance/ Personnel	2,456	19,1752	4,100	665	3,121
Travel	145	6,500	0	186	331
Research/Study Tour	150	14,100	0	403	553
Commodities	1,030	31,000	2,900	969	1,999
Construction	3,100	12,080	48,000	1,717	4,817
Other Costs	<u>225</u>	<u>31,000</u>	<u>0</u>	<u>886</u>	<u>1,111</u>
Sub-total	7,106	113,855	55,000	4,826	11,932
Inflation (7% un compounded)	497	0	0	0	497
Contingency (5%)	397	6,090	0	174	571
TOTAL	<u>8,000</u>	<u>119,945</u>	<u>55,000</u>	<u>5,000</u>	<u>13,000</u>
TOTAL in U.S. Equivalent	<u>8,000</u>	<u>3,428</u>	<u>1,572</u>	<u>5,000</u>	<u>13,000</u>

113

Table 11: Expenditures by Fiscal Year

	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>FY 88</u>	<u>Total</u>
USAID (\$000)	1,629.5	2,663.5	1,638	1,175	\$US 7,106
GOZ/AID CPF (Z 000)	46,550	45,155	15,900	6,250	Z 113,855
GOZ (Z 000)	1,700	19,300	18,000	16,000	Z 55,000

Table 12: Metal and Wooden Boat Construction
Expenditures by Source and Fiscal Year

	<u>85</u>		<u>86</u>		<u>87</u>	
	<u>\$</u>	<u>CPF</u>	<u>\$</u>	<u>CPF</u>	<u>\$</u>	<u>CPF</u>
Boat Designer/Builder	62.5	0	150	0	12.5	0
Boat Builder	25	0	50	0	0	0
Evaluation	0	0	0	0	12.5	0
Construction						
Wooden	0	1,000	0	3,080	0	0
Metal	300	2,000	500	6,000	0	0
Total	<u>387.5</u>	<u>3,000</u>	<u>700</u>	<u>9,080</u>	<u>25</u>	<u>0</u>

46

Table 13: Régie des Voies Fluviales

Régie des Voies Fluviales Expenditures by source and Fiscal Year

	<u>1985</u>			<u>1986</u>			<u>1987</u>		
	<u>\$</u>	<u>RB</u>	<u>CPF</u>	<u>\$</u>	<u>RB</u>	<u>CPF</u>	<u>\$</u>	<u>RB</u>	<u>CPF</u>
Hydrographers	12.5	0	0	125	1,000	0	262.5	1,200	0
Shop Foreman	75	900	0	112.5	1,000	0	0	0	0
Equipment and Supplies	200	800	10,000	240	1,300	7,500	100	800	2,000
Study Tour	0	0	0	80	0	0	0	0	0
Evaluation	0	0	0	0	0	0	25	0	0
	<u>287.5</u>	<u>1,700</u>	<u>10,000</u>	<u>557.5</u>	<u>3,300</u>	<u>7,500</u>	<u>387.5</u>	<u>2,000</u>	<u>2,000</u>

117

Table 14: Office des Routes

Expenditures by Source and Local Year

	1985			1986			1987			1988		
	\$	RB	CPF	\$	RB	CPF	\$	RB	CPF	\$	RB	CPF
Construction												
Slopes and Bridges	0	0	0	700	16,000	0	800	16,000	0	800	16,000	0
Surfacing Study												
Personnel	25	0	1,800	0	0	1,800	0	0	0	0	0	0
Laboratory Tests	0	0	1,000	0	0	1,100	0	0	0	0	0	0
TOTAL	<u>25</u>	<u>0</u>	<u>2,800</u>	<u>700</u>	<u>16,000</u>	<u>2,900</u>	<u>800</u>	<u>16,000</u>	<u>0</u>	<u>800</u>	<u>16,000</u>	<u>0</u>

218

Table 15: Impact Monitoring

Expenditure by Source and Fiscal Year

	1985		1986		1987	
	\$	CPF	\$	CPF	\$	CPF
Systems Manager	12.5	0	150	0	62.5	0
Communications Expert	100	0	0	0	0	0
Short-term Technical Assistance	140	2,000	56	2,000	0	0
Training	0	150	20	500	5	200
Research	50	4,000	20	6,000	0	2,000
Equipment	250	5,000	40	2,000	0	0
Housing, Supplies, Maintenance, operation	0	10,000	0	4,000	0	2,000
Total	<u>552.5</u>	<u>21,150</u>	<u>286</u>	<u>14,500</u>	<u>67.5</u>	<u>4,200</u>

Table 16: Project Management and Monitoring Unit

Expenditures by Source and Fiscal Year

	1985		1986		1987		1988	
	\$	CPF	\$	CPF	\$	CPF	\$	CPF
Chief of Party	75	0	150	0	150	0	150	0
Engineers	0	1,000	0	2,000	0	2,500	0	1,500
Admin. Assistant	15	0	30	0	35	0	35	0
Secretary	12	100	25	175	28	200	30	250
Support Staff	0	500	0	1,000	0	1,000	0	500
Project Officer (USAID)	35	0	35	0	40	0	40	0
Travel	25	1,500	50	2,000	50	2,000	20	1,000
Equipment	150	2,000	50	2,000	0	500	0	0
Vehicle Operations Maintenance	15	1,500	30	2,000	30	1,500	25	1,000
Office rental, equipment, supplies and furnishings	50	3,000	25	2,000	25	2,000	25	2,000
Evaluation	0	0	25	0	0	0	50	0
Total	377	9,600	420	11,175	358	9,700	375	6,250

50

C. Economic Analysis

1. Macro-Economic Analysis

Demand

Urban growth in Africa has been the most rapid of the kind world-wide since the early 1960s, and Kinshasa, its population doubling every ten or so years, has been a pace setter. From less than a half of a million at independence (1960), informed observers today feel three million inhabitants is a low estimate.

Such a population needs an enormous quantity of food to sustain itself. Kinshasa's population, although a poor one, nevertheless represents an aggregate market of great importance and likely consumes in excess of 700,000 tons of manioc, the basic carbohydrate, annually. Proper consumer surveys are lacking. However, inquiries in similar locales suggest a basic staple with few significant alternatives to be both price and income inelastic, which is to say, changes in either stimulate a less than proportionate quantity response. A price elasticity of .3 or even .2 would be reasonable and usable approximations. This means that in practice considerable swings in price will have comparatively small impact upon quantities consumed. Poor consumers are very sensitive to small changes in real income and the income effect of a rise in price, for example, will see more tightening of belts than shifting to alternatives when the staple in question is as basic as manioc.

Such rapid growth as Kinshasa has witnessed is not without pain and the needed changes in marketing structure to keep pace has confronted dealers, jobbers, transporters and others with an unprecedented challenge. Twelve times the quantity of manioc must now be found, bought, shipped, and distributed to retailers than was needed twenty years ago. And real incomes have fallen by at least four/fifths according to some sources over the same period of time. In addition, other foods and commodities have to be marketed as well. Finally, the production sector itself has had to restructure itself completely to cope with this new presence.

An alternative market for manioc has come into being to the east, in the Kasais, where private diamond mining has created a number of boom towns. It is likely that these new markets buy several tens of thousands of tons of Bandundu manioc annually.

Supply

Kinshasa's main food basket is to be found several hundred kilometers to the east in Bandundu region. This area, one of Zaire's and Africa's most densely populated areas, has only become a food surplus area in recent years. As recently as World War I the local male population still engaged actively in hunting, supplemented by fishing and gathering. Cash crops were grown, mainly palm products and some fiber and sesame. Whether grown on large scale or small, these cash crops were within the male domain. Women were and are the primary cultivators of the food crops that have now become the major cash crops as well. By 1960, Bandundu had achieved self-sufficiency in foodstuffs and produced regular surpluses of cash crops. Independence and the

accompanying agitation led to a decline in cash crop production. For a time the newly unemployed males seemed to drift to the city adding mouths while reducing rural crop production capability.

The region is agriculturally rich in only a relative sense. It is essentially a rather dry plateau with fragile soils, traversed north to south by a number of rivers and valleys. In the valleys one finds relatively better soil and moisture, and some forest. The population, which dwells in small dispersed hamlets on the uplands, clears fields primarily in the less healthy but richer bottomlands and slopes. Gradually the forest is being removed to be replaced by a dense system of small fields, fish ponds, wood lots with residual patches of original cover. The quality of life is low.

There is relatively little animal husbandry; protein has until recently mainly come from the vanishing wild life. Manioc is the principle food followed distantly by maize and, in certain areas, millet.

Crop production continues to be dependent upon slash and burn, which is viable so long as fallow times can be kept sufficiently long to allow the soil to regenerate the required level of fertility; usually ten or more years. Good land being scarce, a growing population has required that extra hectares come from fallow, such that land is typically retired for no more than two or three years, with a consequent decline in average fertility. Mouths are now outrunning hectares, yields are declining and fallow land brought back under cultivation has less productive potential than formerly. Fortunately manioc is tolerant of poor soils, so that it is less affected than other crops in this particular regard.

Nevertheless, the agricultural system has managed to adjust to new market realities. As Kinshasa has become commercially important with its growing and insatiable appetite, food crops increasingly have become the primary cash crops. Men are beginning to enter the agricultural workforce. So far there has been sufficient flexibility in the system, by substitution among crops and utilization of underemployed resources, to meet demand. How much slack remains is unknown.

Very little is known about the economics of quasi-subsistence farming in this area. Hence the supply and cross elasticities of manioc and manioc with respect to alternative crops are unknown. It is likely that supply response of manioc is fairly inelastic. Given its relative importance as a crop, the limitations to expanding the area under cultivation and the relatively limited genetic potential of the crop, it is likely that extra production will be accompanied by more than proportional increases in costs. Although manioc has been plagued by mealy bug and green spider mite, these pests are coming under control as exotic predators are introduced. New varieties of manioc are being produced on research stations, and extra yield is being obtained, but the genetic potential does not appear to be such as to suggest new green revolutions.

Crops typically mature at a particular time and must be harvested at once if losses are not to be sustained. Manioc differs in this regard. As a root crop it can stay in the ground, in storage in effect, for months after maturing. Farmers need not, therefore, sell the crop at a time of maximum

supply, which acts to support farm level prices above what they might otherwise be. Unless the farmer has pressing need for cash, she (which almost all the food producers are) can withhold her crop for up to a year. Manioc can play a role somewhat analogical to cattle in other African cultures as a store of wealth.

In sum, given the decline in real income, increases in demand will come from growth in aggregate demand, which will place great pressure on supply given the relative importance of manioc in diets. However, long term prices are likely to rise reflecting both limitations in resources and the inherent nature of the crop itself. Such a trend is an ominous augury for an urban population sensitive to every pressure to its real income. If significant savings are not to be found in production, and cheap alternative commodities do not exist, food marketing will have to become and remain extremely cost effective if the urban population is to be fed even a minimally acceptable diet.

Transportation

Bandundu is linked to Kinshasa by road and by river. Few parts of the principle crop zone are more than 10 kilometers from either a navigable waterway or what was at least at one time a motorable road. The dirt roads, although in greatly varying condition, are typically negotiable by trucks most of the year. This is not to say that every point is within economic distance of Kinshasa. Many roads are in sufficiently poor condition that trucks can go no more than 10-15 km a day in low gear and with high cost to the vehicle itself. There are numerous rivers up to 30 meters in width so that roads have frequent bridges or depend upon ferry service. Where either is not functional long and costly detours must be made. Nevertheless, once on a passable road, and assuming no rain and no breakdowns, few areas are more than 18 hours by truck from Kinshasa markets. Kikwit is 525 kilometers from Kinshasa via paved road. In 1981 shippers could move a ton to Kinshasa from Kikwit for about a zaire per kilometer, for a total cost of 525 zaires per ton.

Rivers are navigable over much of the area up to depths of 1.3 meters most of the year. The Kasai is usable year-round by large barges and the Kwilu for 10 months of the year. These rivers are linked to Kinshasa by one the greatest rivers in Africa, the Zaire (the Congo if one is on the right bank). A well-developed barge traffic operates on these rivers which would be extremely cost effective relative to road if all other factors were equal. This is lamentably not the case.

The majority (70%) of water traffic is presently moved in barges operated by a public corporation, ONATRA. The company provides its service at what are apparently very competitive rates. Building upon a base rate in 1981 of 21.45 zaires per ton increments are added depending upon how many ports are passed up to the destination. There are forty ports in all. A tariff of 3.575 zaires is added for each port of the first twenty and 2.076 for each the remainder. If one were to send a ton from say Kikwit to Kinshasa, a trip of 26 steps the total calculation would be as follows:

base	21.45
steps 1-20	71.50
steps 21-26	14.46
<hr/>	
Total	107.41/ton

Note: These figures represent typical road and barge rates for 1981. Although since changed the ratio between them remains approximately constant.

The shipment of a ton of manioc to Kinshasa from Kikwit by barge costs one-fifth of the cost by truck. Unhappily this straight forward advantage to river transport is substantially narrowed by a number of factors, some inherent to barge traffic, in particular its slow speed, but, more serious and ultimately decisive, to costs accrued by bureaucratic and corrupt human agencies. Whereas less than a day is required to move a ton to Kinshasa by truck, the same trip may take weeks by barge. While goods are thus exposed they can suffer water damage, spoilage, other damage, or pilferage. These last can reduce the quantity delivered by up to 30%. In addition shippers must arrange for truck delivery and pickup and storage at each end. The extra costs of storage, losses from all sources and tied up capital can (and do) completely eliminate the original large margin in favor of barge shipment.

Still the potential remains and, increasingly, private shippers are moving in to provide secure and more timely movement of cargos by water. Since 1972 they have captured perhaps thirty percent of the trade and are limited only by lack of capital from gaining yet more. This progress is particularly noteworthy when it is realized that, compared with the ONATRA armada of 400 barges (250 being normally operable), the four main private firms (OMNRA, SICOIRA, CEIZA and ALAGEM) use a handful, certainly no more than 30 barges. ONATRA operates barges of 200 tons and upwards capacity. This size reflects the bulky nature of their prime cargos, mineral products from Shaba, palm oil, fuel, construction goods and beer, none of which suffer acutely from water damage. Private operators compete where goods tend to be perishable and/or of high cash value. However, the large average size of the available barges means that more often than not the vessel must remain immobilized for weeks until sufficiently full to move it profitably. What are needed are smaller barges, perhaps self powered, of 20 to 40 tons capacity. Even limited as they are by size of equipment, private shippers are competing on grounds of safe passage and relative speed despite their higher charges to the user. With a wider variety of equipment they could satisfy a broader range of market needs.

Truckers have their share of problems as well. Operation costs are typically substantial, reflecting high fuel costs, poor running condition of equipment, scarcity of parts, high capitalization costs, all of which must be redeemed in shipping rates. Furthermore, the truck fleet is aging as demand for transport exceeds the ability to import additional units. Poor maintenance and hard use of machinery are commonplace in Africa. Operators seem unwilling to do more than the minimum necessary to keep a vehicle operational. Because capital goods are scarce, the urge to use them to the limit and beyond is irresistible, accounting for the gross overloading of trucks. As a consequence, a poorly maintained vehicle is routinely abused,

54

the upshot being rapid deterioration and higher costs of operation, while bridges and roads sustain abnormal wear. It is in fact quite rare for a truck to make a round-trip between Kinshasa and Bandundu without significant delays (often accompanied by spoilage of some of the load) due to mechanical breakdowns.

Spare parts are in constant demand. A poor economy such as Zaire's would find it difficult to maintain parts inventories for even one mark of vehicle; there are currently at least 24 makes and innumerable models engaged in transport, making the spare parts problem needlessly complicated and costly. This situation is in large part explained by the number of donors, each pushing its national product(s) upon a recipient too poor to be choosy.

The basic cost of transport vehicles is the major constraint to added competition in the transport industry. Even so, relative to demand, there are sufficient truckers in business to keep it competitive, and therefore economically efficient. However, the poor condition of roads, the dispersion of producers and the high cost of operating semi-functional vehicles cause owners to be abnormally careful as to the sort of places they are prepared to service. Increasingly they are loathe to send a valuable truck to a place where it is likely to be mired or seriously damaged for a few dozen sacks of manioc. Thus the economic distances are constrained well within what is physically possible.

A partial solution is to use different types of trucks in different places. Smaller trucks, less than eight ton capacity, could be used on the rural feeder roads. Larger vehicles, up to 25 ton capacity could be used on the longer haul on the paved road. This makes good economic sense and allows poorer local entrepreneurs to share in the business, using local knowledge and contacts to pay for the cost of smaller vehicles.

The 525 km long Kinshasa-Kikwit road is the only paved trunk road serving the area. The several thousand kilometers or more of secondary and tertiary roads are dirt in various states of disrepair. The more local the road, the more government leaves it to the immediate users to maintain. In some places, groups of locally recruited cantonniers (one person assigned to maintain two to five kilometers) level and fill the tracks in their individual areas. Intensity of care varies widely and directly reflects the seriousness of local interest, although general support of this system has dropped significantly since independence. Plantations, local businesses, religious organizations and collectivities still assume some responsibility for keeping local roads open. In their absence a road can deteriorate to a mere track or worse. Gradients leading to bridges and ferries are frequently so steep as to become unusable when wet. All of these impede the speed of transport and greatly increase the cost of evacuation of goods.

River transport suffers from a special set of constraints. The last complete set of charts was done forty years ago and has been only fitfully updated. Navigation channels, hazards and markings have changed greatly from what is found on charts. The system of lateral buoyage is out of date and often nonexistent. Not only do costly groundings occur frequently, but also night time passage is virtually impossible on the Kasai and Kwilu rivers, doubling travel time. Port facilities such as mooring, wharfage, storage,

52

loading equipment etc., have deteriorated. All these act to make river transport a far less effective means of transport than it could be. And even where a port itself is adequate, lack of passable roads can isolate the port from its hinterland.

Marketing

There are few more controversial areas in development economics than that surrounding marketing. Its failings are manifest. Price signals move only fitfully from consumer to producer. Significant elements of monopsony appear to flourish. Market information is notably lacking, as witness herds of cattle passing one another going to markets in opposite directions. Popular belief views middlemen (itself a pejorative) as either illiterate, marginally competent parasites or, more typically, greedy and avaricious speculators. To the extent they represent a minority they are doubly damned. When rich, they are monopolists, when poor it is just desserts. What is rarely acknowledged is the risk-bearing role played by merchants in moving and storing goods so that commodities arrive when and where needed at prices consumers can pay. Unfortunately even when working well the market seems disorderly, as anyone who has ever seen the commodity exchange can attest. The appearance of chaos combined with the evident cupidity of the actors gives marketing the unfortunate public odor that seems to beg intervention. Governments have needed few pretexts to restore order in the market place through the interposition of civil servants who bring discipline and public supervision to this vital service.

Doubtless many faults exist in marketing structures which function in poor economies. It is unarguable that any dealer worth his salt is going to try to corner his own particular market. This is best addressed by more competition, and not by the establishment of government monopoly. It is no doubt true that the price mechanism is typically unable to function optimally, giving both tardy and frequently misleading signals. But can this shortcoming be assigned to free enterprise marketing or to a gravely underdeveloped information network? It is likely that, were the cost functions of transporters in a given commodity regressed, considerable dispersion about the function would be found to exist. But this only points to underdeveloped communication, poor bookkeeping and a simple lack of access to parts plus chronic poor maintenance, rather than irrationality as is sometimes alleged. Studies into entrepreneurship in traditionally oriented and transitional economies have repeatedly demonstrated that these managers marshal and organize their resources as best they can, often subject to severe constraints of risk and uncertainty, to earn a profit. What are often taken to be proofs of chaos and irrationality are found upon inspection to be symptoms of orderly rational behaviour. Will Rogers used to say that he knew a lot of farmers who couldn't write but he had never met one who couldn't add. The same can be said for traders in Zaire.

Part of the problem facing marketing in Zaire is that it is cash starved. Although the final market is large in absolute terms, and substantial quantities are moved, the value of product is so low and the consumer so indiscriminating (because of his poverty) that relatively little specialization can be attempted or service provided (for example, there is almost no grading or packaging beyond the barest minimum). Consequently

merchants must be generalists, attempting assembly, storage, transport, wholesaling and retailing themselves while absorbing losses from poor handling, tardy movement, inadequate information, and, often, thoughtless regulation. In such a context they must cover substantial capital costs and provide a product that a typically poor consuming public can afford. It's a big order.

Large scale long distance movement of commodities is a relatively new activity in Zaire, as compared with, say, West Africa. There is little accumulated experience to which to turn, and almost every activity is to some degree without precedent. A not unsophisticated fairly competitive and therefore arguably efficient marketing mechanism has come into being. It is nevertheless plagued with the amateurishness of inexperience, the waste of duplicative effort where specialization would make sense, severe undercapitalization and little financial control, all while struggling in a very high risk environment. There is more than a little politicking by the well-connected to weigh things in their favour: creation of local transport monopolies, collateral requirements for credit (often Kinshasa real estate), the imposition of an agricultural marketing campaign are cases in point.

What is presently in place is a young system only beginning to shake out the less able and to develop norms and precedents for operation and gradually to become a recognized way of business. There are a large number of active business people, typically undercapitalized, with only rudimentary understanding of accounts, who collude to the best of their ability so that many can have some share of the market but who are nevertheless providing a vital service to remote areas on the one hand and food to the city on the other. The large scale operators who own their own trucks are the essential core of the trade. and provide long distance haulage, access to the district markets in Kinshasa, storage as needed and perhaps credit under special circumstances to the smaller operators. There is a swarm of smaller commercants attempting to win some share of this inter-regional trade, ranging from individuals carrying a sack to market a day from home, to owners of a bicycle, a baleinière or small truck, and the majority who hire a part or all of someone else's truck or barge, all engaged in haulage. So long as they can cover their costs and earn a bit, this assemblage too can provide many jobs while marginally serving the market.

In the region itself a secondary network exists, centering upon local market towns. Individual operators may or may not maintain links to the center, they may attempt to operate alone or sell to the next step up the line. The more important own small trucks with which they carry goods to local markets and bring produce back. The final link is the farmer who has a sack head-carried to market: the effective radius of such portage seems to be 15-20 km. A profile of these local operators is beginning to emerge. The exceptional commercant seems to keep books, understand the need to care for his truck, nourish contacts in the village, provide credit to secure commodities pre-harvest, reinvest rather than distribute his capital and look upon his work as a full-time activity. The more typical carries his accounts in his head, is less specialized and generally less able to speculate. The less astute will find it difficult to fend off family claims to his capital which will be dissipated as gifts.

The scattered evidence in hand does suggest, however, that there is considerable competition in transport and commodity purchasing at the market level. Dealers certainly attempt to set prices, but their very number prevents them from being too effective. It is unlikely that monopsony is at present very widespread and to the degree it exists is the product of very local circumstances. There are simply too many alternatives. Ease of entry is such that a very large number can at least attempt to be traders.

One cannot be optimistic that long distance haulage will remain as competitive as would be ideal forever. Entry is limited by the high cost of capital, and to the extent political pressures are brought to bear it is not unreasonable to expect only a handful of colluding operators will survive in the long run. This is much less likely in local trade, where the market margins are sufficiently thin to be uninteresting to large operators and where local knowledge and contacts can be very important. So long as the market is growing and entry does not require special skills and large initial capital, it is likely a few large operators will be accompanied by a fleet of small traders.

2. Benefit-Cost Analysis

Introduction

Benefit-cost analyses have often been constructed from inaccurate and unreliable data and from doubtful assumptions about economic trends. As a result these analyses have not provided useful bases for later attempts to monitor and evaluate the economic effects of the project.

In order to develop a valid economic analysis of the project area it is preferable to outline a suggested analytical method and the data needed to perform the analysis. Such a method is presented in this section.

At present the statistics needed for a credible economic analysis are not available. Much data has in fact been collected, but the statistics on the same subject, gathered or analyzed by different official sources, vary so much as to be useless. The statistics often appear to reflect official projections rather than actual occurrences. Moreover, no institution currently has the capacity to collect and analyze the data needed for a benefit-cost analysis.

To build up that institutional capacity this project aims to provide a computer and computer training to the Institut de Recherches Economiques et Sociales (I.R.E.S.) at the University of Kinshasa. The companion Area Food and Market Development Project (660-0102) will include a detailed methodology for monitoring and evaluating the impact of the project. It will also implement several baseline studies required for the project area.

In addition, these studies will gather data on such economic factors as the rates of return on boats and barges, licensing fees and revenues to RVF and the labor requirements for road maintenance.

From the combined efforts of these two complementary projects it will then be possible to gather the data required for an accurate economic analysis, and to analyze them efficiently.

56

Method of Analysis

The World Bank Staff Working Paper entitled "The Economic Analysis of Rural Road Projects" (No. 241, August 1976) suggests a method which is appropriate for the benefit-cost analysis of this project. The paper states that conventional economic analyses of rural road projects are inappropriate for rural areas with low levels of traffic. Conventional analyses are used to evaluate projects in which significant "normal" traffic already exists. The project benefits are then measured from the increased traffic and lower transport costs resulting from the improved roads. In such areas the transport cost savings provide a reasonable measure of the economic benefits resulting from the project.

In rural areas with low levels of traffic, however, the economic gains from increased traffic are not an adequate measure of the project's benefits. Traffic levels remain so low after the project as not to reflect adequately the development benefits in the area. The World Bank therefore suggests that the economic analysis of such project areas incorporates data on the distribution of project benefits, producer responses to the project, and constraints other than transport which may limit the producer's responses.

The gains from increased agricultural production, together with the transport cost savings to producers, transporters, and merchants, constitute the principal project benefits. Thus, the overall effects of the project on rural production and income are measured and evaluated directly.

As this project will occur in an area with only one primary road, but numerous secondary and tertiary roads, the above method offers a sound approach to analyzing the project benefits. Traffic on these auxiliary roads is seasonal and often irregular. River traffic is somewhat more predictable although also seasonal. With appropriate data it will be possible to evaluate the rates of return on barge and boat investments.

For both road and river transport it is assumed that better roads and waterways will stimulate agricultural production and marketing. Transport time for boats and trucks should decrease with an improved transport system. Given that river transport has lower operating costs, it is assumed that the volume of river transport will increase relative to road transport. These savings should contribute to increased farmgate prices and greater agricultural production.

The benefits from both increased agricultural output and transport cost savings can be quantified. To do so data is needed for the amount of cultivated land in the project area, the rural population, the number of farmers, major crop production and yields, and marketing and transport activities. This data will be collected in the project (660-0102) baseline studies, and in collaboration with the ongoing efforts of I.R.E.S., the Groupe d'Etudes Economie et Planification (GEEP) of the Department of Transport and Communication, the Direction des Marchés, Prix, Crédits de Campagne (DMPC) of the Department of Agriculture and Rural Development, and the Centre National de Planification de Nutrition Humaine (CEPLANUT).

In order to respond to the increased opportunities made possible by

improving the transport system, farmers must also be able to increase crop yields and improve their methods of farming. Constraints other than those concerning transport, and which limit agricultural production, will be addressed in the Area Food and Market Development Project (660-0102). That project aims to improve agricultural production and marketing by providing improved seeds, technical assistance, and extension services, and by helping to set up marketing and credit facilities.

Because these projects complement one another estimation of the benefits from either project alone will undervalue the total benefits to the project area. Evaluation of the benefits of this project alone would not include those gained from improved crop inputs, farming practices, and crop yields. The benefits from the other project would likewise not include the gains resulting from an improved transport system.

The full economic benefits to the project area will arise from the combined effects of these projects. Improved roads and waterways, together with greater agricultural production, will enable farmers to increase their marketable crop surplus and their incomes.

Model of Quantified Benefits and Costs

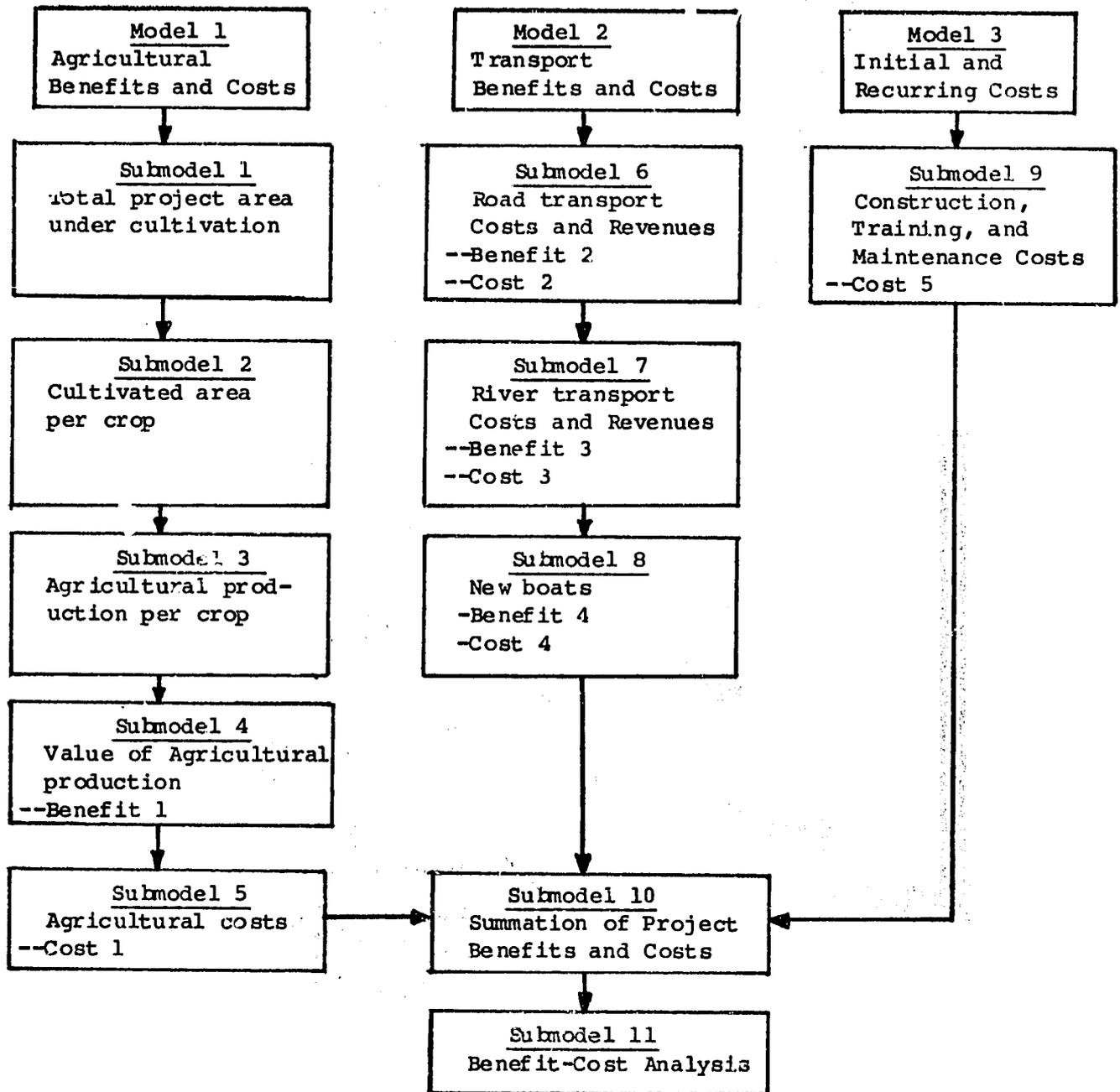
A series of models are used to distinguish and calculate the benefits and costs. Increases in economic activity are calculated for the project area with and without the project. Benefits directly attributable to the project can then be calculated. These are compared to the increased costs resulting from the project to determine the project's economic value.

Model 1 indicates the agricultural benefits and costs. The benefits are based on increased land under cultivation, greater production, improved yields, and higher farmgate prices resulting from the project. Related costs result from the use of more labor, seeds, and other inputs to increase production.

Model 2 estimates the benefits and costs which will arise from increased transport activity on rivers and roads. Benefits arise from increased revenues to transporters, and to non-agricultural users of the transport system. Reduced costs to agricultural producers are reflected in the higher farmgate prices in model 1. Higher costs to transporters also occur because of increased transport activity. A separate stream of benefits is estimated for the new boats to be built and launched during the project.

A stream of net benefits and costs over the life of the project is then discounted to the present. The net present value of the project indicates the difference between the with-project and without-project increases.

The entire model can be schematized as follows:



Submodel 1: Total Project Area Under Cultivation

Data will be collected on the total cultivated land in the project area. This can be corroborated with known patterns for fallow periods.

Increases in total production will arise from increased land use, from better seeds and improved crop rotation, and from advanced farm management and extension services. While the Agricultural Marketing Development Project (660-0098) is expected to stimulate more land use, the Area Food and Market Development Project (660-0102) should, as yields increase, decrease the rate at which new fields are opened up.

Submodel 2: Cultivated Area by Crop

Manioc and rice are the only major food products which are not intercropped. By examining the production and yields of these crops a conservative estimate can be made of the total crop production. Multiplying the percentage area of manioc and rice times the total cultivated area of each indicates the total cultivated area for each crop.

While the production of only two crops is calculated, peanuts, maize, and gourd seeds, which are intercropped with manioc, also represent important food cash crops in the project area. The actual benefits to the area are likely to be higher than is calculated in the benefit-cost analysis.

Submodel 3: Agricultural Production by Crop

The cultivated area for each crop is multiplied by its respective yield to determine the total production of each crop.

Submodel 4: Value of Agricultural Production

Farmgate prices for manioc and rice are multiplied by total crop production to determine the value of agricultural production. These prices are expected to increase with greater agricultural production and improved transport systems. The difference between the with and without values for each year of production indicates the agricultural net benefits. This is benefit stream B1.

Submodel 5: Agricultural Costs

The figures for increased cultivated land (calculated in submodel 2) are used to estimate increased agricultural costs with the project. Multiplying the increased hectarage by the value of labor, seeds, and other agricultural inputs indicates the net costs from increasing agricultural production. These net costs with the project represent cost stream C1.

Submodel 6: Road Transport Benefits and Costs

The benefits and costs of improving roads are calculated using transport prices and costs. Trucking expenses are based on the number of trucks and the volume of traffic on the project area roads. The difference between transport prices with and without the project indicates the higher revenues to

62

transporters. The difference between transport costs with and without the project indicates the net costs resulting from the project. These two calculations represent benefit stream B2 and cost stream C2.

Submodel 7: River Transport Benefits and Costs

Calculations similar to those for submodel 6 are made for river transport benefits and costs. The number of barges and boats, the volume of river traffic, and the shipping costs and prices are used to calculate the costs and benefits. Benefit stream B3 indicates the difference between transport prices with and without the project. Cost stream C3 represents the net cost change resulting from the project.

Submodel 8: New River Boats

AID will provide several new boats and barges as part of its assistance. As these boats are not part of the current shipping system, they will provide a unique stream of benefits. These boats include:

- 2 40-ton barges and 1 pusher;
- 2 20-ton barges and 1 pusher;
- 1 20-ton boat;
- 2 15-ton boats;
- 12 20- to 40-ton wooden boats.

The same data for 20-ton boats in submodel 7 are used to calculate the costs and prices in this submodel. The net costs and benefits from these boats will begin to accrue in year 4 of the project. These constitute benefit stream B4 and cost stream C4.

Submodel 9: Construction, Training, and Maintenance Costs

The initial project costs include:

- 1) equipment and the capital costs of the new boats;
- 2) personnel training, and
- 3) technical assistance.

The recurring costs cover maintenance and equipment costs during the life of the project. These costs represent cost stream C5.

Submodels 10 and 11: Net Benefits and Costs, and Benefit-Cost Analysis

The benefit and cost streams are totalled for each year and discounted over the life of the project. The sum of these benefits and costs indicates the net present value of the project.

From these net sums the internal rate of return on the project can be calculated. Different discount rates and percentage increases can be tested to determine the sensitivity of the analysis to changes in different parameters.

63

3. Non-quantifiable Benefits

The project is also expected to generate a series of non-quantifiable benefits, including:

1. Economic Benefits

- More frequent and regular marketing opportunities
- An expansion of the local boat building industry using locally available resources
- An increased ease of access to the transportation sector by smaller investors
- Increased competition between road and river transporters
- Improved navigation conditions
- Greater number of private river transporters
- Savings to non-agricultural users of improved roads and waterway
- Higher prices to producers
- Decreased producer vulnerability to financial contingencies
- Greater possibility of producers planning sales
- Proceeds of producers' sales spent or invested in the area
- More manufactured goods available in the area
- Easier access to goods and services
- Creation of employment opportunities in the wood and metal boat building industries

2. Social Benefits

- More food available at the household level
 - Decreased isolation
 - Safer river and road transportation
 - Decreased vulnerability of persons and goods to delays
 - Possibility of increased mobility
- 64

3. Human Development Benefits

- A transfer and expansion of skills in the wooden boat building industry
- Skills training in metal boat building
- Ability to plan for sales, consumption and planting needs could lead to a sense of some control over lives

4. Institutional Development Benefits

- Improved capacity of RVF to maintain and improve navigation conditions
- Higher productivity of RVF personnel because of training, motivation and increased respect of population
- Improved capacity of private construction firms to undertake road and bridge maintenance work

5. Technical Benefits

- Development of a relatively low cost technique for stabilizing slopes on rural roads.
- Improved design of existing small wooden boats
- Design of a new range of appropriate wooden boats and barges
- Longer life for improved boats
- Determination of availability of road surfacing materials and aggregates in the region

D. Social Analysis

1. Socio-cultural Context and Feasibility

Ethnic groups in the project area include the Yansi, Pende, Mbunda, Dinga, Mbala, Pindi, Mputu, Ngoli, Hungana, Lori, Suku, Kwese, Ngwi, Ngongo, and Sakata. These diverse groups speak different though related languages and have different histories, social organization, and cultural practices.

Along the Kwilu river alone, at least seven different groups occupy land. Complexity is further increased by the fact that these holdings are not contiguous; groups' territories alternate with each other. This geographic mixture of ethnic groups is unusual for rural areas of Zaire, undoubtedly reflecting a historical jockeying and negotiating for better land. How land was obtained in the past can influence relations between groups in the present.

This long history of close association of diverse ethnic groups in the area with one of the highest rural population densities in the whole country augurs well for the willingness of cultivators in the area to try new ideas. The average villager, after all, knows several local languages other than his or her own, is quite aware of different cultural practices, and is aware that there are alternative ways for things to be done. This exposure to varying ways to accomplish the same essential task and to a variety of modes of behavior occurs in this heterogeneous region to a greater degree than in those areas of Zaire which are more ethnically homogeneous. In other words one can predict that this heterogeneity may well enhance the possible spread effect of new technologies and information rather than create additional barriers.

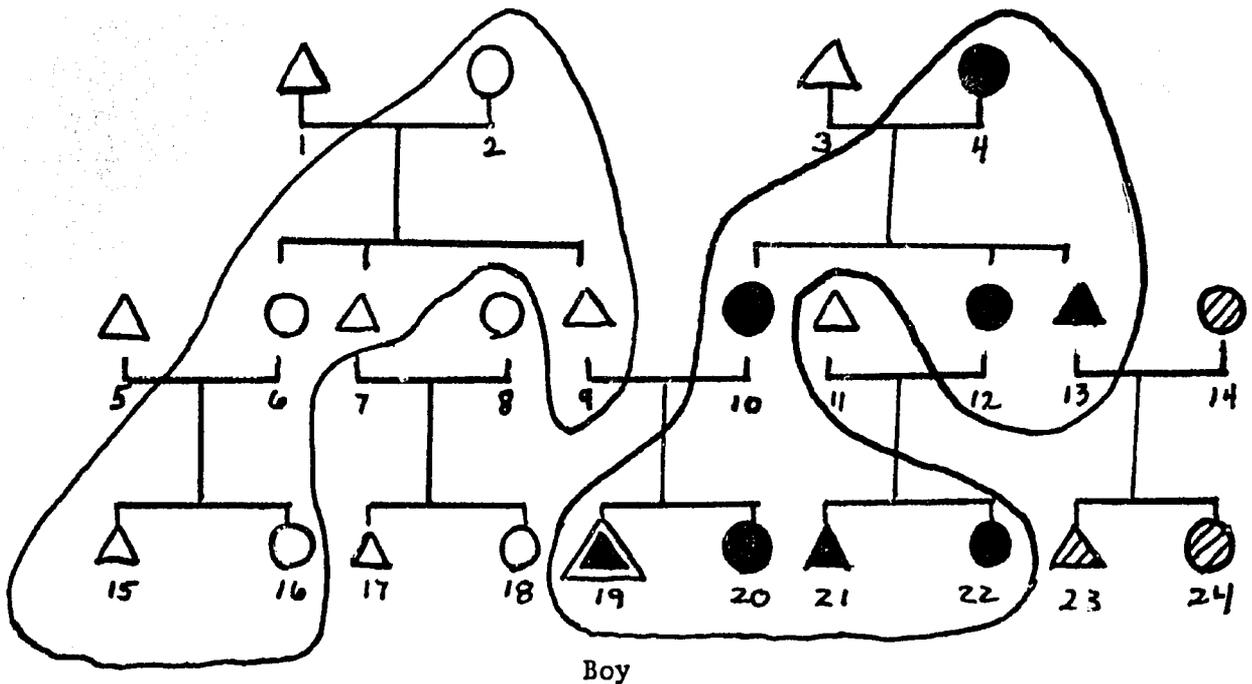
On the one hand, there are certainly cases within the Kwilu in which traditional ethnic rivalries or simply traditionally different ways of doing things may create barriers to the smooth flow and sharing of information. These are not insuperable constraints, but they must be taken into account in the planning of training programs, establishment of demonstration plots, or placement of personnel. In this context it is very important that project benefits be available to people of all ethnic groups and in all villages equitably. For some to be perceived as advantaged more than others will cause rivalries and jealousies which can have a wide range of negative consequences, not least of which would be to limit the spread effect of new information, technologies, and participation in other aspects of the project.

Although some patrilineal filiations exist, matrilineal kinship systems with associated patriarchy are the most commonly encountered social structures in the project area. (See diagram I)

The families of mothers, their children and their grandchildren, who have all descended from one original great-grandmother, make up the lineage. In matrilineal societies males are incapable of transmitting the bloodline of the lineage, the force vitale. These matrilineal societies are not matriarchal, i.e., they are not ruled by women. They are patriarchal, ruled by the oldest male in the lineage, typically a brother of the oldest woman. Any rights are defined by men in the lineage. Power, authority, and responsibility are in their hands.

66

Diagram I
Matrilineal Descent



Boy (19) belongs to the lineage (black), which is traced through his mother (10). His sister (20), his mother's mother (4), his mother's sister (12), and her children (21, 22), and his mother's brother all belong to the same (black) lineage.

The mother's brother (13), boy's maternal uncle, has children (23, 24) who do not belong to boy's lineage but to the lineage (striped) of the wife of boy's maternal uncle.

Boy's father (9), his father's brother (7), his father's sister (6), and his father's mother (2), and the children of his father's sister (15, 16) do not belong to the boy's lineage but to his father's own lineage (white).

Loyalty/solidarity bands enclose boy's father's lineage (white) and boy's lineage (black).

(67)

Traditionally, maternal uncles had more power over their sister's children than the children's fathers did. Maternal uncles, heads of the lineages, assumed responsibility for the needs of their nieces and nephews and eventually received the primary benefits from their labor value (e.g., the largest share of the marriage payment made for their nieces). Uncles had a vested economic interest in choosing husbands and wives for their nephews and nieces.

In addition to the marriage payment, which was meant to compensate for the loss to the bride's maternal lineage of an able and productive farmer, maternal uncles also received any income their married nephews earned. The maternal uncle used these incomes to pay himself a manager's salary and to redistribute funds to the families of his lineage as needs or emergencies arose. This distribution system of payments and returns describes the importance of lineage and clan solidarity. It represents a strong chain of cooperation and loyalty through the maternal line of descendants.

Though many aspects of the traditional system of responsibilities and payments are not as rigidly enforced as in earlier times and fathers in many areas of Kwilu, despite the matrilineal tradition, are now taking more responsibility for the financial and educational needs of their own children in addition to those of their nephews, it is clear that any change in the household budget, and particularly any transfer in the decision-making power over income from agricultural production from wife (or wives) to husband, or vice-versa, can have far-reaching impact on the household and its children. Each parent is under completely separate and still very strong lineage pressures to use his or her portion of the household income to benefit different individuals.

The project area is not only predominantly matrilineal, it is also virilocal. This refers to the pattern of settlement in which men settled in the village of their oldest maternal male relative and women moved to the village of their husbands upon marriage. A woman's children played with the children of her husband's lineage, not her own. Although the woman's sons would return to the lineage village of origin (the village of her maternal uncle) to live on land belonging to the lineage when they became older and married, a woman might never live in this village, the geographical nucleus of her lineage, in her life-time. She would most likely have greatest affinity for the village in which she grew up, the village her mother moved to upon her marriage.

This virilocality, demonstrated in diagram II, has important implications for the project design and implementation. It means, for one thing, that most of the males in any village will be related to most of the other males in the village. The land nearest to the village will belong to their lineage, one of them will almost certainly be serving as the traditional "chef de terre" in charge of preserving and protecting the land for the lineage, and all of them have the primary interest in maintaining the productivity of the land.

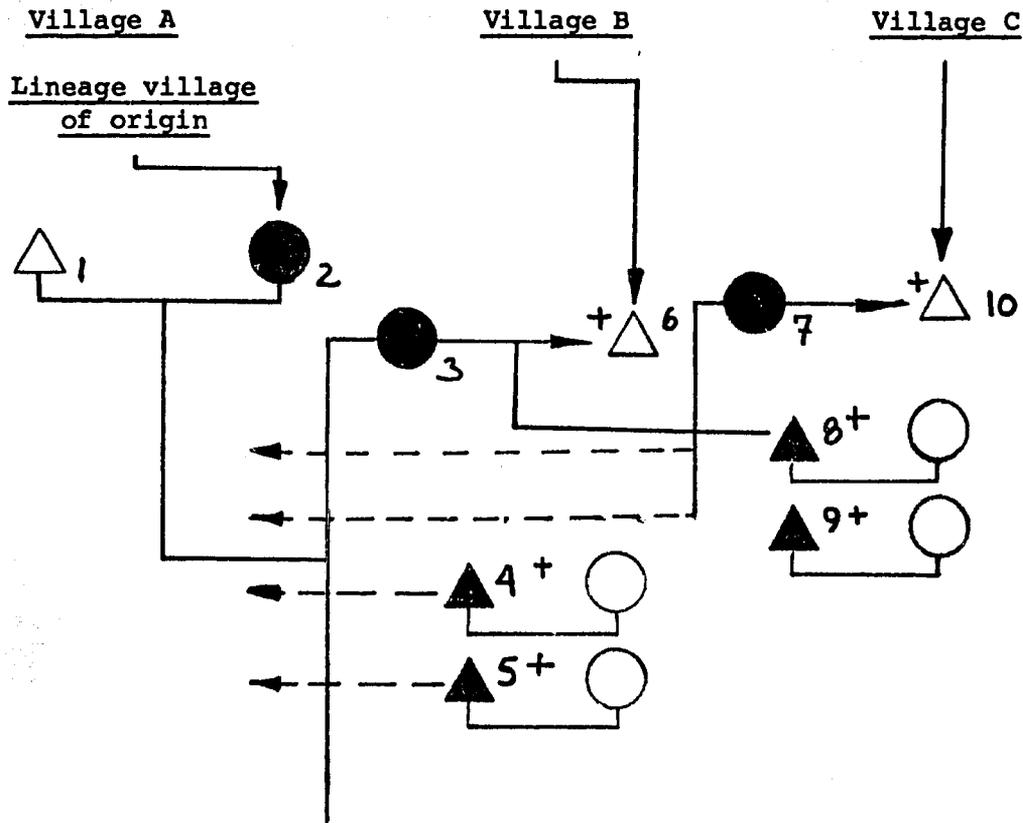
On the other hand it means that most of the women in the village are not directly related to each other. They live in the village because of their marriages to men of the village lineage. They are initially strangers both to each other and to the lineage of their husbands. To the degree that the

108

village of their husbands does things differently than their own village or lineage, they must learn new ways. This includes any different agricultural techniques or products.

Diagram II

Virilocation



Grandmother of the lineage resides in village A where the lineage has land. Her sons (4, 5) are born in village A and bring their wives to live there. Son (4) is the oldest and becomes lineage head. Son (5) is younger, has no lineage responsibilities, but by tradition lives in village A.

Her daughter is born in village A but when she marries, goes to reside with her husband in village B. Her children (7, 8, 9) are born in village B. When her sons get older (8, 9), they will marry and return to village A. When her daughter (7) gets older, she will marry and go to reside with her husband (10) in village C. Daughter (7) may never see village A, her lineage village of origin.

To speak of the women as strangers to each other is probably in most cases making too strong a statement because, in fact, they are quite likely to come from nearby or neighboring villages, or even the same village as their husband. This is why so many women not only till fields on the land of their husbands' lineage but also walk more kilometers to till fields on the land of their own lineage, increasing the distances they must cover on foot each day.

It is important to be aware that villages are not stagnant, rigidly unchanging and homogeneous units. Villages are composed of individuals, many of whom, particularly the women, have gone through many personal changes and learned many new ways of doing things in order to adjust to the requirements of their new circumstances. Add to this traditionally dynamic situation of personal adjustment and change the important contemporary fact of modern primary and secondary schooling and the migration, for at least a few years, to regional or national metropolises, by both young men and young women. Now, the village under closer inspection reveals itself to have wider and more frequent contacts with the outside world and a greater internal dynamic than appear at first sight, or certainly than is indicated by that oft-repeated error of the Western tourist, "They are doing things the same way they have done them for a thousand years".

On the other hand, village cultivators do need more information to improve their techniques and even to understand in a number of cases that they can effect changes in their circumstances that they were not aware that they could effect. And, as all who have worked with village agriculturalists are aware, they cannot afford to take too many risks in their agricultural practices lest they threaten the very lives of those who depend upon them for survival. Yet, given useful information and the opportunity to learn to use new skills, new planting material, or new techniques in ways which do not immediately threaten the old, the Kwilu farmer and her husband live in a world where change is expected.

There is an additional atmosphere in Kwilu villages at this time which is conducive to receptivity to good new ideas. The completion of the paved road to Kikwit opened the Kwilu to serve as a potential breadbasket for Kinshasa. That happened in 1977. For most of the project area it is only since then that the major food crops, particularly manioc, have become important cash earners and village farmers have begun participating in a serious effort to convert themselves from predominantly subsistence farmers to cash crop farmers, but using the same crops and the same techniques as before. Then in May 1982, effective during this past major selling season, the GOZ instituted a policy of price liberalization which has, in fact, raised the price per unit received at the farmgate in many cases. Throughout the Kwilu at this time there is a strong feeling among village cultivators that there is a possibility that life could in fact get better rather than continue to get steadily worse, and that the future is, indeed, in agriculture. A preliminary look at the data obtained in a USAID survey of 400 village households in the area indicates that the village cultivators are aware to a remarkable degree of the continuing constraints on their productivity and the problems that need to be overcome to increase and regularize the commercialization of their surplus produce. There is certainly an awareness that in many cases land is less productive than it used to be, though this is not necessarily connected to the decrease in fallow periods on the land. There is an acute awareness of

the problem of plant diseases that have attacked manioc, peanuts, and other crops, though there is inadequate knowledge about what to do about the problem.

The point is, there is a readiness to work on improving the conditions in the villages because there is an increasing sense throughout the area that life can, indeed, be improved and that they themselves can make a difference. When asked in what ways life was better now than in the past, a significant number of village respondents said that the major improvement was the money earned from their fields. When asked in what ways life was worse, many responded with discussions of various constraints on productivity or the inability of buyers to reach their villages because of bad roads or collapsed bridges, and their dependence on the price offered by the one trader who might reach their village.

This readiness to try to improve one's lot in life, together with the real need for greater cash income in the villages to pay for educational, health, and consumer requirements and government fees and taxes, provides a setting in which there is a strong likelihood that, once the initial risk-takers have proven a given technique to have advantages over the old, the spread effects will be more rapid than would otherwise be the case.

This spread effect is seen rather dramatically in the dynamic trading sector in which many new entrants quickly copy successful methods of previous participants, including the search for the best mode of transportation available at their level of capital. The rapid spread of the use of baleinières since their first introduction into the river trade in the mid-nineteen sixties and the quick adoption of the very few innovations to improve the efficiency or life expectancy of baleinières that have been available to owners and builders since then, are also striking evidence of the spread effect in the trading and transport sectors. Most people who are in trade or transport are doing it for survival, not simply for extra income. They are quick to read market signals, quick to take advantage of elasticities even in a generally inelastic market, quick to adopt demonstrably successful ways to increase their profits, and thereby to increase their own chances of survival.

There is a great diversity among the participants in the marketing system (Table 17). Many are Kinshasa-based individuals or large firms; the remainder mostly live in the project area or nearby. All the small and almost all the medium traders are Zairians. Traders often amass capital slowly, starting with tiny inventories and selling in small quantities, e.g., individual bars of soap, handfuls of peanuts, either in a local market, along the street, or in front of their house. Then, as capital accumulates, they invest in larger inventories and more costly goods. Other traders, especially women, start with sufficient capital given by a spouse or consort, to set up a significant business initially. Sometimes also savings groups (likelemba) are used by women to acquire the initial capital.

There are many considerations which affect these traders' choice of a mode of transportation and carrier. The unit cost of transportation is only one of these considerations. For the larger marketing operations, the choice is also influenced by the accessibility of the modes, delivery time and losses in transit. The choice between public and private river barge transport is

Table 17 : Project Area Traders

Type of Trader	Appox. Marketing Capital (zares)	Entry Investment Requirements (zares)	Organizational complexity	Preferred form of long-haul transport	Comments
Bicycle Trader	5-10,000	Bicycle	nil	Road	Sometimes transport goods by river but organization more complex: village - port - Kin - depot - market - village.
Village Based *	10-40,000	Truck (0 or 1)	nil-medium	Road	Vehicle fleet badly depleted. Shortage of marketing credit has caused change in status from self employed to piece rate buyers for large trading firms.
Port Based	10-90,000	Minimal	medium	River	Prefer private river transporters. Distrust small wooden boats since vulnerable to theft, rain and sinking.
Kinshasa Based -Bateau courier	10-180,000	nil	nil	River	Often use pirogues for transport to river's edge.
-Truck	50-100,000	nil	nil-minimum	Road	Most trucks are rented.
-Barge	50-150,000	nil	medium	River	Use road transport to port. Communication with Kinshasa is a problem.
Owner/Operator of wooden boats	100-200,000	Wooden boat (150,000 z)	minimum	River	Often use pirogues for transport to boat.
Large local trader	200-500,000	Trucks (1 to 3)	medium	Road predominantly	Truck fleet depleted. Some crops are transported by barge (maize, palm products).
Large Regional/ National Traders	1-10m	Trucks (3 plus) Barges	high	River and road	Future investments will be predominantly in small river stock (40-100 tons) (CAC, CCB, Solbena). Trucks used in village to port hauls.

CL

normally determined by the availability of services. Most small to medium traders prefer the more expensive (200 to 500 percent) private operators but due to the infrequency of their operations use ONATRA by default. Larger traders send for an ONATRA barge as soon as they have assembled enough to fill it to capacity.

Small operators, who are the major traders in manioc but who also trade to a considerable extent in peanuts, rice, fish and maize for the urban markets, have their choice determined primarily by the level of organizational complexity required for the transportation. A person operating alone or with insignificant assistance will use predominantly road transport, the ONATRA bateau courier passenger boat service or small wooden boats. ONATRA only allows traders to travel with their goods on the barges when the whole consignment is theirs. If small traders nevertheless send goods by ONATRA barges, they themselves must travel by truck or by boat from the port of embarkation to Kinshasa in order to complete the custom formalities on arrival at Kinshasa port, and organize the transport, storage and sale of the goods. More complex operators can diversify responsibilities and thus can more easily choose the more cost effective river transport mode. The constraint for small traders on expanding their operations seems to arise from a perhaps realistic lack of trust of non-family members coupled with the lack of a financial and communications infrastructure. Entry into trading is, therefore, relatively easy and equitable. It is not easy however, to prosper beyond mere survival as a simple trader. This project aims to help both producer and trader do better than mere survival.

Equity Considerations

This project will enhance the role of women in particular and of small-to-medium traders in general. Women, as has been demonstrated, are both the primary producers of marketable agricultural products, and they make up a significant proportion of the small-to-medium traders who would be beneficiaries of this project.

Although no bicycle traders and very few if any village-based traders are women, several of the other categories of small-to-medium traders are predominately or significantly composed of women. One of the major builders of wooden baleinieres has said that most of the people who place orders for new baleinieres from him are Kinshasa-based women and it would seem to be true that the majority of the baleiniere owners are women. Certainly the majority of the traders who go up and down the Kasai River on the bateaux courriers, the large ONATRA passenger/cargo boats, are women. Also, at least a small number of the traders who base themselves in ports along the Kasai River are women.

All of these traders, none of them in the category of the advantaged large trader, would benefit from the aspects of the project which are aimed at improving the marketing of products by river. By improving the design of boats and the placement and maintenance of navigational aids it is hoped to decrease the turn-around time on the capital invested in market goods, a major constraint to the use of river transportation at present for the small-to-medium trader. By increasing the range of small wooden boats and the total capacity of this private small-carrier river fleet there will be an

increase in access to this mode of transportation for the small-to-medium investors or owner-traders, a category which, as pointed out above, includes many women.

Likewise, improvements in the road transport system will benefit those small-to-medium traders, many of them women, who transport themselves and their sacks of goods on other traders' trucks, or who rent whole trucks themselves. Reduction of the time trucks are on the road with mechanical breakdowns due to the bad road conditions, or are unable to proceed because of rain-slick hills, reduces the risk factor for the small trader who can lose everything from spoilage if anything goes wrong on the road.

Improvements in both road and river transportation systems should reduce the cost per kilometer for transporting goods from farm to city as well as reduce the risk factor from spoilage or mishap or theft. This in turn should ease the entry of new participants into the lower and medium levels of trade. As more traders create more competition and transportation costs are reduced, the project will provide a combination of factors in which other projects (particularly 660-0102) can ensure that the producers of agricultural products, again overwhelmingly women at this time, will benefit in the form of increased prices for their produce and more predictable opportunities for sale.

The various aspects of this project will enhance equity rather than favor the already favored in the society. It will not promote one ethnic group over another because ethnic groups are very widely mixed along the rivers and the roads and no one group dominates in the small-to-medium trader categories. Small traders, who normally work with little entry investment other than sacks and transportation money, will benefit in larger numbers than any group other than the village producers themselves.

3. Impact on the Rural Standard of Living

An explicit concern in the design of this project and the related Area Food and Market Development Project (660-0102) has been to ensure that they have a generally beneficial impact on the standard of living in the project area. Nutrition is one measure of the standard of living, along with health, schooling, time and task allocation, access to public services and employment opportunities. It is a reasonably sensitive indicator since insufficient food consumption to meet nutritional requirements is closely related to poverty.

To date most development efforts related to nutrition have concentrated on the design and implementation of nutrition intervention programs such as supplementary feeding programs, nutrition education, food fortification and nutrition rehabilitation. However, it has become clear that government policies and development projects, particularly those in the agricultural sector, often have a greater effect, positive or negative, than do direct interventions. Land use policies, agricultural price policies, food input policies, the choice of agricultural technology, the shift from subsistence food production to cash crops and food marketing policies among others can affect the nutritional status of the poor, principally through their effects on incomes and prices. Similarly project level interventions which cause changes in control of income, expenditure patterns, cropping patterns, time

74

allocation and form of income may also affect a household's food allocation.

There are two basic reasons why rural development projects may not automatically bring about improved nutrition. Firstly, the malnourished do not always derive the benefits from such projects. Secondly an increase in household income may not bring about an increased or improved food consumption. Indirect effects of rural development projects, for example migration and changed labor patterns, may also effect nutrition. We need to be able to assess ex ante likely nutritional effects in order to influence project design.

The most important factors determining the effects of an agriculture project on the nutritional status of individuals seem to be (1) its impact on low consumption target groups, (2) its effect on incomes and food prices and, (3) its effect on the intra-household distribution of food.

Serious malnutrition already exists in the project area, especially in Idiofa zone. In 1983, the USAID-funded Centre National de Planification de Nutrition Humaine (CEPLANUT) carried out a nutrition survey of children under five in the region of Bandundu. They found that 17.3 percent of children under five in the region were acutely malnourished (below the 5th centile of weight for height of the NCHS/CDC standards). However in the mixed savannah/gallery forest areas, as in the project area, the percentage was as high as 20.7. Along the roads the incidence of malnutrition was 17.0 percent and in Kikwit and Bandundu City it was a lower 12.1 percent. No significant difference was found between the proportion of boys and girls malnourished. Adult malnutrition, both acute and chronic, is also a problem and an estimated 30 percent of women suffer from chronic nutritional anaemia. The malnutrition is compounded by the high incidence of endemic diseases and parasites and by the poor public health environment, especially with respect to water and sanitation.

The CEPLANUT survey generated little data that could be used to analyse the causes of malnutrition. Some observers in Zaire have linked increasing malnutrition with road improvement programs, that is, malnutrition increases along the roads that become marketing roads. However, there is some evidence to show that this observation is more a result of rural tourism than an adequate causal analysis. The CEPLANUT survey, for example, showed higher malnutrition in the mixed savannah/gallery forest areas away from the roads than along the roads.

What is clear is that, firstly, entire households in the project area suffer from inadequate food intake even though there are adequate levels of production of food crops. There is insufficient evidence to show whether or not the distribution of this deficit among individuals in the household is even or uneven. Secondly, nutrient imbalances such as vitamin and mineral deficiencies also exist and vulnerable groups within the household do not receive adequate food to meet the special nutrient requirements for pregnancy, lactation or growth. These two different states of malnutrition require different strategies for improving nutritional status. Both states exist in the project area. Further, there is marked seasonality to the pattern of malnutrition. The most difficult time of the year is the wet season preceding the first harvest. Food is scarce, food prices are high, work is demanding

75

and infections are prevalent. Malnutrition, morbidity and mortality increase; body weights decline.

A number of factors have been identified as contributing to this low level of food intake, most importantly, an irregular and sporadic marketing system, a lack of storage facilities, and inequitable terms of urban/rural trade.

In most parts of the project area, there is no organized marketing system and there is a low level of marketing activity. The unpredictability of the opportunity for sale makes planning virtually impossible. When a trader does arrive at the village, the temptation to sell all available produce, including that put aside for seeds or consumption, at what may be the only opportunity available, may be overwhelming. To sell under such circumstances may also be a rational economic decision. When farmers have a predictable marketing schedule, they can plan their processing, sales and income to fit the other requirements of their lives.

Malnutrition is also linked to a household's consumption and investment priorities. In the project area these latter are influenced by:

- cash needs for paying educational fees, health fees and taxes, for the purchase of manufactured goods and discretionary items, and for emergency or customary expenditures (funerals, commemorative feasts, marriages, etc.);
- household labor requirements for agricultural and household duties;
- judgements as to the likely future returns from educating children; and
- knowledge of nutritional requirements.

Very few households in the project area have consumer goods such as lamps, radios, watches, sewing machines or bicycles. Producers sell to satisfy a need for cash for items that are more highly valued than consumption or non-essential consumer goods. Present real income levels are so low that such choices must be made.

Although the producer's return on labor has increased since price liberalization, there has been little increase in real spending power because of the inequitable terms of rural/urban trade. Furthermore, a large number of transactions are made by exchange rather than by cash. These exchange relations are invariably exploitative. For example, a peasant farmer may be given a piece of cloth at Christmas time whose wholesale value is about 200 zaires, in exchange for two sacks of manioc whose farmgate price may be 250 to 300 zaires each.

Because of the high cost of services and goods, households often must choose between investment in education or in health. Education is valued in itself but it is also seen as a generator of future household income and as a means of improving future well-being.

The project has been designed to have a positive impact on the level of

76

food and income available to individuals and households. It does not address the connection between food availability and nutritional status which is more properly addressed by the Area Nutrition Improvement Project (660-0079).

The improved road and river access to be achieved by this project will provide rural households with more opportunities to sell and will allow the possibility of a regular, predictable and organized marketing system. In this case producers can better plan the allocation of production, consumption, planting material, gifts and exchanges, sales. Greater opportunity to sell in itself may not have any impact on present levels of food availability and the obverse of this situation is that the producers will have more opportunities to buy consumer goods. What little evidence there is does not suggest that consumer goods are valued more highly than health in general and adequate nutritional intake in particular but the possibility of this should also be addressed by Project 660-0079.

Improved road and river access will bring about a decrease in vehicle transport costs. The project will assist the market to remain competitive by facilitating ease of access to river transportation. Hence savings in transport costs will be passed on to the producer. By these means, even if present levels of production remain constant the producer will receive a higher return on labor.

Since this project is being designed jointly with the Area Food and Market Development Project (660-0102), the higher yields of basic food crops to be gained will also lead to increases in producer incomes, assuming that urban demand remains high. This latter assumption seems a solid one since there is little evidence in urban Zaire of the sort of food substitution phenomena to be found elsewhere, especially in West Africa. Manioc remains the basic and preferred staple, with bread and rice being mainly supplementary foods.

Assuming then that the present rural/urban terms of trade improve (which they may with decreased transportation costs), or at least do not deteriorate, and that the present expenditure patterns remain basically the same, then proportionately less food will have to be sold to generate the required cash income and more food will be available to the household.

The undernourished in the population are children under five, both girls and boys, pregnant and lactating women and women with chronic nutritional anaemia. The project will not increase the demand on women's time and, by regularizing the market system, may well decrease the time spent on walking to and from markets and on selling. Thus it will not have a negative nutritional impact on infants and small children due to reduced breastfeeding and time spent on food processing and preparation. Furthermore it will not transfer control of either food or cash income away from women, thus the project will not adversely affect the intra-household distribution of available food and should thus improve the food available to the undernourished groups in the population.

Nutrition is, however, only one dimension of a number of interlocking dimensions of the quality of rural life. Poverty is a function of lack of assets and flows of food and cash; of physical weakness which is reflected in

lower body weights and greater seasonal variations in those weights; of vulnerability to contingencies, particularly the incurring of debts through sickness, disaster, death, dowry or other costs; of powerlessness; and, of isolation. Isolation can be described in terms which are spatial, social, or related to access of knowledge. By reducing the economic distance between producers in the project area and Kinshasa and other urban centers, a number of these other interlocking dimensions will also be improved.

E. Energy Analysis

River transport is the most energy efficient form of transportation and the least costly per ton-kilometer. In the U.S. nearly 25 percent of domestic freight traffic moves by water using only a fraction of the nation's fuel supplies. Barge transport uses about one-half of one percent of the nation's petroleum and three-tenths of one percent of the nation's fuel supply. Studies of relative energy efficiency across different transport modes suggest that for total work performed, barge transportation is two and a half times more energy efficient than rail and almost 9 times more energy efficient than truck transport on a comparison of route miles of service.

The project will improve navigation conditions and increase the fleet available for the transportation of food crops. This improved river transportation capacity should lead to a shift from a less energy efficient mode of transportation, trucks, to a more energy efficient transportation mode, boats and barges. Thus the project favors an energy efficient form of technology which is significantly more cost-effective than alternative technologies.

The wooden boat design component will also encourage the use of a renewable source of energy which is locally available. The boats produced since they will substitute diesel engines for the currently used gasoline engines will also be more fuel efficient. The road component by focusing on bottlenecks in the road transportation system will result in more efficient transportation of agriculture products at a lower cost per ton/kilometer.

Part V: IMPLEMENTATION PLAN

A. Administrative Arrangements

The project mode will be a bilateral grant agreement between the Government of Zaire represented by the Department of Plan and the Government of the United States represented by USAID. Office des Routes will be the Host Country Contracting agency responsible for managing the road assistance component. Régie des Voies Fluviales will have major responsibility for the implementation of the project component designed to assist and improve river marking and maintenance practices. The Department of Plan will sign the grant agreement on behalf of the Government of Zaire and has responsibility for administering Counterpart Funds. Certain project elements will consist of grants, equipment and technical assistance to the private sector.

The entity responsible for the day-to-day implementation of the project will be the Project Management and Monitoring Unit (PMMU). This will be contracted to a U.S. firm. The Unit will be located in Kinshasa and will consist of at least the following:

- 1 Engineer/Chief of Party (42 PM)
- 1 Engineer responsible for the road component (42 PM - locally recruited)
- 1 Engineer responsible for the river component (36 PM - locally recruited)
- 1 Boat builder/designer (18 PM)
- 1 Bilingual Administrative Assistant (42 PM - locally recruited)
- 1 Bilingual Secretary (42 PM - locally recruited)
- 2 Clerks (42 PM - locally recruited)
- 2 Chauffeurs (42 PM - locally recruited)

The PMMU will be responsible for the awarding of sub-grants, the management of subcontracts, and the meticulous monitoring of the road and river transportation project elements. It is possible that the engineer responsible for the road component will be located in Kikwit, although he or she will remain under the jurisdiction of the Chief of Party. The PMMU will have responsibility for project performance monitoring. Data base studies and impact monitoring surveys for this project will be undertaken under its planned companion Area Food and Market Development Project (660-0102). USAID will manage the impact monitoring and project evaluation component of this project which will develop an institutional capacity within the Institut de Recherches Economiques et Sociales at the University of Kinshasa to undertake the required base line studies and impact surveys and to process and analyze them.

Procurement for this project will be overseen conjointly between the USAID project officer and the Project Management and Monitoring Unit (i.e. the implementing U.S. contractor). Coordination and liaison will be maintained with AID/W (SER/COM) as appropriate.

80

The responsibilities of the PMMU will include, but not be limited to the following:

1. the development of detailed implementation plans, schedules, budgets, and operational procedures;
2. the establishment of a project Trust Fund Account;
3. the preparation of counterpart-funded annual budgets and the administration of disbursements;
4. the preparation of commodity lists and specifications;
5. local and emergency procurement;
6. the customs clearance, receiving, and transportation of commodities;
7. the preparation of detailed job descriptions for short-term consultants and their support and monitoring;
8. the subcontracting of the appropriate project elements;
9. the development of an institutional capacity in Office des Routes to do Host Country Contracting, in particular assistance in the development of requests for proposals or Invitation for Bids, the review and evaluation of proposals and bids, and the administration of contracts.
10. the awarding of sub-grants on behalf of USAID within the regulations and policies of the U.S. Government;
11. the establishment of an acceptable accounting system for sub-grantees for audit and evaluations;
12. the development of designs and techniques required for project implementation;
13. the strict monitoring of subcontractors and Host Country contractors with respect to laboratory testing, quality control, engineering standards and practices, record keeping, and evaluation;
14. the selection of sites for bridges and slope stabilization jointly with the Chief of Party of the planned Area Food and Market Development Project (660-0102) and in consultation with Office des Routes and other relevant bodies, and with local government officials;
15. the identification of sites for building the prototype wooden vessels and the selection of individuals, artisans, or firms for participation and on-the-job training;
16. the selection of recipient organizations or individuals for evaluating the performance of the wooden boat prototypes, the determination of the conditions of sale and the receipt of proceeds;

17. ensuring that adequate on-the-job training is given to the personnel of the hydrographical service of Régie des Voies Fluviales;
18. the development of a project performance monitoring accounting system including forward planning, order chasing, and programming aspects to ensure the timely availability of inputs and their monitoring;
19. the careful monitoring and assessment of outputs;
20. the preparation of regular reports of project implementation progress and of achievement of targets;
21. the provision of housing, medical services, logistical services, office facilities, transportation, and general administrative support for long and short term contract personnel.

The responsibilities of the U.S. contractor will include the following:

1. the recruitment of project technical assistance, both long term and short term;
2. assistance to the PMMU to carry out its responsibilities;
3. the procurement and delivery of all equipment and supplies called for in the contract according to established US Government procurement regulations;
4. the management and support of all project personnel, their salaries, stipends, travel, etc.;
5. the maintenance and furnishing of records for audit and evaluation;
6. the preparation of reports for USAID and for the Department of Plan on project activities and expenditures;
7. the achievement of the project's objectives.

USAID/Zaire will have the following responsibilities under the project:

1. represent the USG in negotiations and discussions with other concerned parties on project matters;
2. negotiate the Project Grant Agreement with the Government of Zaire;
3. review and accept documentation relating to the satisfaction of Conditions Precedents;
4. establish procedures for the disbursement of dollar and counterpart funds and monitor expenditures;

88

5. monitor the procurement of commodities to be procured through a Procurement Services Agent (PSA);
6. disburse funds to the Government of Zaire and the U.S. Contractor;
7. organize the study tour to the United States for senior personnel of Régie des Voies Fluviales and Régie des Voies Maritimes;
8. review progress reports from the Government of Zaire and the contractor;
9. participate in the organization and implementation of periodic project evaluations;
10. establish a Trust Fund and manage all funds relating to the impact monitoring and project evaluation component.

The Department of Plan will have the following responsibilities;

1. negotiate and approve the Project Grant Agreement with USAID/Zaire;
2. provide USAID with the documentation to satisfy the Conditions Precedent of the project agreement;
3. disburse counterpart funds to the project;

Office des Routes will have the following responsibilities:

1. advertise, negotiate, and execute Host Country Contracts with local contracting firms to conduct the slope stabilization and bridge installation component;
2. establish detailed implementation plans, schedules, budgets, and operational procedures;
3. manage the subcontracting of the appropriate project elements;
4. allocate staff and resources as agreed;
5. participate in periodic evaluations.

Régie des Voies Fluviales will have the following responsibilities:

1. develop detailed implementation plans, schedules, budgets, operational procedures, and equipment specifications;
2. maintain project funded equipment and use it for agreed purposes;
3. provide personnel, counterparts, equipment, and resources as agreed;

85

4. identify personnel for on-the-job training and for the study tour;
5. participate in periodic evaluations.

B. Implementation Schedule

Project Commencement and Management

It is anticipated that the Project Grant Agreement will be signed by the Department of Plan and USAID/Zaire by July 1984. As soon as this occurs, a Request for Proposals will be issued and budget allocation procedures will be established. Recruitment will begin for a USAID/Zaire Assistant Project Officer to be approved as soon as possible. The USAID/Zaire Management Office will also contract administrative and logistical support services for the pre-implementation phase of this project and its planned companion Area Food and Market Development Project (660-0102).

It is expected that a U.S. Contracting Firm will be selected and a contract signed by February 1985. The Chief of Party is expected to arrive by April 1985 and the Project Management and Monitoring Unit (PMU) will be established the same month. The PMU will draw up a revised work plan for the following fiscal year each August. This revised work plan will be reviewed and approved by USAID within a month of its receipt.

The life of the project is ten years to coincide with that of the planned companion Area Food and Market Development Project. However it is expected that the wooden boat design elements and the establishment of the Survey Analysis and Data Processing Center will be completed within three years and the assistance to RVF, to Office des Routes and the construction of the metal vessels within four years. At this stage, an appraisal will be made of the effectiveness and benefits of the assistance of the needs for further assistance and of the possibility of adding further project components. Further funding may be sought for the project on the basis of this appraisal.

Assistance to Régie des Voies Fluviales

The timing of the hydrographical study will be determined by the need to commence these activities at the beginning of the dry season, that is, in May. However, a hydrographer will be brought in for one month in May 1985 to establish the detailed terms of reference for the survey and to finalize personnel and equipment needs. The process of ordering the required equipment and identifying suitable technical assistance or sub-contractors will begin in June 1985 in order to ensure the timely commencement of the study in May 1986. Negotiations will be held with RVF in May 1985 to determine the timing and grant conditions of other inputs and the timetable for the disbursement of funds.

Fifteen months of technical assistance will be required to work with the RVF boat yard to rehabilitate its U.S.-manufactured equipment. The services of an experienced mechanical engineer or boat yard workshop foreman totally familiar with all aspects of U.S.-manufactured general heavy machine and job shop equipment will be required to receive, inspect, and accept the

84

components, supervise their installation, establish a components file for all equipment, instruct RVF personnel in the proper use and care of the equipment, and to establish a correct work environment for each piece of equipment. This assistance will begin in May 1985. Régie des Voies Fluviales will establish an inventory of the existing U.S.-manufactured machinery, the specifications for the required components drawn up, and the procuring of the equipment initiated by September 1984.

The study tour for senior personnel of RVF and RVM will be scheduled for mid-1986 and will be negotiated by USAID, possibly in collaboration with the USIS International Visitors Program. The reconnaissance study of the Kasai river tributaries is scheduled to take place at the completion of the hydrographical survey. The project will be evaluated and an appraisal made of ways in which further assistance could be given to RVF at the completion of the project element in July 1987.

Wooden Boat and Barge Design

Twenty-six person months of technical assistance will be required to assess the present state of river boat construction, to evaluate navigation conditions in the project area, to design a range of wooden boats and barges, to oversee the construction of up to 12 prototypes at a number of locations and to evaluate their performance. The service of a naval architect/boat builder with in-depth experience in the design of wooden work boats will be required for 18 months beginning May 1985. The services of a second boat builder experienced in boat construction and navigation on Zaire's rivers will be required for the same period from May 1985. Both individuals must have extensive hands-on experience in all phases of boat construction and in diesel mechanics.

Two months will be required for the consultants to become familiar with navigation conditions, the techniques and materials available, present design features and building sites. Work on the production of the prototypes is due to begin in August 1985 and continue until November 1986.

The construction of the prototypes should be undertaken by existing boat builders, if possible under present arrangements which are normally that the client pays for the inputs before the beginning of construction and for labor after the completion of the vessel. This would be preferable to the specific recruitment of labor for construction since the construction is intended to be a period of on-the job training for present boat building firms to upgrade and expand their boat building skills. Suitable sites for construction would be determined by the contractor but could include the Free Beach (Kingabwa) at Kinshasa and the Forescom timber mill at Nioki.

The prototypes will be evaluated by giving them to either missions or other private voluntary organizations involved in the transportation of food crops or by selling them at a price higher than the cost of the traditional boat but lower than actual cost to traders/transporters who will agree to put them to regular commercial use between the project area and Kinshasa and to keep adequate performance records for the purposes of evaluation.

85

The project element will be evaluated at its completion, in December 1986.

Construction of Metal River Boats and Barges

The Swedish Baptist Mission (CBB) will submit a detailed cost estimate for the construction of 3 small metal boats in September 1984. This will be reviewed and approved by December 1984. The sub-grant will be made early in 1985.

DPP will be invited to submit detailed cost estimates for the construction of their boats in June 1985. It is anticipated that these will be received by September 1985. They will subsequently be reviewed and approved and the sub-grant made in December 1985.

It is anticipated that the construction of these metal boats and barges will be completed by late 1987. The PMMU will have the responsibility of monitoring the construction of all the metal boats and barges with respect to quality control, engineering standards and practices and record keeping.

Assistance to Office des Routes

Office des Routes is the Host Country Contracting Agency for both Agriculture Marketing Development Projects (660-0026 and 660-0028). Experience with these projects has shown that Office des Routes has the proven capacity to administer and promptly and effectively execute such an agreement. Office des Routes follows the U.S. Government's policies and procedures for contracting. The road component for this project complements the work undertaken under the earlier projects and the overall objective of all these projects, the improvement of the rural road network in central Bandundu, is an integral part of the Office des Routes public works program.

The PID/T to enable Office des Routes to be the Host Country Contracting Agency will be drawn up in February 1985. The PMMU after its establishment will have the responsibility of assisting Office des Routes in the development of the Invitation for Bids, in the review and evaluation of the bids and in the administration of the contract. In particular it will have responsibility for the meticulous technical monitoring of the road stabilization and bridge construction components.

Technical assistance for the study of gravel sources will be provided as requested by Office des Routes. It is anticipated that this will be in June 1985.

Procurement

The authorized source of procurement is the United States (Code 000). A portion of the project commodities may appropriately come from Code 899 (Free World) countries, however, the level of any such procurement is subject to the results of research to be undertaken during the project. There may also be a

8/1

certain amount of procurement of commodities that originate from Zaire itself. Appropriate waiver requests will be submitted as required.

Purchases will be made by either a procurement services agent (PSA) or the implementing contractor in accordance with AID regulations and good commercial practices. Proprietary procurement may be approved by AID on a case-by-case basis to ensure standardization with equipment already in place within Régie des Voies Fluviales and the rural religious missions that this project will be working with. Payments will be made to the procuring entity upon receipt of the commodities as designated by USAID. These payments will be periodically audited by AID. Reimbursement to the PSA or the implementing contractor for commodities purchased will be made by USAID or AID/W as appropriate.

Shipment of commodities to Zaire will be the responsibility of the party designated to procure a particular commodity or list of commodities - either the PSA or the implementing contractor. Shipment will either be to Matadi, Zaire if commodities are shipped by sea, or Kinshasa, Zaire, if commodities are shipped by air.

Once in country, logistics services, customs clearances, and in-country transportation to the project site for commodities will be handled by the particular parties involved. Commodities designated for RVF will be handled by their logistics department. Commodities designated for other project participants will be handled by them, with possible assistance from the US Embassy as authorized. The sub-grantee mission organizations (CBB, DPP) will be responsible for the clearances and transportation of the commodities imported for their respective components. AID's shipping regulations will be observed.

Materials shipped will be marked with the AID hand-clasp emblem as required by AID regulations. This marking will be the responsibility of the firm handling the procurement and shipment of commodities.

Project management (contractor) will be responsible for the receiving and monitoring of all project commodities and their utilization. The project officer will assist in the monitoring of commodity receipt and utilization.

Implementation Schedule

	<u>Date</u>
1. GOZ/USAID Project Grant Agreement	July 1984
2. PIO/T submitted to SER/CM	September 1984
3. Budget allocation procedures established	September 1984
4. Recruitment procedures commenced for an Assistant Project Officer	September 1984
5. Cost estimates for boat construction received from CBB	September 1984
6. Request for Proposals for U.S. Contracting firm prepared and published	November 1984
7. U.S. Contractor proposals reviewed	January 1985
8. CBB cost estimates reviewed and approved	January 1985
9. U.S. Contract signed	February 1985
10. Agreement between USAID and <u>Office des Routes</u> as Host Country Contracting Agency signed	February 1985
11. Sub-grant made to CBB by USAID	February 1985
12. FMMU established; Chief of Party arrives	April 1985
13. Local Staff recruitment for FMMU begins	April 1985
14. FMMU begins to monitor CBB boat construction and OR contracting and contractors	April 1985
15. Wooden boat designers/builders arrive; commence to explore design and site possibilities	May 1985
16. Hydrographer arrives (1 pm) to negotiate detailed terms of reference and finalize personnel and equipment needs for RVF hydrographical survey	May 1985
17. FMMU negotiations with RVF to finalize timing and conditions of inputs and the timetable for the disbursement of funds	May 1985
19. Geotechnician arrives to work with OR (2 pm)	June 1985
18. Mechanical Engineer/shop foreman arrives for the RVF boat yard	May 1985

20. DPP invited to submit detailed cost estimates for construction of metal boats and pushers June 1985
21. Construction of wooden boat prototypes begins August 1985
22. PMMU submits revised annual work plan August 1985, 1986, 1987, 1988
23. Revised PMMU annual work plan reviewed and approved by USAID September 1985, 1986, 1987, 1988
24. DPP cost estimates to be submitted to PMMU September 1985
25. OR road work begins October 1985
26. DPP cost estimates reviewed, approved and sub-grant allocated December 1985
27. RVF reconnaissance study of Kasai River tributaries (1 PM) May 1986
28. Initial Project Evaluation (2 PM) June 1986
29. RVF and RW U.S. study tour June 1986
30. Evaluation of wooden boat and barge design component and appraisal of future assistance possibilities (1 PM) December 1986
31. Evaluation of RVF project component and appraisal of further assistance requirements (2 PM) July 1987
32. Interim project evaluation and appraisal of future project assistance requirements (4 PM) January 1988
33. Final project evaluation June 1994

C. Performance Monitoring Plan

The Project Management and Monitoring Unit will be responsible for the collection, storage and processing of all information required for (1) monitoring the day to day operation of the project, and (2) project monitoring relating to operational performance, planning and control.

The information required for (1) relates to the types of project inputs and outputs. The inputs are technical assistance, commodities and supplies and training. Information about these inputs is required to allow the recording of requests for technical assistance, materials, equipment; the programming of inputs; the recording of supplies of inputs to the various types of organization responsible for project implementation; the monitoring of delays in the supply of inputs to project.

The information required to carry out these tasks, together with the kinds of reports that could be produced, are detailed below for each of the four types of input.

1. Technical assistance:

- requests and programmed periods of technical assistance by date of request/start of period/finish;
- type of assistance;
- skills, qualifications required for technical assistance;
- institution receiving technical assistance;
- details of individual provided (if applicable);
- status, whether active, awaiting recruitment, completed;
- dates of reports produced/required.

This kind of data will be used to provide regular reports on current assignments, outstanding requests or upcoming commitments to provide technical assistance, level of technical assistance by type of organization and part of project program concerned. Additionally it will contribute to an inventory of persons involved in project implementation which may be useful for identifying suitable people for other assignments.

2. Equipment and materials:

- details of equipment/materials;
- quantity, value, unit;
- organization requesting/receiving;
- date requested/programmed, ordered, received by project, received by end users;
- supplier;
- method of transport to site;
- carrier.

It is obvious that there is a close link between this kind of information, and conventional accounting procedures. However, in general, accounting systems do not adequately cope with the forward planning, order chasing and programming aspects of project monitoring of inputs. This kind of information will be used to produce reports of receipts of materials by users,

value of inputs provided by project activity, actions required, lag times from request to on-site delivery, and so on.

3. Training:

- training opportunities;
- details of trainees, qualification, name;
- position and, organization;
- course and nature of training;
- dates (start, finish);
- institution at which course held;
- reports and evaluations from trainees;
- post training position/organization.

This kind of information will be used to provide regular reports of number of trainees by type of training, vacancies, number of trained staff completing course by current position (whether still involved with project or not) and should contribute to the resource bank referred to above.

Outputs are the primary project outcomes and monitoring information is required to allow relationships between input and output to be established and monitored; allow an inventory of project infrastructure and other assistance to be created; allow progress towards output targets to be monitored.

It is envisaged that the main users of this information will be the staff supervising implementation and the information will be provided by agencies and institutions implementing project plans. The organizations involved in implementation are likely to vary in scale, complexity, procedural formality, and monitoring information relating to project outputs will depend upon the type of organization. In cases where these are large organizations, with established management systems (such as engineering consultants employed on major infrastructure projects) the format of regular reports of progress achievement of targets, receipt of materials, etc, will form part of the contractual obligation of the contractor or sub-grantee.

These latter will be required to provide regular, say quarterly, reports upon their activities, and the assistance that they receive should be contingent upon the provision of this information. In some cases technical assistance may be needed in order to meet these obligations.

Information relating to operational performance, planning and control ((2) above) would include: ensuring that information on past activities of organizations involved in implementation is received in a timely and accurate manner (such information would cover the use of inputs and supplies, technical assistance being supplied, training undertaken, measures of output, such as progress on major projects, length of road improved and so on); receiving reports of studies undertaken to assess project effect and impacts (such as results of transport surveys); relating project inputs to outputs, progress towards operational targets and detailed project planning.

D. Impact Monitoring and Evaluation Plan

The baseline and impact studies for this project will be undertaken by the planned companion Area Food and Market Development Project (660-0102). This project will develop an institutional capacity within the Institut de Recherches Economiques et Sociales (I.R.E.S.) to undertake household and other surveys in preparation for the joint studies to be undertaken under project 660-0102.

Technical services will be required for 2 weeks in January 1985 to produce a detailed specification for the computer hardware and software to meet the broad specifications set out in Annexe 10; to advise on training requirements for I.R.E.S. staff; advise on the recruitment of staff to operate the center and establish selection procedures for choosing suitable candidates for the various training activities of the center; advise on data transfers between this and other relevant systems on machine readable media; determine accomodation, structural alterations and services required. This person should be familiar with mini-computers, have had extensive experience with statistical survey analysis and be aware of problems associated with the purchase, installation, running and maintenance of computers in Africa.

The procurement of the equipment will be initiated through a Procurement Service Agent in February 1985. It is anticipated that the equipment will be installed and the Survey Analysis and Data Processing Center established in September, 1985. A System Manager will be appointed for 18 person months from September 1985. The System Manager will be responsible for the overall management of technical aspects of the hardware, software and operation of the Center. In addition, the system manager will advise on the training, recruitment and personnel management of staff, and will be responsible to the Director of I.R.E.S. He or she must have had extensive experience with the selected hardware as a systems programmer.

In particular, the System Manager will:

- undertake the installation of software acquired by the center, and provide any systems programs or job control language command files necessary for this;
- liaise with the supplier at the installation of the hardware and ensure that the system meets the specifications;
- identify additional software to meet the needs of the center;
- provide systems programming support for other activities of the center;
- provide advice on system configuration and use of system utilities;
- ensure that correct procedures for system operation are followed to maintain security of data, for the allocation of user resources and for the budgeting and accounting of computer use.
- provide on-the-job training to two trainee operators and counterpart staff.

98

- ensure that sufficient documentation is written for users of the Survey Analysis and Data Processing Center.

I.R.E.S. staff with teaching background and experience in the use of software packages for survey analysis (as users rather than programmers) will be contracted to train users of the Survey Analysis and Data Processing Center. Their responsibilities will be:

- prepare documentation and training material for short (1-2 weeks) courses in the use of the packages available;
- maintain a documentation library (French and English) and ensure that the documentation for running packages covering local conditions is available;
- organize and conduct short courses in the use of packages in survey analysis, statistical analysis and introductory courses in computer science and programming for I.R.E.S. staff, research associates and field staff.

These courses will begin shortly after the installation of the system and the appointment of the System Manager.

I.R.E.S. will be responsible for the overall management of the computer facility; for the provision of adequate housing for the equipment and supplies; for the organization of any structural alterations which may have to be undertaken (vibration-free flooring, underfloor cables, suitable power supply, air-conditioning and humidity control); the provision of adequate office space; the maintenance of the equipment; and, the provision of a counterpart to the System Manager, two computer operators who will also be responsible for programmer and user advice and data entry staff. Priority will be given in the allocation of machine and staff time to the work of this project or that of the planned Area Food and Market Development Project.

The initial evaluation of the project will take place in June 1985, early in the life of the project. This evaluation will appraise the initial start-up phase of the project and consider problems which may have arisen and means to overcome them. Two components, assistance to Régie des Voies Fluviales and the wooden boat design component, will be separately evaluated and an appraisal made of the effectiveness of assistance of that kind. An interim project evaluation will be made in January 1988 and an assessment made of future assistance possibilities under this project.

ANNEX 1

UNCLASSIFIED

) ACTION AID2 INFO AND COM ROOM CLERK

02010388
UNRELI
UNRELI 02017 0240102
UNRELI 020
02010388 JAN 84
UNRELI WASHDC
AMEMBASSY KINSHASA PRIORITY 0203

LOG: 201
24 JAN 84
CN: 13208
CHRG: AID
DIST: AID

CLASS STATE 020317

DAC

1. 12355: N/A

020317: ZAISE AGRICULTURAL MARKETING DEVELOPMENT
(0-0000) PID

UNRELI COPY, CRAFTED BY DAA/AFR, J. JOHNSON, MHT ON
MAY 23 AND APPROVED PID. CRAFTED ON UNRELI CONCERNS
GUIDANCE FOLLOWS. SEULTZ

UNCLASSIFIED

STATE 020317

BEST AVAILABLE DOCUMENT

FRJ7

DEO

ARD

01/27/84

41

Annex 2 : PID ISSUES

Several issues were raised in AID/W during the PID review. These issues are discussed below:

Issue #1 Will the project prove impossible to design and implement?

Although this project has proven to be a design challenge, it has not been an impossible task. Similarly, it will not be impossible to implement. The project design has addressed the various issues, taking into account the realities and difficulties of operating in Zaire. As project design progressed, certain project elements were focussed on more closely and others were rejected, possibly to be addressed at a later date when institutional or policy constraints might be less forbidding. This process eliminated the more problematic components from the design.

This design process led to the decision to have a technical assistance contractor with strong engineering skills manage the project. This technical assistance team will work closely with Régie des Voies Fluviales during the river navigation and boat yard rehabilitation phases of the project. For the road rehabilitation component, the technical assistance team will closely monitor the slope stabilization and bridge construction activities which will be carried out by a locally contracted firm, experienced with such operations in Zaire.

Issue #2 Most reviewers thought the project was underfunded.

The streamlining addressed in issue #1 above also reduced the estimated costs of the total project. Activities such as dredging were rejected both because of high expense and of limited relative impact.

Because the project is exploratory and innovative in many of its aspects, it was decided that, although the length of the project remains ten years, the principle project elements will be completed within five years. This will then allow an interim appraisal of the effectiveness of the various elements, and of the appropriateness of their continuance or expansion, and will allow the possible addition of other components which were not appropriate to be included at this time.

Issue #3 The PID did not adequately discuss institutional policy or management issues regarding ONATRA, RVF, or other GOZ agencies involved. Should we help ONATRA compete with private firms? Should look to increase private sector efficiency.

This project will not work directly with ONATRA. When ONATRA was consulted during project development, they requested USAID to give first priority to working with Régie des Voies Fluviales. ONATRA is dependent on the continuing maintenance and improvement of the waterways. Major managerial improvements have been made at RVF. New management, coupled with increased taxing authority, have brought costs in line with revenues. RVF is presently

being studied by a World Bank team of financial and organizational specialists. It is anticipated that the capacities of RVF will be even further upgraded as the recommendations of these studies are implemented.

The government agency that will oversee this project is the Department of Plan. The Department of Plan was selected as the most logical government agency as Régie des Voies Fluviales is under the jurisdiction of the Ministry of Transportation and Communications and Office des Routes falls under the jurisdiction of the Ministry of Public Works. By this administrative arrangement, USAID will have the convenience of dealing with one Ministry, but will also have the latitude to work with each individual organization participating in the project.

Issue #4 Insufficient discussion of other donor activities. Only mention is of a Belgian project with RVF.

The Belgian Cooperation is the only other bilateral donor currently assisting RVF. The World Bank is undertaking studies and, as a result of these studies, it may also assist RVF to implement part of its planned Five Year Investment Plan.

Issue #5 Getting involved with fuel distribution raises policy questions, as fuel is politically controlled.

USAID has decided to delay any assistance in fuel distribution until such time as such assistance may be shown to be effective.

Issue #6 How will the project be designed to minimize recurrent costs? AID/W should carefully review design plan because of complex nature. How can we be assured that system will be maintained?

The problems stemming from the recurrent cost issue have been minimized through the careful design of the project components. Essentially, the project seeks to assist RVF to conduct its activities more effectively, bringing in equipment that will make navigation and marking easier, and bringing in spare parts to bring the RVF boat yard into more efficient operation.

Office des Routes will contract the slope stabilization and bridge construction components to local construction firms. This is the most realistic approach suggested by an analysis of the capacities and present commitments of Office des Routes. Options for maintenance of water crossings and accesses will be explored during the course of the project, and the most suitable option vis-a-vis sustainability will be selected in each particular case.

Issue #7 Should we instruct the mission to drop some parts, like boat building, to reduce complexity?

USAID has dropped project components that it felt would be overly complex or unmanageable.

Issue #8 Why has the funding level been reduced from \$10.0 to \$8.0 million, in view of the diversity of activities and the scale of need? Will resources be spread too thin, given the number of interventions?

Funding was reduced for this project for programmatic reasons. Consideration will be given to further funding of additional elements at a later stage in the life of the project.

Issue #9 How will technical assistance needs be analyzed and a proper mix determined so that technical assistance will reach and be effective across the range of institutions participating?

Technical assistance requirements have been determined by a careful analysis of the technical and other requirements of the project and of the capacities of the recipient agencies, organizations, and firms.

Issue #10 Who will be responsible for assuring execution of all aspects of the project and for accomplishment of detail work (will there be a technical assistance contract to include all project services)? Given the wide range of activities/components, will adequate manpower levels be provided for necessary elements (logistics, accounting/administration, specialized technical skills, etc.)?

A technical assistance contract will be let to a US firm to implement the project activities. As most of the work is engineering in nature, it is anticipated that the technical assistance team will be heavily staffed with engineers. There will also be other staff on the team that will specifically handle logistics, accounting, administration, etc. Field support will also be facilitated by a field based General Services Officer position now being established by USAID in the project area (Kikwit).

Issue #11 PID says there will be a full-time mission project manager. Is this included in staffing pattern, and how will impact upon mission management load?

There will be a part-time project officer (DH) and a full time assistant project officer funded by the project for the purpose of daily operations in project management. This will satisfy USAID management requirements without overburdening USAID staff capacities.

Issue #12 Privatization of some public services - Why isn't consideration

being given to partial privatization of some public services now being handled by ONATRA, RVF, and Office des Routes? How might this be included into the project and what impact would this have upon design of the project?

Transportation routes, by their nature, tend to devolve upon the public sector, whether national or local. On the other hand, there are opportunities for privatization of the use of those routes. ONATRA is the primary transporter of agricultural commodities on Zaire's rivers. By working with small boats and barges, USAID hopes to shift a major proportion of agricultural produce being shipped by the river from the public sector to the private sector.

For those activities under the charge of RVF, there is no ready opportunity for the private sector to engage itself. River navigation and marking is a public function, and private operators presently would not likely be interested in making the effort to navigate and mark the rivers (although there might be opportunities, for contracting such services). There are cases where larger private companies (for instance, Compagnie Commerciale du Bandundu (CCB)) mark and dredge the smaller rivers for their own private boats and barges. However, this is the exception rather than the rule at present.

ANNEX 3: LOGICAL FRAMEWORK MATRIX

A. Program Goal:

To raise the standard of living of the rural population of central Bandundu.

Measures of Goal Achievement:

1. Increased farm incomes through an increase in farmgate prices
2. Improved food availability to households

Means of Verification:

1. Baseline studies; impact studies
2. EOP evaluation

Important Assumptions:

1. Sufficient competition exists to distribute benefits, margins etc. to producers while covering marketing costs.
2. Increased production insufficient to affect market prices for food crops.
3. There will be a balanced development of the region.

B. Sub-Sector Goals:

1. to increase total food crop production
2. to improve marketing conditions

Measures of sub-sector achievement:

1. Yield per hectare increases for selected crops.
2. Demand increases for transportation;
3. Farmers' crop mixes reflect market prices.

Means of Verification:

Benefit cost analysis, with and without project, data to be gathered from baseline and impact studies.

Important Assumptions:

1. Government of Zaire continues its policy of liberalization of farm prices.
2. Project 660-0102 is implemented as planned.
3. There will be large volumes of produce to be marketed.

C. Project Purpose:

To reduce the economic distance between producers in Central Bandundu and commercial markets.

End of Project Status:

Cost of transportation falls as a consequence of: improved navigability of the rivers; greater frequency and regularity of services; reduced user costs on rural roads; increased transportation alternatives for traders; and a somewhat increased river fleet.

Means of Verification:

Mid-project and end-of-project evaluation based on baseline studies of costs of transportation, losses, down time, etc, rates of return on boats and barges, revenues, to RVF, etc.

Important Assumptions:

1. Project 660-0102 will be implemented on time with some output effects by its fifth year and increasing thereafter.
2. Unit costs of operating vehicles will fall.
3. There will be a net increase in the effective supply of transport and in the non-agricultural use of the network.
4. IBRD and other donors will work with RVF to upgrade their operations.
5. Local road maintenance arrangements will be effective.

D. Project Outputs

1. Improvement of navigation conditions in the Kasai River Basin.
2. Improved efficiency of RVF boat yard.
3. Development of small to medium wooden boat and barge prototypes suitable for local construction.
4. Construction of a small number of metal boats and barges for transporting produce.
5. Construction/improvement of the network of feeder roads to ports and to markets.
6. Determination of the local availability of surfacing materials for rural roads.
7. Establishment of a capacity in I.R.E.S. to carry out, analyze and process baseline and impact studies.

Magnitude of Outputs:

The following is indicative of the magnitude of the outputs:

- Improved river marking and maintenance practices in the project area
- Updated navigation charts for the Lediba Pool, Kasai River
- Sixteen fixed markers on the Kasai River
- Over thirty pieces of equipment in the RVF boatyard returned to performance capacity
- Ten RVF boatyard personnel trained in the proper use and maintenance of this equipment
- Eight senior staff of RVF and RVM acquainted with river marking practices and equipment in the United States
- Three new wooden boat and barge designs
- Twelve prototype boats and barges constructed
- Twenty artisanal builders trained in new boat building skills
- Two people trained in the construction and welding of metal boats
- Fifty kilometers of slopes stabilized
- One large and 20 small water crossings constructed or improved
- Availability of surfacing materials determined
- Improved transportation data collection systems established
- Six people trained in data collection and analysis
- The creation of the institutional capacity of I.R.E.S to undertake and analyze household and other surveys
- The establishment of a Survey Analysis and Data Computer Processing Center at I.R.E.S.
- Two I.R.E.S. staff trained in the operation of the mini-computer
- Six short training courses for users of the I.R.E.S computer center in the use of computer software for survey analysis and statistical analysis and an introduction to computer programming
- Twenty users trained in use of computer software for survey and data analysis

Means of Verification

1. Project performance monitoring
2. Project impact monitoring and evaluation

Important Assumptions

1. Government of Zaire will provide all the agreed inputs.
2. Private sector boat builders will wish to learn new boat and barge designs.
3. Office des Routes will act efficiently as a Host Country Contracting Agency.
4. Local construction and metal boat building firms have the required skills and capacities.

E. Project Inputs

	<u>First Year</u>	<u>All Years</u>
	<u>\$</u>	<u>\$</u>
USG: Grant	1,630	8,000
Host	<u>1,379</u>	<u>5,000</u>
Total	<u>3,009</u>	<u>13,000</u>

Input Categories

	<u>Total</u>
Technical Assistance/Personnel	3,121
Travel	331
Research/Study tour	553
Commodities	1,991
Construction	4,817
Other	1,111
Contingency and Inflation	<u>1,068</u>
	<u>13,000</u>

Means of Verification

Project performance monitoring.

Important Assumptions

Government of Zaire will commit \$5,000,000 to the project.

102

ANNEX 4: PROJECT ELEMENT APPRAISAL MATRIX

Preliminary analysis suggests a number of possible interventions, some of which are impracticable (such as improved access to fuel) under prevailing political realities, others too costly (for example, dredging and similar river engineering) or perhaps requiring more behavioral change than AID can realistically undertake. Six possible ideas, any of which conceivably could be a sub-project, were tested in an appraisal matrix against seven criteria: number of serious assumptions, additional information required to proceed, post-project recurrent costs, spread and incidence of benefits, project complexity, difficulty in implementation, and ease of staffing (see Table A). Each criterion was rated on a five point scale in ascending order of difficulty. When all seven criteria were summed, the figures were compared and ranked so that the lower the final number the easier or more appealing the idea. The six proposed initiatives follow, in ascending order of difficulty:

1. Boat design. It is proposed that AID recruit a wooden boat designer to work with the artisanal boat builders in Kinshasa and in the region to improve the design of wooden boats and barges. Prototype models of new designs will be constructed at USAID's expense for testing and demonstration. Before the design process begins, a survey should be made of needs to establish particular criteria to be followed in the design. For example, should the vessels be flat bottom, or shallow chine and keel? The whole activity would be easy to manage and technical assistance is available through UNDP as well as US domestic boat builders. No post-project concerns exist.

2. Boat and barge construction. Given that the barges presently operating are larger than the market can efficiently use and that there is a need for reliable and regular transport for food crops, it has been proposed that USAID commission the construction of a number of smaller barges, either self-propelled or with pushers. There is also a need for design modifications to barges to allow for adequate ventilation and thus to lessen spoilage of moisture-susceptible cargoes such as manioc. Given the large potential savings possible from a more efficient river transport system this initiative seems very appealing.

3. Removal of road bottlenecks. A major factor explaining economic distances between producers and markets is the cost of road transport, in particular cost of fuel and damage to vehicles from poor roads. An important share of the problem can be assigned to broken bridges and steep and slippery slopes near bridge approaches and other points along the roads. These can make the difference between an economic link and an uneconomic link. A preliminary analysis supports this on grounds of savings to vehicles at present levels of road use as well as favorable effects on output and income in the area of influence of the roads. Thus, a limited works project designed to upgrade them is indicated.

4. River navigation. Neither the Kasai nor Kwilu river is now navigable 24 hours per day. As a consequence barge traffic can only move half as fast as potential. In addition, the danger of grounding has increased enormously as the existing buoyage system has become dated or nonexistent. Taken together, these hazards navigation probably add up to 10 days per voyage from the upper-most reaches of navigable waters in the area, and in many

particular instances considerably longer. A hydrographic study will be undertaken of the Kasai and Kwa rivers between Mushie and Lediba, and assistance given to rehabilitate equipment in the RVF boat yard. A further study will be undertaken in preparation for phase two to determine (a) what must be done to update aids to navigation and (b) how can improvements be sustained post-project? These inquiries would direct subsequent AID initiatives. It is unlikely the agency would choose to undertake dredging or other major engineering works, but proper channel marking alone would be a feasible project and minimize grounding. The activity would be relatively costly, the spread effects with respect to primary beneficiaries would be slow and concentrated among shippers and merchants, and the post-project assumptions would have to be very optimistic.

5. Upgrade feeder roads to ports. This activity depends upon the assumption that project 0102 will, in time, stimulate sufficient extra marketing that present means will only be able to cope with difficulty, and that river traffic, perhaps as a result of project proposals one and two above, is a more competitive alternative than at present. If either or both are the case then evacuation routes will be needed from project areas to existing roads and ports. The project would not build roads where none have been, but would rather upgrade the present network, which in many instances has been allowed to deteriorate to a point where it is not commercially usable. This is especially the case in areas near the Kasai river and its ports. Virtually all persons in the affected zones would be primary beneficiaries and these benefits would begin to flow as soon as the routes were open. Actual planning of the routes must await the implementation of 0102. The Kwilu river, in particular, passes through areas which produce marketable surpluses, now mainly sent to market by truck. Were river transport to become more efficient, even for local short hauls, shipping costs could be significantly reduced. The spread effects would assert themselves fairly quickly and be widespread. There would be no serious management problems.

6. Upgrading river ports. The large majority of farmers who will benefit from 0102 will be concentrated along rivers, including the Kwilu. Although these areas already have, or will have, road links to market centers, in many particular instances a river alternative could be very cost effective, especially if the barge fleets grow and are suitable to smaller loads. Mooring, wharfage, storage and bunkering facilities are operable in varying degrees at best. The ten ports are frequently overburdened when surpluses are moved. They would be completely unable to cope were marketing to increase significantly. A survey of port capacity should be made, especially in zones where roads have been (or will be) improved. Where constraints are noted, a remedial construction program should be prepared and carried out.

The preceding analysis has also shown that local management is often amateur and typically lacking in skills. In particular, basic business concepts are lacking: inventory control, financial analysis, bookkeeping, to name the more obvious. As a consequence operators are often ignorant of their true position and can only grope towards a decision made on any other than rule-of-thumb criteria. Considerable phase one investment would have to be made to identify the market for training, identify what sorts of skills were really needed and then how to prepare useful and relevant curriculae to

satisfy these wants. Actual implementation would be relatively easy once this investment had been made. How the product would be delivered would have to be determined as part of the feasibility analysis: Would present teaching facilities do the job or would something ad hoc have to be established? Would it have to be permanent and if so how could it be done? Beneficiaries would be limited to the users of the skills, but in the long run secondary beneficiaries would include all who enjoyed lower costs or prices.

TABLE A: PROJECT APPRAISAL MATRIX

	# of Serious Assump- tions	Add'l Info Req'd to Pro- ceed	Post- Project Recurrent Costs	Spread Incidence of Benefits	Project Complex- ity	Diffi- culty in Implemen- tation	Staffing Ease	Total
Boat design								
Boat and barge construction								
Removal of road bottlenecks								
River navigation								
Upgrade feeder roads to ports								
Upgrading river ports								

106

ANNEX 5 : STATUTORY CHECKLIST

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

- | | |
|---|--|
| 1. FAA Sec. 481: | No |
| 2. FAA sec. 620(c): | No |
| 3. FAA Sec. 620(e) (1): | No |
| 4. PAA Sec. 532(c), 620(a),
620(f), 620D; FY 1982
Appropriation Act Secs.
512 and 513: | No |
| 5. ISDCA of 1981 Secs. 724,
727 and 730. | N/A |
| 6. FAA Sec. 620(j): | No |
| 7. FAA Sec. 620 (1): | N/A |
| 8. FAA Sec. 620(o):
Fishermen's Protective
Act of 1967, as amended, Sec. 5: | No |
| 9. FAA Sec. 620(g): FY 1982
Appropriation Act Sec. 517: | N/A |
| 10. FAA Sec. 620(s): | Covered in the administrator's
"Taking into consideration" memo |
| 11. FAA Sec. 620(t): | No |
| 12. FAA Sec. 620(u): | Taken into Account |
| 13. FAA Sec. 620A; FY 1982
Appropriation Act Sec. 520: | No |
| 14. FAA Sec. 666: | No |
| 15. FAA Sec. 669, 670: | No |
| 16. ISDCA of 1981 Sec. 720: | Covered in administrator's "Taking
into Consideration" memo |
| 17. ISDCA of 1981 Sec. 721: | N/A |

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

- 1. Development Assistance Country Criteria
 - a. FAA sec. 116: No
- 2. Economic Support Fund Country Criteria
 - a. FAA Sec. 502B: N/A
 - b. ISDCA of 1981, Sec. 725(b): N/A
 - c. ISDCA of 1981, Sec 726(b): N/A

C. GENERAL CRITERIA FOR PROJECT

- 1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653(b) The Congressional Notification describing the project cleared Congress on June 29, 1984.
- 2. FAA Sec. 611(a) (1). Yes
- 3. FAA Sec. No further Legislative action required.
- 4. FAA Sec. 611(b); FY 1982 Appropriation Act Sec. 501 N/A
- 5. FAA Sec. 611(e). Yes
- 6. FAA Sec. 209 No
- 7. FAA sec. 601(a) This project is designed to foster private initiative and competition and discourage monopolistic (or monopsonistic) practices.
- 8. FAA Sec. 601(b) US firms will have opportunity to bid for technical assistance contract and proprietary procurement for U.S. commodities will be made.
- 9. FAA Sec. 612(b), 636(b); Set forth in Grant Agreement
- 10. FAA Sec. 612(d) No
- 11. FAA Sec. 601(e) Yes
- 12. FY 1982 Appropriation Act Sec. 521. N/A

13. FAA 118(c) and (d)

Yes

14. FAA 121(d).

N/A

D. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

This project is designed to reduce key infrastructural bottlenecks to increase agricultural marketing in productive areas in the project area. Beneficiaries will be small cultivators (mostly women) and traders, as well as other villagers as a result of more commodities flowing into the area.

b. FAA Secs. 193, 103A, 104, 105, 106

Yes

c. FAA Sec. 107.

Yes

d. FAA Sec. 110(a)

Yes

e. FAA Sec. 110(b)

Yes - Country relatively least developed.

f. FAA Sec. 122(b)

Yes

g. FAA Sec. 281(b)

Project aims to ameliorate key constraints to economic development in the project area.

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b)

N/A

b. FAA Sec. 620(d)

N/A

c. ISDCA of 1981, Sec. 7624 (c) and (d)

N/A

3. Economic Support Fund Project Criteria

a. FAA Sec. 531(a)

N/A

b. FAA Sec. 531(c)

N/A

c. FAA Sec. 534

N/A

d. FAA Sec. 609 N/A

E. Procurement

1. FAA Sec. 602 Yes

2. FAA Sec. 604(a) Yes

3. FAA Sec. 604(d) N/A

4. FAA Sec. 604(e); ISUCA or
1980 Sec. 705(a) N/A

5. FAA Sec. 604(d)

6. FAA Sec. 603 Will be complied with

7. FAA Sec. 621 Yes

8. International Air
Transport. Fair Competitive
Practices Act, 1974 Yes

9. FY 1982 Appropriation Act
Sec. 504 Yes

F. Construction

1. FAA Sec. 601(d) Yes, to the extent reasonable

2. FAA Sec. 611(c) Yes

3. FAA Sec. 620(k) N/A

G. Other Restrictions

1. FAA Sec. 122(b) N/A

2. FAA Sec. 301(d) N/A

3. FAA Sec. 620(h) Yes

4a. FAA Sec. 104(f); FY
1982 Appropriation Act
Sec. 525 Yes

b. FAA Sec. 620(c) Yes

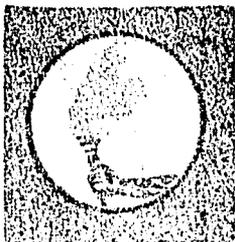
c. FAA Sec. 660 Yes

- d. FAA Sec. 662 Yes
- e. FAA Sec. 636(i) Waivers will be required for all purchases of motor vehicles outside the U.S.
- f. FY 1982 Appropriation Act, Sec. 503 Yes
- g. FY 1982 Appropriation Act, Sec. 505 Yes
- h. FY 1982 Appropriation Act, Sec. 506 Yes
- i. FY 1982 Appropriation Act, Sec. 510 Yes
- j. FY 1982 Appropriation Act, Sec. 511 Yes
- k. FY 1982 Appropriation Act, Sec. 515 Yes

ANNEX 6

Host Country Requests for Assistance

Ministère des Travaux Publics et de l'Aménagement du Territoire



Departement des Travaux Publics et de l'Aménagement du Territoire

OFFICE DES ROUTES

DIRECTION REGIONALE
B. P. 450 Bandundu

N° OR/DRE/INT/ 210 /84.--

NOTES DE LA REUNION ELTSIENH
Ambassade des Etat Unis
à
K I N S H A S A .-

Reference :

Annexe :

Objet : Projet 098

Madame ,

Suite à l'entrevue du dimanche 13/05/84 à laquelle participaient :

- Pour l'AID : Mme REID Elisabeth
Mr PERRET STEL
- Pour l'U.R. : Mr Le GUELL Michel, Directeur technique Régional/Bandundu.

Les possibilités suivantes ont été évoquées :

1°/ Financement par l'AID d'un programme de photogramétrie Aérienne pour la recherche de sites gravéliers sur l'ensemble du Bandundu.

2°/ Financement par l'AID d'un lot de buses ARICO pour la réalisation de passages sous routes dans le cadre du projet 098., ainsi que des deniers buses pour cariveaux.

3°/ Financement de 2 Ateliers de stabilisation de pentes comprenant chacun :

- 1 FULVO HELLER
- 1 BULDOZER D6 C Cater
- 1 CONTACTEUR SPA 54 INGERSOL
- 1 CHARGEUR 950 BATER
- 4 CHARIOTS 8 m3
- 1 TRACTEUR 14 G CATER
- 1 CHARIOT A BRU
- 1 CHARIOT A C.C.
- 1 CHARIOT
- 1 TRACTEUR A BRU
- 2 TRACTEURS 10 Personnes.

... / ...

BEST AVAILABLE DOCUMENT

Le coût en matériel de pièces détachées et buses de cette opération à la charge de l'ONRID serait le suivant :

- Matériel (voir tableau n° 1/a)
- Pièces détachées (tableau n°1/a)
- Tentes camping (" ")
- \$/Total en Z. et \$ (" ")
- Buses : a) pour passages sous-routes (Tabl.1/b)
- Four caniveaux (voir tableau 1/b)
- Total en Zaires et \$ (tab. 1/b)

Le coût à la charge de l'Office des Routes pour ses 990 km de routes et à la charge de la Territoriale pour les 640 km R.I.L. serait de :

- Matériaux (voir tableau n° 2)
- Personnel (voir tableau n° 3)
- Carburant (voir tableau n° 4)
- Total en Z. et en \$ (tabl.n° 5)

Ce projet 098 est à articuler sur les routes suivantes :

- a) Routes O.R. : 876 kms
- b) Routes Agricoles : 740 kms

Les pontes à stabiliser représentent à peu près 10 % de ces linéaires c'est à dire : OR. 88 km, RTL 75 km = 163 kms.

La prévision du remblaiement d'un atelier a été estimée à 50 mètres de route terminée avec caniveaux par jour soit, compte tenu de 200 jours de travail possible par an, une longueur annuelle de 10 kms de pontes stabilisées soit environs 5 points chauds.

Pour couvrir tous les besoins de la Région dans le cadre de ce projet, il faut :

$$\frac{163}{10} = 16 \text{ ans.}$$

Donc, il faut 2 ateliers pour réaliser ces travaux en 8 ans, ce qui représente à peu près la durée d'amortissement du matériel.

Pendant cette période, il aura donc été possible de supprimer 80 points chauds.

BEST AVAILABLE DOCUMENT

OFFICE DES ROUTES
INSTITUT TECHNIQUE / SUD
K. W. I. T.

LE DIRECTEUR TECHNIQUE DE L'INSTITUT
Michel Lo... 114

République du Zaïre
REGIE DES VOIES FLUVIALES
Etablissement Public



B. P. 11.697 KINSHASA I
Tél. 24.471 - 24.719
Direction Générale

Direction Générale

Kinshasa, le 11/7/1984

N/Réf.: N° 0565 / 1/DIV/PDG/Sec.MM.

A L'U.S.A.I.D.

KINSHASA.

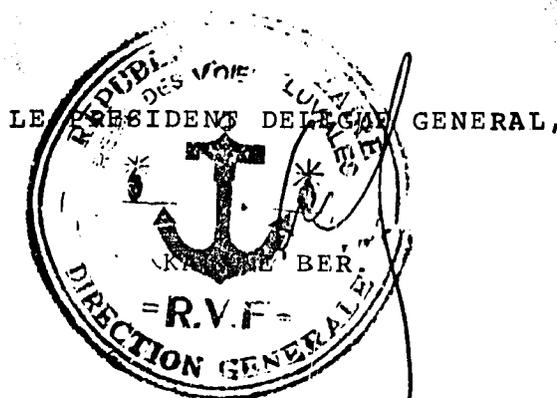
A L'ATTENTION DE MADAME ELISABETH.

Concerne : Transmission Note sur Investissements R.V.F. en
Relance Agricole dans la Sous-Région KWANGO-KWILU
KASAI-FIMI-LUKENI.

Nous avons l'honneur de vous transmettre en annexe à la présente la note sur les investissements R.V.F. en relation avec la relance agricole dans la Sous-Région de KWANGO-KWILU, KASAI-FIMI-LUKENI et nous vous en souhaitons bonne réception.

Veillez agréer, Madame, l'expression de notre considération.

Annexe : 1



NOTE A L'INTENTION DE L'U.S.A.I.D. à Kinshasa.

Objet : Investissements R.V.F. en relation avec relance agricole
dans la sous-région KWANGO-KWILU, KASAI-FIMI-LUKENI.

La R.V.F. est chargé de l'entretien du réseau navigable de façon à permettre une navigation en sécurité sur ce réseau.

Par manque de moyens matériels, la R.V.F. se borne aujourd'hui à assurer un balisage permanent sur le KASAI et un balisage intermittent sur le KWILU et la FIMI.

Les autres rivières, bien qu'inscrites au programme de la R.V.F. ne font plus l'objet d'aucun travail depuis plus de 20 ans. En outre, les plus petites rivières non reprises dans la classification officielle des rivières navigables (LUBUE, KAUTSCHA LOANGE...) n'ont plus fait l'objet d'aucune inspection depuis parfois plus de 50 ans. Les programmes de relance et d'expansion agricole obligent à s'intéresser à nouveau à ces diverses rivières d'une part et à augmenter la sécurité sur les grands axes d'autre part.

A cet effet, de nouvelles études d'orientation et de réalisation devraient être effectuées et un programme plus régulier et plus permanent d'inspection de ces diverses rivières doit être établi et respecté.

Les moyens matériels et les études et travaux dont il est question ci-après ne peuvent pas être séparés totalement des programmes généraux d'investissements et de rénovation de l'ensemble du réseau navigable ; ils sont toutefois plus spécialement consacrés à la sous-région en cause, compte tenu de leur situation géographique ou de leur nature particulièrement adaptée aux besoins de la navigation en la région.

BEST AVAILABLE DOCUMENT

I. Fourniture d'une vedette d'inspection et d'intervention. Estimation : 5.000.000 z.

La remise à jour des albums de navigation et la remise en état du réseau limnimétrique sur les rivières de la région font partie de la mission permanente de la R.V.F. ; cette mission peut-être remplie correctement faute d'embarcations adéquates. Le matériel existant est soit trop encombrant (impossibilité de naviguer dans les petites rivières) soit trop exigu (absence totale des commodités les plus élémentaires).

II. Etude hydrographique des passes divagantes du bas-Kasai (région de LEDIBA) - estimation pour la partie non assurée par R.V.F. : 15.000.000 z.

Le pool de LEDIBA constitue le tronçon le plus délicat pour la navigation dans la région considérée ; il est situé sur le bas-Kasai qui draine l'ensemble du trafic fluvial de la région ; plusieurs accidents y ont eu lieu au cours des dernières années ; une étude d'ensemble de ce pool est nécessaire afin d'assurer aux travaux de balisage entrepris par la R.V.F. le support technique et scientifique qui leur manque actuellement.

III. Fourniture d'appareils radiophoniques pour la R.V.F. ; -Estimation pour 10 appareils : 2.000.000 z.

Les communications rapides et permanentes entre les diverses unités de la R.V.F. en opération dans la région sont essentielles pour envoyer informations et instructions régulièrement et pouvoir aussi avertir les divers armateurs des modifications de tracés et de profondeurs des routes navigables.

Le matériel en service, très souvent en panne par suite de vétusté, doit être remplacé au plus tôt afin de restaurer les communications et une meilleure sécurité pour la navigation.

BEST AVAILABLE DOCUMENT

- IV. FOURNITURE D'APPAREILS ECHO-SONDEURS POUR LE SERVICE HYDROGRAPHIQUE : Estimation pour 6 appareils : 1.000.000 z.

Le service hydrographique a reçu récemment de la coopération belge un lot important d'appareils topographiques et hydrométriques lui permettant d'entreprendre les nouvelles études ; par contre, les appareils écho-sondeurs, indispensables pour la cartographie et les reconnaissances fluviales, font défaut, ce qui empêche l'utilisation rationnelle des autres équipements et réduit à néant les espoirs de meilleure efficacité dudit service.

- V. FOURNITURE D'UN BATEAU-BALISEUR, TYPE AFFLUENT : Estimation 50.000.000 z.

Depuis une quinzaine d'années, la R.V.F. a acquis 3 bateaux-baliseurs sur financement BIRD ; l'étude entreprise à l'époque avait conclu à la nécessité de 4 nouvelles unités ; les conditions qui prévalaient à l'époque sont toujours actuelles ; l'absence de cette dernière unité se fait sentir surtout sur les affluents, la R.V.F. ayant assuré tout d'abord la sécurité sur les grands axes et ne disposant pas des unités suffisantes pour les plus petites rivières.

- VI. RECONSTRUCTION DE BALISES DANS LES PASSES ROCHEUSES DU KASAI : Estimation pour 16 balises : 8.000.000 z.

Un programme de reconstruction de balises a été commencé depuis plusieurs années et il se poursuit actuellement sur financement du Conseil Exécutif ; l'accélération de ce programme permettait d'arriver plus rapidement à l'objectif final qui est de restaurer la sécurité dans la traversée de ces passes ; une intervention financière en ce domaine serait dès plus utiles et pourrait être suivie très rapidement d'une réalisation effective, vu que le programme général est déjà en cours.

Les estimations des divers projets présentés ci-avant sont basées sur l'expérience acquise par la R.V.F. pour ces types de marchés ; elles ne peuvent être considérées comme définitives, une révision générale des programmes d'investissements étant actuellement en cours à la demande du Conseil Exécutif et de la Banque Mondiale, pour la période quinquennale 86/90.

Les projets retenus dans la présente note présentent la particularité qu'ils seront certainement retenus dans ces programmes généraux, leur caractère indispensable ne souffrant aucune exception : toutes les discussions à leur sujet n'auront pour autre but que d'en préciser éventuellement certains aspects particuliers ou leur ordre de priorité dans l'ensemble du calendrier.

Nous pensons toutefois à ce sujet que les projets retenus resteront dans le premier lot parmi les investissements prioritaires pour la R.V.F. et leur prise en considération dans le cadre de la présente note serait donc de nature à faciliter beaucoup la gestion de la R.V.F. et la sécurité de ses opérations dans la région considérée.

ANNEXE 7

FOREIGN ASSISTANCE ACT

Special Considerations

SECTION 611 (a)

Technical advice for this project plan has been provided by REDSO/WCA engineering staff in consultation with host country engineers in the Office des Routes (for road and bridge planning), in the Régie des Voies Fluviales (for riverine charting and ship operations), and in the private sector (for boat construction). This technical assistance has explored a range of options. Actual project implementation will depend on the outcome of on-site testing (for construction of access roads to bridges and rivers) and the actual design (of specific wooden and metal boats) to be performed by engineers contracted through the project. The engineering, financial, and other planning has been sufficient to provide reasonably firm estimates of the dollar costs of these activities.

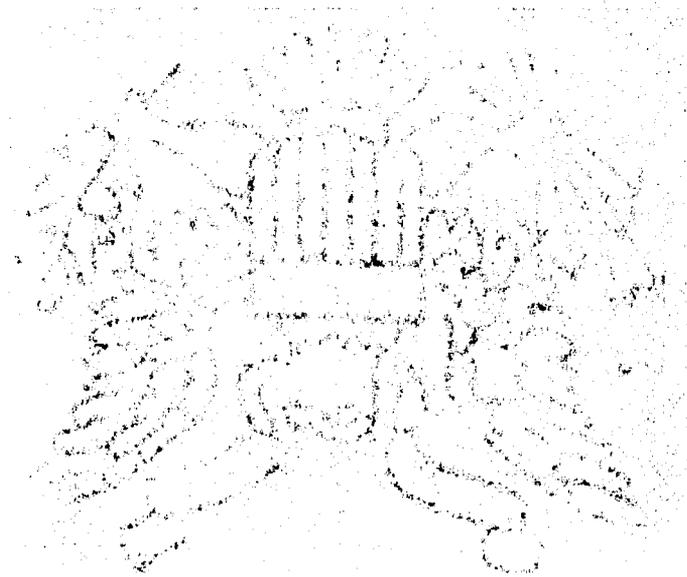
SECTION 611 (e)

The rural roads, bridges, and boats to be constructed with project financing will all be readily utilized. Design for all these has concentrated on increasing their useful life and minimizing maintenance requirements. Financing the costs of the maintenance of public facilities currently is a challenge for Zaire as for other developing countries in Africa. USAID and the GOZ continue to explore options through project experience. Reliance upon private sector maintenance support has proven preferable in some cases. Options for supporting long-term maintenance requirements in a manner superior to that commonly obtaining at present will be specifically examined and pursued in the course of this project.

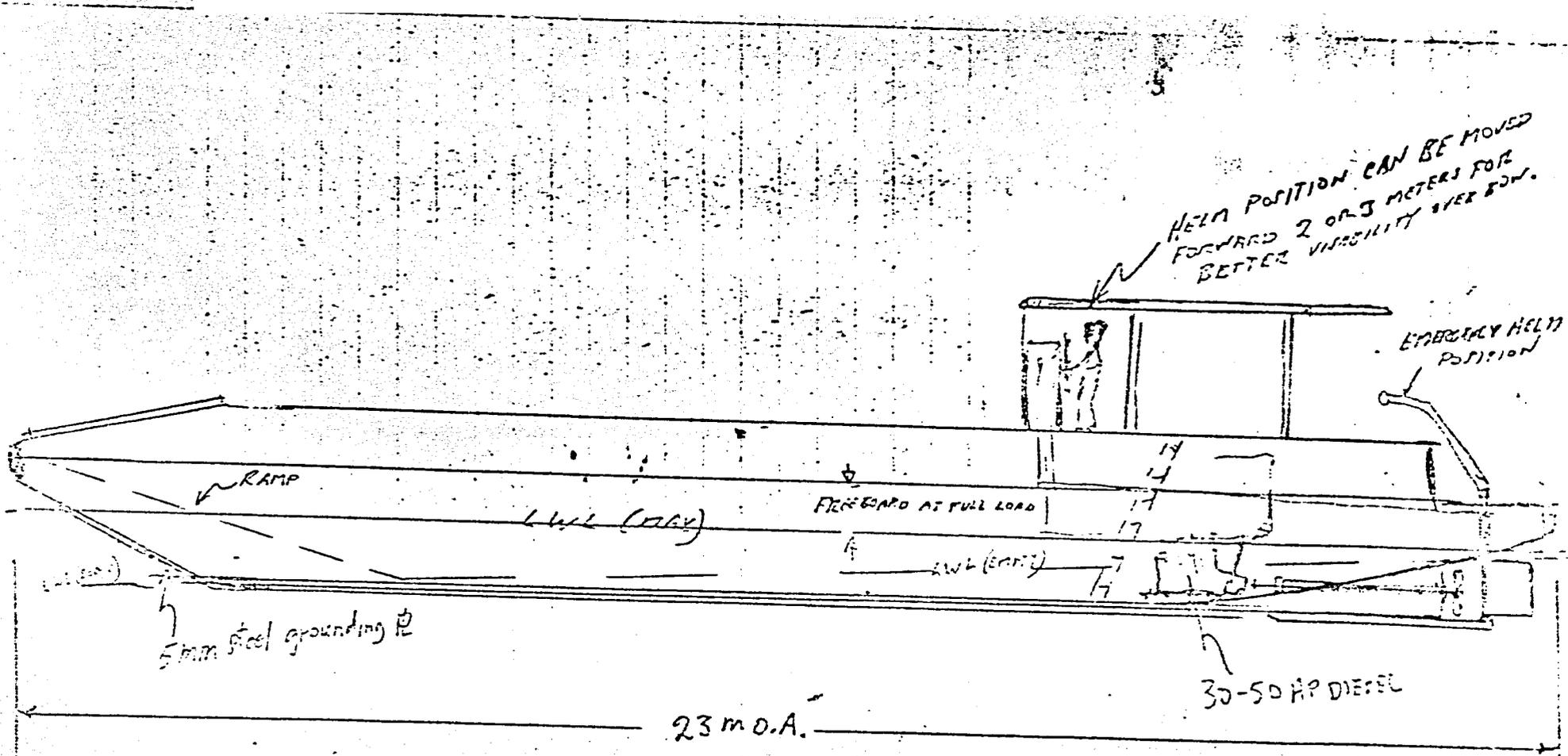

Arthur S. Lezin
Acting Director
USAID/Zaire

July 30, 1984
Date

ANNEX 8: BOAT DESIGN SPECIFICATIONS



The attached suggested design specifications for the prototype
barge-type wooden boats were drawn up by
Hugh Papworth, Engineering Advisor, USAID REDSO/WCA, Abidjan.



HELM POSITION CAN BE MOVED FORWARD 2 OR 3 METERS FOR BETTER VISIBILITY OVER BOW.

EMERGENCY HELM POSITION

RAMP

LWL (MAX)

FREEBOARD AT FULL LOAD

LWL (CRUISE)

5mm steel plating

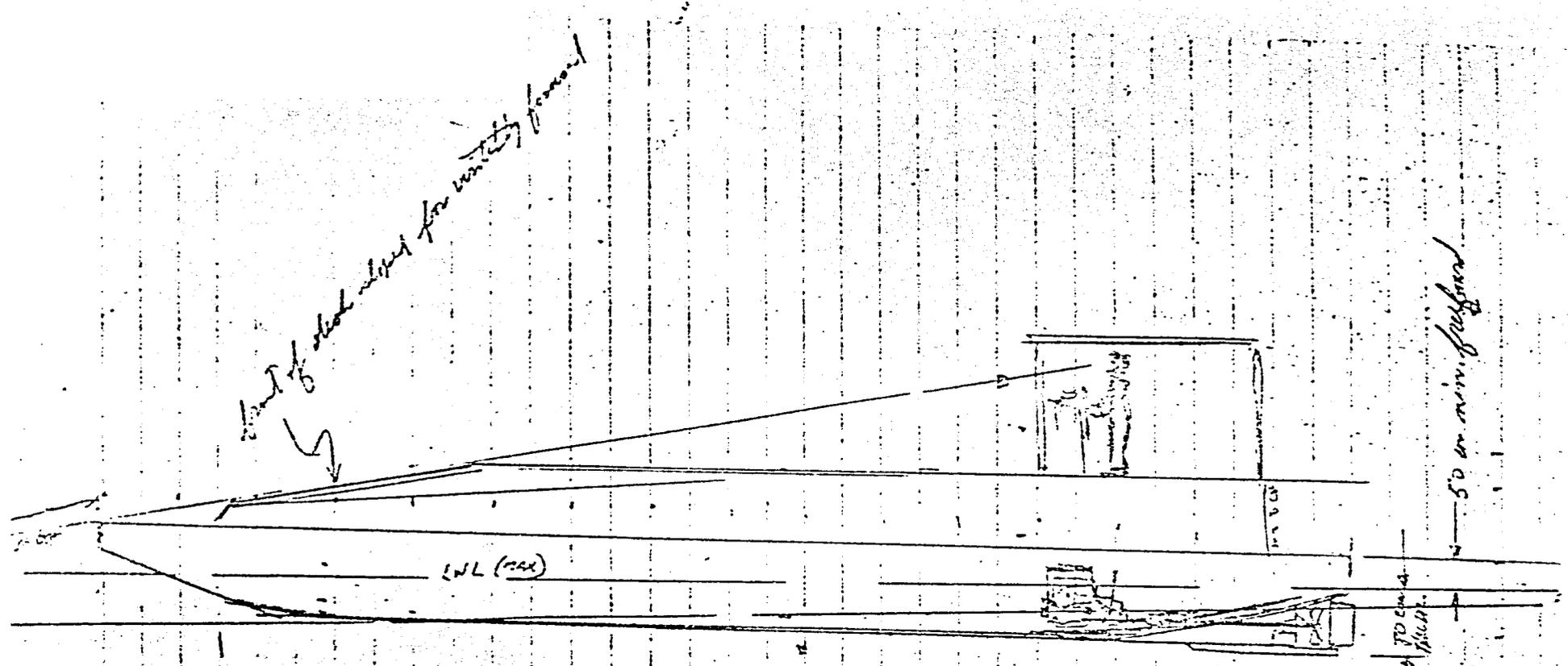
30-50 HP DIESEL

23m O.A.

CATEGORY "III"

BURDEN 40 TONNE NORMAL - 50 TONNE MAX EST. COST \$11,000

122



CATEGORY II

OVERALL LENGTH 18 m
 AVG BOUYANCY LENGTH 15 m
 BEAM 3 m
 MAX. FULL LOAD DRAFT .8 m
 GROSS DISPLACEMENT 34 metric tonnes

EST. WT. OF VESSEL 7.5 TONNES
 PAYLOAD (MAX) 26.5 TONNES
 POWER DIESEL (20 or 30 HP)
 PROPELLER 50 cm dia 30 cm pitch

DECK 2.5 cm plate
or 2 cm plywood

DECK BEAM 6x20cm

196 cm (HEIGHT)

MAX. BEAM 4.4m
A/B. FLOT. BEAM 4.1m.

L.O.A 23m
AVE. FLOT. LENGTH 20m

GROSS DISPLACEMENT 2.8m draft 64 TONS
" " " 6m " 48 T.

APPROX BURDEN (MAX) 50 T.
WT. OF VESSEL (APPROX) 14 T.

LWL

FRAME 8cm x 12cm ON 1m $\frac{1}{2}$

800mm x 100mm
= 4 x .7 = 2.8m

SOLE (4cm)

THIS FRAME
HARD END
FULL LENGTH 100mm

100mm FULL LENGTH "NAILED" (IN PLACE OF RABBIT)

FULL FRAME (1 METER $\frac{1}{2}$) 8cm x 25 (at center)

LIMBER HOLE

END CURVE 100mm x 10cm

CATEGORY III

HEAVY SOTTAGE (5 OR 6cm)



HEAVY KEEL TAPER (30cm x 30cm)

4.9
6.15 - 5.4

1761

ANNEX 9: ADDITIONAL PROJECT POSSIBILITIES

A number of possibilities for inclusion in the project were considered. For various reasons it was decided not to include them at this stage however they remain as possibilities for inclusion at a later date.

1. Fuel:

It was considered important to attempt to make fuel more accessible in the project area. There is not a single operational gas station in the whole project area. Depots where fuel can be delivered upon placement and payment of an order in Kinshasa exist only in Kikwit, Bandundu, Vanga and Dibaya-Lubwe. All of these except Bandundu are difficult of access in the dry season. Gasoline can be purchased illegally around Mushwe and diesel around Dibaya-Lubwe because of the illicit trade carried on by captains of the fuel barges in route to Ilebo.

The major part of the official fuel in Bandundu is distributed by Shell. Discussions with this company about ways in which fuel may be made more readily and locally available brought little response. Shell is presently negotiating with the Government of Zaire to gain greater control of the company; at present they hold only a forty percent interest. It is believed that this is likely to be agreed to in the coming year and if so the company may show more interest in cooperating with USAID.

2. Road Maintenance Equipment

Because Office des Routes decided to sub-contract all the road construction work, no heavy road maintenance equipment is to be provided under this project. Consideration could be given at a later stage both to assisting the regional office of Office des Routes in this way and also to providing heavy road maintenance equipment to private firms interested in maintaining roads in certain areas but with insufficient access to foreign exchange or with insufficient investment capital. A number of firms have expressed an interest in this. The equipment could be provided on a rental basis or on credit.

3. Heavy Equipment to Régie des Voies Fluviales

Régie des Voies Fluviales requested that USAID provide it with a channel marking vessel for use on the tributaries in the Bandundu region. A decision on this was deferred until after the formulation of its five year investment plan with which the World Bank is currently assisting it and after the forthcoming Zairian-Belgian Joint Commission on RVF. It was felt that at this stage USAID would be in a better position to determine RVF's needs and to coordinate their assistance with other donors.

4. Ports

A significant amount of work was done during the design phase on the site selection and design of ports for the Kasai and Kwilu rivers. It was felt that port construction would stimulate river traffic and thus assist in the achievement of the project's objectives. It was also felt that priority should be given to the selection of sites along the Kasai River since it is navigable year round and is in easy access of most of the project area. Potential sites are identified at Bolo, Wakenga and across stream and a little downstream from Yuki, in Sedzo collectivity. More work needed to be done to determine whether there is or will be a need for a port on the north bank of the Kasai. On the Kwilu, assistance is needed in clearing and improving the port on the right bank at Bulungu, some assistance in removing an obstacle is needed at Vanga and an assessment needs to be made of the suitability of Tshumbare and Biliki as port sites.

Two different approaches to port design were drawn up by Hugh Papworth: a bare minimum port/boat landing and simple constructed port. These are outlined below.

Ultimately the decision on port construction was postponed until USAID reflected further on a suitable management structure. In its earlier port work at Dibaya-Lubwe and Panu (660-0026) the decision had been taken to hand these ports over to ONATRA to manage. However, later experience seems to indicate that private transporters are at times denied access to ONATRA ports. This is undesirable and conflicts with the projects' objective of increasing the private river transportation fleet. Consideration, thus, needs to be given to the possibility of the ports being managed by private firms. The means of doing this needs to be worked out.

Port design parameters

1. Bare minimum boat landings.

A. A Minimum Port "Bare Bones" port could consist of an area of 1500 m² (or so) stabilized for all weather truck traffic and with wood construction boat landings consisting of a line of pilings on 2 meter centers and parallel with the shore at about 1 meter depth at low water, faced with 5 cm boards. Behind these (on the land side), there will be a second row at the water's edge which will support the back edge of the wooden dock, with probably 3 to 4 meters between piling rows. A wood ramp will be placed to transit from ground (paved) to dock level. This small facility fits the present operational mode and fleet. With the use of property selected wood, the dock should have a minimum life of 10 years and with normal maintenance, 20 years.

126

Estimated costs	
1500 m ³ stabilized and seal	\$13,500
Set piling	6,000
Dock and Ramp	4,000
Total	<u>\$23,500</u>

2. Sinfa Constructed Port.

A reasonable and affordable approach to create or upgrade river ports would be:

a. Establish at least one good quality feeder road and where feasible, two, for a distance of at least two km (or less if it will reach a reasonably serviceable road).

b. Determine the seasonal high water mark at the port site and drive an aligned wall of interlocking sheet piling into the river bed and parallel to the shore for the estimated requirements of the port in question. (Usually 100 to 150 meters should be sufficient). The piling should be driven to a uniform depth and should be extended above the river level a minimum of 80 cm. at the high water mark. Wharf ends can be turned back towards shore to allow proper concrete edge maintainability. Piling on the turn (ends) does not need to be driven as deep. Face pilings should be driven at least two meters down into the bottom or until resistance is resulting in excessive damage to the impact point.

c. Backfill to establish an apron or dock at least 15 meters wide. This fill material will usually be available at the site and should be compacted after fill is above water level and can support the compaction (whether manual or machine). Fill should be completely compacted in successive layers not exceeding 25 cm. This should be done to within 15 cm of the top of the piling. It should be final graded to drain away from the piling a minimum of 1 cm/m (1%) and a shallow "V" drain should be provided at the land side edge of the slab with the high pt. at the center of the wharf and draining to the river edge at either end.

d. After grading is completed 80 cm diameter holes should be dug to a depth of 80 cm on approximately 20 meters centers back from the piling face about 1.5 meters. Bollards will be carefully and accurately set in these prepared holes so that they extend about 40 cm above the top of the piling. Bollards will consist of 25 cm diameter steel pipe with a minimum wall thickness of 8 mm. If the wharf is 100 meters long on the face, five to seven bollards will be required (depending on the treatment at the ends where the dock cuts back to the normal shore line). The holes can now either be filled to grade with "semelle" concrete or they can be filled to a depth of 40 or 50 cm and the remainder earth filled to grade (complete fill to grade with concrete is preferable). When bollards (pipes) have set in place they should be completely filled with a good grade of portland cement concrete.

e. Reinforcing steel (Mat and 8 mm bar) can now be set. This should be done in 20 meters (or so) sections with the 3 mm or 4 mm x15 cm x 15 cm steel mat covering the area to be poured (the use of an edge board or form will improve the appearance of the job and make finishing easier). Mat should be held off the ground at least 4 cm on "chairs" (rocks or bricks will do). A perimeter or nosing bar (8 or 10 cm) should be placed on all outside slab edges (not on adjacent pour edge) and should be located (on wire supports) so that it lies about 3 cm in from the edge and the top surface of the finished slab.

f. Wet the area to be poured until it is thoroughly soaked.

g. Pour the slab - disturbing the reinforcement as little as possible. (If barrows are used boards should be placed for the run).

h. Trowel and finish after set is proper for the work. If further amenities are desired they could be added if funds allow (market, facilities, security fenced storage, etc.).

If the boats dock abeam of the wharf perhaps as many as seven could be accompanied on a 100 meter wharf face. If they nose in perhaps thirty or forty could load or unload simultaneously. Of course this is easier over the wide bow proposed in the project paper. This will provide upwards of 2000 m² of all weather dockage per site.

Since theft is a serious problem while boats are in port some method of limiting access should be considered. This can be accomplished by good fencing (or walls) around the port area and limiting port access by road to the daylight hours.

Temporary storage for cargo make up and marketing purposes could be economically accomplished by providing 4 to 8 fenced limited access stalls which would yield and improved security as well as provide some discreet separation and personal identification of goods.

ANNEX 10

COMPUTER REQUIREMENTS AND SPECIFICATIONS

The following are the computer hardware and software required for monitoring and evaluation of the Project. These estimates are based on peak period usage for project purposes and on the nature of tasks to be undertaken.

The kind of machine required is a small minicomputer, capable of running the following software:

- a screen formatting and form design package to carry out data capture and editing (something like VIEW/3000 on the HP 3000 range of computers or a data base management system with a screen design and data entry capability) able to handle complex data structures under program control;
- a validation and editing program with powerful command syntax (like CONCOR of the US Bureau of the Census) to carry out validation within and between records;
- a tabulation package for producing n-way tabulations from hierarchical data sets with counts and totals as cell entries;
- software to allow the manipulation of data files containing multiple record types with a hierarchical data structure (such as data base management package on CONCOR);
- statistical software;
- system utilities such as editors, copy, sort and merge;
- compilers for FORTRAN and COBOL high level programming languages with linkers, system libraries;
- software not necessarily included above but with which IRES staff are familiar (SPSS, TSP and RATFOR).

A minicomputer with the following minimum specifications is required:

Cpu with 512 Kbytes core memory
120 Mbytes of disk storage
8 terminals (excluding system console)
2 printers
1 magnetic tape deck

In addition the specifications should cover the need to transfer data on machine readable media between the minicomputer and other machines, mainly microcomputers. This may most easily be done using a microcomputer with flexible disk drives to emulate a terminal (which may require special software).

It is unlikely that a microcomputer based system can offer the same range of survey processing software at the present time. However, a system built around a network of microcomputers with adequate shared disk storage offers the next best solution.