PD BAX 351

Official File Copy

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete)

Amendment Number

DOCUMENT CODE: 3

COUNTRY/ENTITY: SUDAN

3. PROJECT NUMBER: 650-0054

4. BUREAU/OFFICE: AFR 06

5. PROJECT TITLE (maximum 40 characters): Kordofan Rainfed Agriculture

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 06 DD 30 YY 92

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 85 B. Quarter 2 C. Final FY 87

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

A. FUNDING SOURCE	FIRST FY 85 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	2,000		2,000	18,100		18,100
(Grant)	(2,000)	( )	(2,000)	(18,100)	( )	(18,100)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		3,000			32,000	32,000
Other Donor(s)						
TOTALS	2,000	3,000	2,000	18,100	32,000	50,100

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	133	252				18,100		18,100	
(2)									
(3)									
(4)									
TOTALS						18,100		18,100	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 061 013 044 031

11. SECONDARY PURPOSE CODE: 253

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	BS	COOP
B. Amount	50,100	10,000

13. PROJECT PURPOSE (maximum 480 characters)

To complete an agricultural marketing and transport network in Kordofan Region by improving farm-to-market transport, increasing farmers profit margins on current production levels, and alleviating farmers' seasonal cash constraints that limit marketing options.

14. SCHEDULED EVALUATIONS: Interim MM 04 YY 87; MM 03 YY 89; Final MM 12 YY 91

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [X] 941 [X] Local [ ] Other (Specify)

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

17. APPROVED BY

Signature: William R. Brown

Title: Director, USAID/Sudan

Date Signed: MM DD YY

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 05 DD 20 YY 85

BLE OF CONTENTS

		Page
I.	Summary and Recommendations	1
II.	Project Background and Rationale	11
	A. Background and Setting	11
	B. Rationale	13
	1. Implications for Farmer Incentives	13
	2. Mitigating Drought	14
	C. Rainfed Strategy	15
	D. USAID Program	17
	1. Policy Reform	18
	2. Western Initiatives	18
	3. Kordofan Rainfed Agriculture Project	21
	E. GOS Policy	22
	F. Logframe Narrative	23
III.	Project Description	27
	A. Introduction	27
	B. Feeder Roads	28
	1. Project Location	28
	2. Design Standards	28
	3. Implementation Strategy	30
	4. Equipment and Fuel	35
	5. Maintenance	36
	6. Maintenance of the Arterial Road Network: Kosti-El Obeid-Kadugli	38
	C. Storage	38
	D. Credit	42
	1. Location and Implementation	42
	2. Credit Mechanisms	44
	3. Capital Requirements	46
	4. Technical Assistance	47
	E. Training Summary	49
IV.	Cost Estimates and Financial Plan	51
	A. Introduction	51
	B. Estimated Cost	51

1. Feeder Road Component..... 51
2. Storage Component Cost Estimates..... 52
3. Credit Component Cost Estimates..... 53
4. Summary of Project Cost Estimates..... 55

C. Method Implementation and Financing..... 55
D. Payment of Invoices..... 56
E. Audits..... 57
F. Recurring Costs..... 57
G. Project Obligation in Relation to USAID OYB..... 58

V. Implementation Plan..... 60

A. Project Interrelationships..... 60
B. Feeder Road Component..... 61

1. Overview..... 61
2. Implementation Schedule..... 64
3. Implementation Responsibilities Under the Feeder Road Component..... 68

C. Storage Implementation..... 69

1. Design Phase..... 69
2. Construction Phase..... 70
3. Technical Assistance..... 70
4. Contracting Mode..... 71
5. Storage Component Detailed Schedule..... 71
6. Implementation Responsibilities..... 75

D. Credit..... 76

1. Implementing Agents..... 76
2. Timing..... 76
3. PVO Selection..... 77
4. Implementation Schedule..... 77
5. Implementation Responsibilities..... 78

E. Project Evaluations..... 80

1. Evaluations of the Project Goal..... 80
2. Evaluation of the Project Purpose: Feeder Road Component..... 81
3. Evaluation of the Project Purpose: Storage and Credit Components..... 83

VI. Project Analyses

A. Technical Analysis..... 85

1. Feeder Roads..... 85
2. Storage Facilities..... 88

B. Economic Analysis..... 91

1. Introduction..... 91
2. Feeder Roads..... 92
3. Storage Facilities..... 95
4. Financial Analysis: Inventory and Production Loans..... 96

C. Social Analysis..... 98

1. Regional Ovewview..... 98
2. Socio-Cultural Context..... 99
3. Beneficiaries..... 99
4. Participation and Feasibility..... 100
5. Impact..... 101

D. Administrative Analysis..... 102

1. Introduction..... 102
2. Feeder Roads..... 102
3. Storage Component..... 104
4. Credit Component..... 105

E. Environmental Analysis..... 105
F. Capital vs. Labor Intensive Road Construction Maintenance..... 107
G. Analysis of the Projects' Energy Efficiency, Cost Implications and Appropriateness..... 107

I. Conditions Precedent and Covenants..... 109

A. Conditions Precedent..... 109
B. Covenants..... 110

TABLE OF ANNEXES

1. PID Approval Cable

2. Logical Framework

3. Statutory Checklist

4. GOS Requests for Assistance

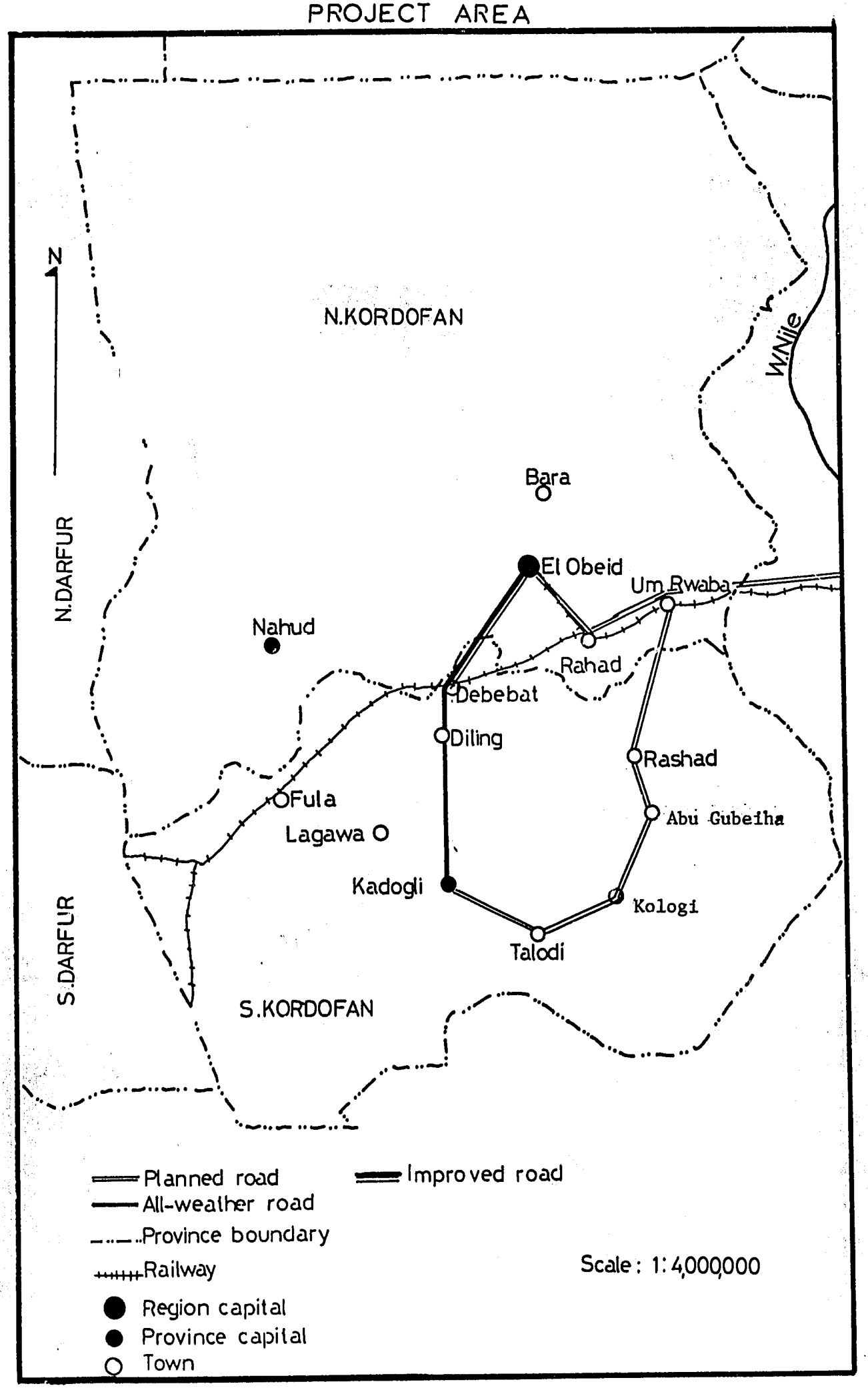
5. FAA Section 611 (c) Certification

6. Analyses

   A. Technical Analysis
   B. Economic Analysis
   C. Detailed Cost Analysis
   D. Social Soundness Analysis
   E. Administrative Analysis
   F. Environmental Review

7. Master Implementation Plan

PROJECT AREA



I. Summary and Recommendations

A. Project Purpose

The project purpose is to complete an agricultural marketing and transport network in Kordofan Region that will complement the Western Agricultural Marketing Road's interregional transport link and technical production developments under the Western Sudan Agricultural Research Project. The purpose has three components tied to the project's feeder road, credit and storage activities. The implementation strategy will help develop Sudanese private construction capability. The purpose of improved storage is to increase farmers' profits on current production levels. Increased profits will be a function of obtaining peak seasonal prices and reducing storage losses. The credit component will alleviate cash flow constraints that preclude farmers from responding to seasonal price fluctuations. Feeder roads are intended to improve linkages from production areas in Kordofan to the interregional transport network and key regional markets. Lower transport costs will also contribute to higher farmgate prices and reinforce policy reforms under the Agricultural Planning and Statistics project and the PL 480 program. By constructing project roads and storage facilities with Sudanese engineers and contractors, the project will develop indigenous skills to replicate similar transport and marketing activities in rural areas.

B. Background

The project is focused on Kordofan Region which is one of Sudan's key rainfed production areas and critical to AID's geographic focus on western Sudan. Kordofan has a population of 3.2 million people made up mostly (75 percent) of sedentary farmers living in clustered villages. Most foodgrains--principally sorghum and millet--are produced for domestic consumption. Significant percentages (up to 25 percent) are also marketed and supplement sales of cash-earning commodities such as groundnuts, gum arabic, sesame and livestock. Production is almost exclusively private, and producers have been responsive to price incentives and railroad infrstructure improvements. In 1982, the last relatively normal rainfall year before the current drought, Kordofan produced large shares of Sudan's export commodities: 23 percent of groundnuts, 52 percent of gum arabic, 16 percent of cattle, 20 percent of goats, and 20 percent of sorghum. Overall, the rainfed agricultural subsector earns more net foreign exchange than any single component of the Sudanese economy, including irrigated agriculture.

Yet Kordofan's year-to-year production has often been unstable. Poor infrastructure and skewed markets that favor government and merchants over producers have obstructed agricultural growth. Drought is always a threat. Its severity in 1984 made Kordofan a net importer of food and sparked population shifts that may disrupt long-term cultivation patterns. The proposed project addresses the region's socio-economic and physical conditions: exploitation of productive potential and mitigation of physical constraints.

Except for the road between Kadugli and Dubeibat (about 150 km), there are no paved highways in Kordofan, an area the size of California. Road

traffic moves on a series of non-permanent tracks created over the years by trucks. Travel is expensive but at least is competitive. Numerous small trucking firms with fleets of one to four lorries operate within the region. They go almost anywhere to transport crops from farms to market centers and also deliver goods long distances between markets.

Competition is not characteristic of the supply of storage services or the marketing system faced by producers. Most farmers' seasonal cash flow constraints force them into informal credit arrangements that require in-kind payments at harvest. Not only are de facto interest rates high, farmers are partially forced out of the market system. Their credit agreements, not commodity prices, dictate when and how much they can sell. Throughout most of Kordofan, only merchants can afford to store goods and sell them when prices rise several months after harvest. Private storage facilities usually consist of abandoned buildings or primitive warehouses characterized by high loss rates. Kordofan's Ministry of Agriculture estimates annual losses at about 19 percent for millet and 25 percent for sorghum.

Isolation and monopsonistic markets have been disincentives to production. Slow travel and rough roads have meant high transit costs to compensate for time, vehicle repairs and fuel. These costs cut directly into the farmers return on crops. They also take away from real income since farmers must pay high prices for tea, sugar and other commodities brought to their villages. Lack of marketing options and the low farmgate prices that result further diminish the means or incentives to produce more. That is not to say that farmers are not price responsive. Price expectations affect acreage and crops planted. But once a minimum income has been secured, the value of other commodities or even leisure may exceed the value of cultivating additional land.

Successive drought years have made the seriousness of poor road and storage infrastructure painfully clear. Lack of credit and skewed markets will hinder the speed of recovery. Out of USAID's FY 1985 total emergency food and budget of approximately $200 million (including local currency), almost $120 million will go for fuel and domestic transport. The opportunity costs of high transport expenditures, in this case, are reduced food availability, malnutrition and sometimes starvation. Storage is an obvious food security measure to buffer against poor harvests and stabilize exorbitant price fluctuations such as the 500 percent price increase in sorghum since November 1983. Credit cannot reduce the impact of drought, but it can help farmers rehabilitate their land and renew production.

C. Project Description

1. Overview

USAID has based the Kordofan Rainfed Agriculture Project (KORAG) on various agricultural strategy papers and two technical and economic analyses completed by Wilbur Smith and Associates and Kansas State University. The project's three components--roads, storage and credit--are interrelated.

Feeder road improvements and storage facilities make up the basic infrastructure for a marketing and transport network in Kordofan. Storage sites provide a holding point between producer and consumer, allowing higher marketing profits from seasonal price increases. The third component, credit, gives farmers the financial flexibility to store their crops. All project construction will be done by private Sudanese firms with varying levels of expatriate assistance depending on the level of complexity. Except for administration of warehouses and credit, the public sector's role has been limited to contract management. Budgetary provisions have been made for short-term training courses for regional government staff to upgrade contracting and planning skills and facilitate ongoing management of project activities. The proposed public/private split of roles, if successful, will provide a model for indigenous replication of similar project activities in other areas.

2. Feeder Roads

The feeder road component links an agricultural production area encompassing approximately 900 square kilometers to Kordofan's principal transportation arteries. KORAG feeder roads will extend from Kadugli to Talodi, turn north through Abu Gubeiha, Rashad and El Abbasiya, and connect to the El Obeid-Kosti road near Um Ruwaba for a total distance of 455 km. Construction will proceed in two phases. Phase 1, to be financed under this project, consists of two sections for a total of 301.6 km: Kadugli to Talodi and Abu Gubeiha to Um Ruwaba. Phase 2 completes the loop and consists of the section from Talodi to Kologi to Abu Gubeiha.

Much of the route passes through areas that are impassable during he wet season and, in sandy areas, difficult to cross during the dry season. With the project feeder roads in place and the El Obeid-Kosti road constructed, the area will be accessible to main regional centers as well as to and from Khartoum and Port Sudan, year round. The feasibility of feeder roads in Kordofan has been examined by Norconsult in May 1980 and Louis Berger in 1983. A 1984 study made during PP design by Wilbur Smith and Associates updated the earlier studies and is the basis for the technical, financial and economic analyses of this PP.

The implementation strategy is to maximize the participation of Sudanese engineers and construction firms with Roads and Bridges Public Corporation and the Kordofan regional government acting as contract managers. To this end, the project design utilizes Sudanese engineering and construction firms with a mimimum of expatriate technical assistance. The A&E functions of design and construction supervision will be carried out by a U.S. engineering firm in joint-venture with a Sudanese firm that will provide the predominate number of person months. Construction services will be performed entirely by Sudanese contractors, with assistance and guidance from the expatriate and Sudanese engineers. In consideration of Sudan's fledgling construction industry, construction is scheduled in relatively short segments of 40-50 km over a 30-month period. The schedule is conservative and some contractors may be able to proceed at a faster pace. To allow time to evaluate contractor capabilities and to permit adjustments in the schedule, contracts for various road segments are staggered and potential awards to continue construction are used as performance incentives for contractors already on the job.

As in all road projects in Sudan, maintenance presents a variety of problems. While RBPC is responsible for maintenance of the national road network and regional governments, in theory, maintain local feeder roads, the financial resources of both entities are inadequate. The concern under KORAG is not only for project feeder roads, but also for the connecting road network. There are several factors that should have a beneficial impact on road maintenance in the future: growing GOS realization that road maintenance is a serious problem that must be addressed, the World Bank Third Highway Project for road maintenance is just beginning, and a Kordofan regional maintenance study is scheduled for October 1988 under the Western Agricultural Marketing Road Project. The following provisions have also been made under KORAG for project roads: the construction contractors will be responsible for maintenance on their respective segments during construction and for a maximum of six months afterwards; provisions are made in the KORAG budget to provide funds for maintenance of project roads after the contractor's responsibility ends and until completion of the project; the KORAG budget provides funds to expand the maintenance study under the WAMR project to recommend technical and financial solutions to maintenance on the KORAG roads; the GOS will covenant to meet with USAID, RBPC and the regional government prior to the completion of the project to work out a definite maintenance plan and identify funding for future maintenance of KORAG roads. Meanwhile, USAID is currently exploring with RBPC a plan to maintain the connecting road network from Kadugli to Dubeibat.

3. Storage Component

The storage component consists of the design and construction of seven warehouses, six of 3000 MT capacity and one of 6000 MT capacity. The warehouses will be designed and constructed under the auspices of the Agricultural Bank of Sudan. ABS has experience implementing and administering similar projects with donor financing (See Annex 6E). For all seven warehouses, the ABS will contract with a Sudanese A&E firm for design and construction supervision. Construction will be done by Sudanese firms. ABS's purchasing department will procure the off-shore material and equipment. The feasibility of this component was recently studied by a team from Kansas State University. The KSU study provides the basis for the analysis of the storage component for this PP.

Of the seven facilities, ABS will, after construction, own and operate four of the 3000 MT warehouses under its ongoing storage activities in El Obeid and Dilling and its expanded program in Talodi and Abu Gubeiha. The El Obeid warehouse will serve the traditional sector and the Dilling warehouse will serve the mechanized sector. The Talodi and Abu Gubeiha facilities will store products from both the traditional and mechanized sectors.

In line with the project strategy of involving the private sector as much as possible, the KSU team investigated and recommended a pilot project to test private sector interest in owning and operating grain storage warehouses. Through discussions with ABS, the El Obeid Chamber of Commerce, and private merchants, a plan was developed to offer three constructed warehouses to private merchants on a variety of lease/purchase options. El Obeid was chosen for the location of the pilot project because it is the major market center for agricultural commodities in Kordofan.

The KSU study recommended technical assistance at four points during implementation. During the design stage, three months of specialized technical assistance will be provided to help the Sudanese A&E firm finalize designs, taking into consideration the recommendations of KSU, and prepare the IFBs for construction and procurement of materials and equipment. The manufacturer or distributor of the warehouse materials will be required to furnish four person months during each of two construction periods to assist in erection of the warehouses. The third imput of technical assistance will be to develop a training program on management and operation of grain storage warehouses. This program will be conducted simultaneously for both the ABS and pilot project warehouse personnel and is timed to complement the construction schedule, with annual follow up training. The fourth input of technical assistance will be two person months working with the ABS, El Obeid Chamber of Commerce and private merchants in an effort to facilitate the transfer of the pilot project warehouses from ABS to private merchants.

4. Credit Component

The credit component is complementary to the others in that it removes cash flow constraints that mitigate responsiveness to price incentives. Under the credit program farmers will be offered both production loans before planting and inventory loans at harvest. The total value of the loans may equal 70% of the harvest value of their crops. Production loans will give farmers an alternative to informal credit arrangements that require farmers to pledge their crops well before harvest. Without a pre-commitment on crop sales, farmers will be able to take advantage of seasonal price fluctuations. Combining credit with storage facilities enhances the viability of small farmer lending since stored crops constitute repayment of production loans while providing collateral on inventory loans. Loans will be channelled through village-based farmers' cooperatives to minimize the number and cost of transactions.

ABS will administer the credit fund, but other lending mechanisms will be consistently evaluated during the life of the project. Currently ABS has credit and storage programs in western Sudan. KORAG will permit the expansion of the program and provide the technical assistance needed to improve operating procedures and policies and train additional personnel. The first input of technical assistance, to be provided under a PVO cooperative agreement, will be a two-person team to conduct a six-month review of current financial practices and cooperative organization. Their recommendations will form the framework for the credit program and set a scope of work to be implemented by long-term advisors planned for El Obeid, Talodi and Abu Gubeiha.

The credit fund requirements for production and inventory loans are difficult to estimate because they are affected by several factors, such as the price and availability of agricultural inputs, farming practices, wages and crop prices. For planning purposes an estimate of reasonable prices was made and correlated with the expected volume of stored goods. Loans will equal 70% of the value of stored commodities. A 25% factor for price variation was added plus a 10% drought default factor. Country-wide agricultural lending policies, particularly capital cost recovery, will be addressed as a reform measure under a planned FY 1986 PL 480 Title III program.

D. Summary Findings

1. Technical

a. Feeder Road Component

The design specifications recommended in the Wilbur Smith and Associates study conform to earlier recommendations made by Norconsult and Louis Berger. The designs are standard for feeder roads and appropriate for Sudan. A 6.0 m wide roadway, including shoulder width, will be constructed on an embankment of an average height of 0.5 m with a gravel surface 0.15 m thick. For sections of black cotton soil, WSA recommended an embankment foundation of 0.15 m rocky material. However, WSA did recommend that the construction method for black cotton soil areas be further investigated during final design. Water courses will be crossed by either culverts or fords; no bridges will be required. For ease of construction, WSA recommended that standard drawings be prepared for pipe, box and open-bottom culverts, fords, ditches, erosion control measures and other similar details for multiple design applications. In keeping with the standard of road being constructed, some design features will be determined in the field, such as the exact location of culverts and fords and minor adjustments to the vertical alignment. The WSA analysis, recommended design standards, the implementation plan and cost estimates appear reasonable.

b. Storage Component

The storage component analysis is based primarily on a Kansas State University study. KSU concluded that the Agricultural Bank of Sudan has considerable experience in planning, engineering and constructing warehouses. ABS has been through the process, with external financing, several times. KSU recommended a program that was compatible with the ABS's current and planned expansion of storage and credit programs and consistent with the overall KORAG implementation strategy.

Under the storage component, seven standard design warehouses will be constructed, six of 3000 MT capacity and one 6000 MT capacity. The KSU study presents a detailed analysis of the advantages and disadvantages of bag and bulk systems of storage. KSU concluded that for Kordofan region, bulk storage was not financially viable.

In addition to the general characteristics of the facilities, KSU provided detailed specifications for a frame type building with mild steel

universal section columns and portal rafters with galvanized pressed steel purline. However, the details are illustrative and final determination will be made during final design. Possible variations are that concrete columns may be used with a conventional truss, or concrete and brick may be used up to a height of 2 m above the floor rather than steel walls. Overall, the KSU recommendations are judged by ABS and the PP team to be reasonable and applicable for Sudan.

2. Economic

We have calculated the NPVs and IRRs of the road and storage components for two different cases: our base estimates, and pessimistic estimates (a 15% decrease in benefits and increase in costs). As shown in the table below, the project is economically viable in both cases. The NPV under our base estimates is LS 12,047,000 at a 15% discount rate, and the IRR is 22%.

Overall Project Economic Impact

Scenario	NPVs (LS000) 15%	12%	18%	IRR
Base Case	12,047	24,294	6,244	22%
Pessimistic Case	2,202	10,668	-2,925	16%

Individual economic analyses for the feeder road and storage components, with similar sensitivity tests, were also conducted. The internal rates of return using base estimates for each component are 22% (roads) and 25% (storage). The NPVs at a 15% discount rate are LS 9.2 million (roads) and LS 2.8 million (storage). Since the credit program involves a transfer of resources within the economy rather than a net economic gain, we have only evaluated its net financial impact on farmer income. It is difficult to generalize the impact across Kordofan since farmers have different cropping patterns, areas under cultivation and loan requirements, so we have made illustrative calculations based on farm-level research in northern Kordofan. We have estimated that feasible increases in traditional farmer annual income are 23% from inventory loans and 14% from production loans.

3. Administrative

The implementation of the feeder roads and storage components conform to the overall implementation strategy of maximizing private sector participation and directing government services toward contract management. The A&E feeder road component will be performed by a joint venture between a U.S. and a Sudanese engineering firm, with the Sudanese firm furnishing the predominate number of person months. Construction services will be by

Sudanese construction firms, who will be assisted by the joint venture A&E engineering firm. Roads and Bridges Public Corporation will hold the feeder road engineering and construction contracts with regional government staff participating in the contracting process and contract management. RBPC will furnish a Chief Engineer, two assistant engineers and the necessary office staff to administer the project from a regional office in the Kordofan Region. The Kordofan regional government will provide an administrative manager and clerical staff. Local currency payments will be made from a commercial bank located in Kordofan. The construction supervision services related to inspection and quantity surveying will be furnished by the Sudanese joint venture partner.

The storage and credit components will be implemented under the overall auspices of the Agricultural Bank of Sudan, which is the GOS agency responsible for administering agricultural storage and credit programs. ABS will utilize Sudanese firms for A&E services and construction. The storage component includes a pilot project in which three storage facilities will be turned over to the private sector after construction. Storage and credit expansion conforms to ABS plans for programs in Kordofan Region. Domestic credit ceilings preclude commercial banks from channelling credit, but their role will be reconsidered if there are changes in domestic lending policies.

Annex 6E contains a detailed statement on the background and capabilities of RBPC and ABS. Both agencies are qualified to administer the project and both are in full agreement with maximum involvement of the private sector.

E. Cost Estimates

		(Thousands)		
		FX	LS in $*	Totals
1.	Feeder Road Component			
	Construction Services	3,500	20,000	23,500
	Engineering Services	7,700	6,300	14,000
	Vehicles & Maintenance	300	500	800
	Subtotal	11,500	26,800	38,300
2.	Storage Component			
	Warehouse Construction	1,750	2,750	4,500
	Technical Assistance	850	570	1,420
	Subtotal	2,600	3,320	5,920
3.	Credit Component			
	Technical Assistance	1,720	440	2,160
	Capital Fund	-	1,200	1,200
	Subtotal	1,720	1,640	3,360
4.	Participant Training	260	-	260
5.	Project Management	420	160	580

6.	Audit and Evaluation	100	40	140
7.	Total Project Cost	16,600	31,960	48,560
8.	Contingency	1,500	-	1,500
9.	Recommended Authorization	$18,100	LS in $ 32,000	$50,100

* Exchange Rate $1.00 - LS 2.5

F. Standard Requirements

1. Use of Small, Disadvantaged and Women-Owned Firms

The expatriate engineering services for the feeder road component require extensive home office support and backstopping. Interested firms must incur considerable expenses seeking out a Sudanese joint venture partner and preparing a response to the RFTP. The firm will be selected on the basis of experience and ability to furnish qualified personnel and home office backstopping over a relatively long implementation period. USAID has concluded that it is not likely that a small, disadvantaged or women-owned firm would have the resources to fulfill these requirements and that a set-aside is not justified.

The technical assistance required for the storage component involves approximately ten person months of specialized training in warehouse management and operations. The selection process for these services will be open to all interested firms.

The technical assistance services for the credit component require some unique qualifications because of the location and nature of the responsibilities. USAID considered the alternatives of using a private firm, an educational institution or a private voluntary organization. A private firm, which could include small, disadvantaged and women owned firms, could possibly recruit qualified personnel but because of the remote and isolated location, the cost would be prohibitive. An educational institution was not considered appropriate because the job demands more of a practical than a theoretical orientation towards rural credit. A PVO acquired under a cooperative agreement with agricultural credit and cooperative experience appears best suited. Four PVOs have been identified and recommended for their work in Africa in addition to others recommended by AID/W.

2. Waivers Required

An extension of the Mission's blanket waiver for FY 1985 is required for proprietary procurement of Ford vehicles for Western Sudan. Handbook 13, Chapter 1B requires the Administrator's approval to restrict competition for the credit component technical assistance to PVOs.

3. Major Conditions Precedent and Covenants

The Project Agreement will contain CPs related to a) right-of-ways for the feeder roads, b) land rights for the storage

facilities, and c) the legal status of the ABS as an instrumentality of the GOS. Several covenants will be included on: special local currency funds to cover local cost, appointment of qualified personnel to the project, administration of the project from Kordofan Region rather than Khartoum, agreement on a definite maintenance plan, expansion of ABS branch offices, storage rate structure and credit fund services charges, sale of warehouse to the private sector, and environmental monitoring.

4. Conclusions and Recommendations

The project strategy for KORAG inevitably involves some risk and incorporates some innovations in private sector participation. To minimize risks, it was necessary to involve implementing agencies with proven capabilities and to prepare a conservative implementation plan that prolongs the implementation period. Time obviously has monetary costs, but they were considered necessary to upgrade the capabilities of the private sector. The implementation plan is so designed that if performance exceeds the conservative schedule, adjustments can be readily made. KORAG will require careful and flexible implementation. Despite the risks and with the built in safeguards, the conclusions of the analyses made for the Project Paper are all positive. It is recommended that the Mission Director authorize an $18.1 million grant for the project.

G. Project Paper Design Team

1. AID

Project Development Officers:	Carlos Pascual, USAID/Sudan Arthur Thivierge, PSC
Engineers:	Dennis Light, REDSO/ESA Walter McAleer, USAID/Sudan Dean Moody, USAID/Sudan
Economists:	Frank Martin, USAID/Sudan Azhari A/Karim, USAID/Sudan Yoon Lee, AID/W
Agriculturalist:	Elizabeth Martella, USAID/Sudan
Environmentalist:	John Gaudet, REDSO/ESA
Regional Legal Advisor:	Paul Scott, REDSO/ESA

2. Government of Sudan

Engineers, RBPC:	Osman El Obeid Hussein Ibrahim
Agriculturalists, ABS:	Abdalla Shingrai Ohaj
Kordofan Regional Government:	Saeed Abu Kambal

discs, has been introduced in southern Kordofan on tracts of land averaging one thousand acres. Weeding, harvesting and threshing remain manual operations done by seasonal labor from nearby traditional farms. Mechanized schemes primarily produce sorghum, although small quantities of sesame and millet are planted. Less than 10 percent of Kordofan's farmers are involved in mechanized production.

About 15 percent of Kordofan's population consists of nomadic and transhumant livestock herders living in scattered encampments. Transhumants remain settled in one area for 6-8 months, moving when rains bring biting flies and mud. During the rainy season, transhumants migrate to find better grazing land further north while nomads are continuously on the move. Livestock is trekked from southern Kordofan northward to El Obeid and Khartoum where the best prices are offered with the onset of the rains. Presently, it is difficult to predict the drought's long-term effects on migration and marketing patterns. In the short run both transhumants and nomads are likely to limit their treks north and increase the percentage of livestock offtake at the El Obeid market.

Except for the paved road between Kadugli and Dubeibat (a distance of 150 km.), there are no paved highways in Kordofan, an area the size of California. Road traffic moves on a system of non-permanent tracks created over the years by trucks. These tracks run on natural ground, and there is little improvement or maintenance. When a track deteriorates, truck drivers abandon the original route and create a new one. Often, several parallel tracks are available; drivers shift from one to another in search of the best route to reduce travel time and costs. In northern Kordofan the tracks are sandy and difficult to traverse during the dry season because of poor cohesion. Further south, many creek beds interrupt the dirt tracks and black cotton soils make transit impossible during the wet season and difficult at other times. In some areas road conditions require truck drivers to replace their differentials and transmissions twice a year. The system creates a situation where transportation of goods is slow, costly and, at certain times, practically impossible.

Despite the poor road system, numerous small private trucking firms with fleets of one to four souk lorries (5-ton trucks) operate within Kordofan Region. These companies go almost anywhere to transport crops from farms to market centers and also deliver goods long distances between market centers. A 1983 study found that charges were around 70 piasters (28 cents) per ton/km for farm-to-marke services and 20 piasters for longer distances on the Kadugli-Dubeibat road. While the rates appear high, studies of operating costs indicate that they accurately reflect the extremely difficult conditions on the rudimentary tracks as well as the high cost of fuel which is often available only on the black market. The provision of transport services is a highly competitive economic activity in western Sudan; there is no evidence that high transportation charges stem from monopolistic practices.

That is not the case for storage. Throughout most of Kordofan, only merchants can afford to store goods and sell them when prices rise several months after harvest. Private storage facilities usually consist of abandoned

II. Project Background and Rationale

A. Background and Setting

Kordofan Region typefies the Sudanese paradox of production potential constrained by physical and policy disincentives. Until the recent drought, Kordofan contributed major shares of Sudan's livestock, sorghum, millet, groundnuts, sesame and gum arabic. Production is almost exclusively private, and producers have been responsive to price incentives and railroad infrastructure improvements. Yet the future has always been hazy. Poor infrastructure and skewed markets that favor government and merchants over producers have obstructed agricultural growth. Drought is always a threat. Its severity in 1984 made Kordofan a net importer of food and sparked population shifts that may disrupt long-term cultivation patterns. The proposed project addresses both aspects of the region's socio-economic and physical conditions: exploitation of productive potential and mitigation of physical constraints.

Virtually all crops in Kordofan are produced under rainfed conditions and, except for millet (which is a substitute for imported wheat), contribute significant portions of Sudan's export earnings. Since 1975 and until the recent drought, the combined share of rainfed crops in Sudan's export earnings increased, reaching a total of 65 percent in 1982 (the last relatively normal rainfall year). Kordofan's contribution to rainfed commodities has been significant, as shown by average annual production statistics from 1975 to 1984: 67 percent of gum arabic, 40 percent of sesame, 40 percent of millet, 25 percent of groundnuts, 20 percent of sorghum, 38 percent of comale, 24 percent goats, 23 percent of sheep and 15 percent of cattle.

Three major types of agricultural production systems characterize western Sudan: traditional farming, mechanized farming and nomadic herding. Traditional farmers, who account for 75 percent of the region's population, produce all of the area's millet and livestock and most of the sorghum. Farming is done by single families on small plots averaging 15 acres using few, if any, modern inputs. Some modernization of traditional farming is found in southern Kordofan where the Nuba Mountain Corporation has distributed cotton seeds and other inputs to traditional farmers. The family is still the principal production unit, but most have their land plowed by tractor.

Traditional farmers usually sell their surplus crops to village merchants immediately after harvest when prices are lowest in order to pay off debts. Although some production is strictly for consumption, traditional farmers have a significant cash economy and participate in the market through sales of groundnuts, sesame, livestock, gum arabic and sometimes sorghum. Because of seasonal cash fluctuations inherent in farming, farmers usually have little choice about when to sell their crops. Most profits in the agricultural system, therefore, go to merchants who can afford to buy when prices are low and sell when they rise.

These merchants also constitute the bulk of mechanized farmers. Mechanized farming, limited to land preparation and planting with tractors and

buildings or primitive warehouses with little ventilation or pest control. Traditional farmers have built small brush huts on platforms to store goods for their own use, but cash flow constraints at harvest prevent commercial on-farm storage operations. Several commercial banks rent storage facilities and charge merchants for their use, but little attention is given to protecting crops. Post harvest losses, in fact, are higher in Kordofan than throughout the rest of Sudan. The FAO has estimated Sudan's post harvest losses for millet at 14 percent and for sorghum at 6-20 percent (avg. 13 percent). Kordofan's Ministry of Agriculture estimates regional losses at about 19 percent for millet and an average of 25 percent for sorghum. A Kansas State University study in August 1984 estimated that between damaged kernels and weight reduction, annual storage losses for sorghum in the Agricultural Bank of Sudan's facilities average 18-20 percent.

B. Rationale

1. Implications for Farmer Incentives

Most traditional farmers in Kordofan produce at a point where their returns barely cover their expenses. Slow travel and rough roads have meant high transit costs to compensate for time, vehicle repairs and fuel. These costs cut directly into the farmer's return on crops. They also take away from real income since farmers must pay high prices for tea, sugar and other commodities brought to their villages. Lack of marketing options and the low farmgate prices that result further diminish the means or incentives to produce more. Once farmers have planted a minimum acreage to provide a subsistence income, the value of other activities or even leisure may exceed the value of cultivating additional land. Their low incomes also mean that often farmers cannot afford the price of new technologies unless subsidized, and they are hesitant to assume the risks associated with adopting proven yet new cultural practices.

A brief analysis of farm-level cash flow constraints will help illustrate the proper points for intervention. Traditional farmers participate in a cash economy which determines when and how much they plant, how much they eat and whether they progress from year to year. Figure 1 (see next page) illustrates a farmer's net cash flow position over the calendar year, highlighting when farmers earn and spend cash.

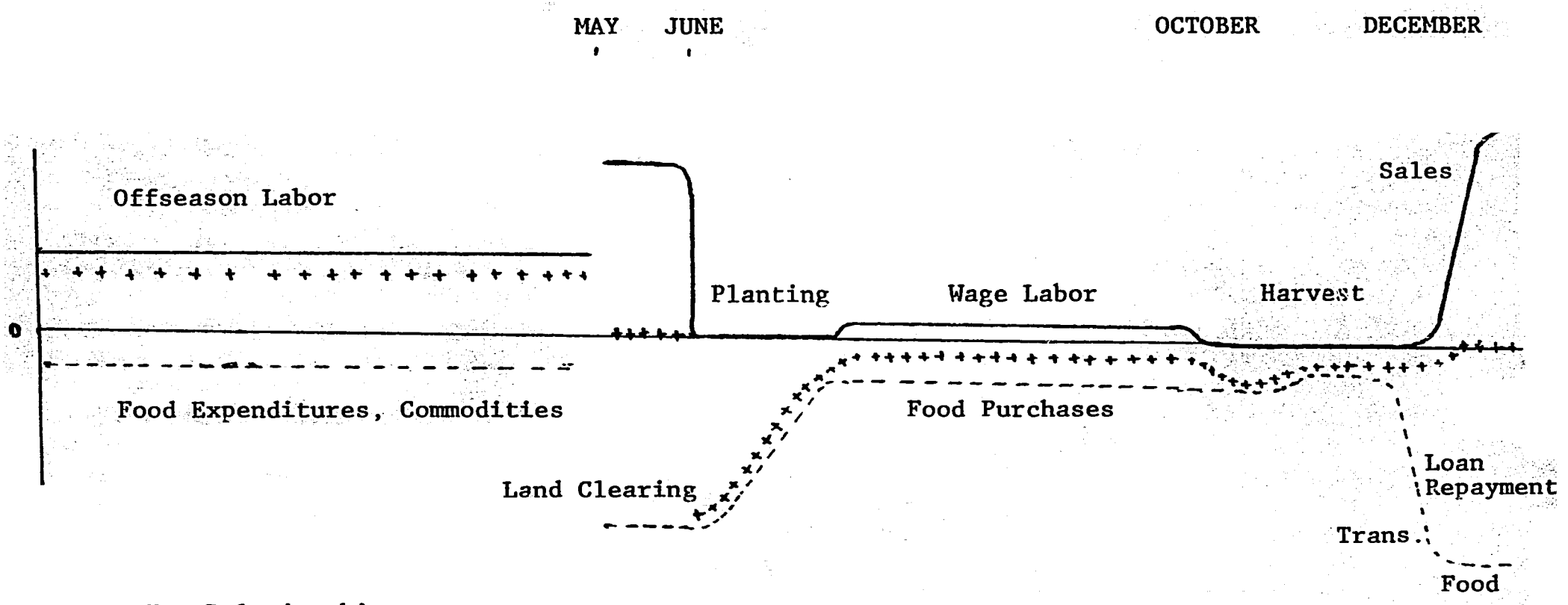
The critical point in the annual cash flow is the start of the growing season (May) when farmers take out loans from local merchants to pay the labor costs of clearing land and planting crops. Although most farmers have saved money from wage labor during post-harvest months, these savings are necessary to finance consumption during the growing season when crops have been planted and employment opportunities are limited. The farmer's only alternative is to borrow from informal credit sources called "sheil" merchants. Under the sheil system a local merchant or money lender advances loans (in cash or kind) to a grower who pledges to repay a specific amount of produce at harvest, even if crop prices at harvest result in exorbitant interest rates.* Once merchants

---

* The sheil system is not considered contrary to Islamic law since there are no defacto interest rates but profit based on speculation. If this profit is translated into interest, rates have been estimated at 100% or more.

FIGURE I

SEASONAL CASH FLOW



Key Relationships

-Loan finances land clearing
-Offseason Labor finances June-Oct. period
-End-year sales finance loan repayment, transport, food

LEGEND

——— Cash Inflow

----- Cash Outflow

+++++ Net Cash Flow

20.31

have collected crops, they store them in warehouses until prices rise. Depending on the crop, seasonal prices may fluctuate up to 100 percent, providing a second significant source of profit in addition to interest on loans.

Because of the sheil system, decisions that farmers usually make after harvest -- namely, whether to sell or store crops depending on market prices -- have already been made before crops are planted. By harvest, farmers usually have no cash. Their wage earnings have been spent, and sheil loans were used for clearing land. Repayment on their loans becomes due, and food and commodity stocks must be replenished. Even though farmers may have accurate information on crop price fluctuations, their cash needs give them no opportunity to follow market signals and store their crops until prices rise.

Given the nature of cash flow and marketing problems, two types of interventions are appropriate: lowering input and marketing costs that place a heavy demand on available cash, and restructuring incentives in the marketing system. For both traditional and mechanized farmers in Kordofan, the major input and marketing cost is transport. The underlying rationale for road improvements under this project is straightforward since transportation affects both gross income (through earnings on crop sales) and net income (through prices on commodity purchases). Interventions to improve market incentives have proved more difficult than upgrading transport since they require attention to the timing of loans and inputs as well as financial concerns over loan repayment.

The farmer's cash flow pattern over the calendar year suggests two options for alleviating financial constraints: either production loans before planting (thus eliminating the need for sheil loans), or inventory loans and storage at harvest. While our financial analysis indicates that inventory loans may have a greater income effect than production loans (23% versus 14% annually), prevailing social patterns demand both. With merchants currently being the only sources of credit, they can also dictate repayment in-kind as a condition for their loans. In such cases inventory loans are useless. The merchant will not accept repayment in cash and forego profits on crop sales, leaving the farmer no choice but to continue with the existing marketing system. Production loans, then, free farmers from committing their crops to a single buyer. Inventory loans allow farmers the flexibility to benefit from seasonal price increases after harvest. Improved storage reduces marketing losses, with stored crops serving as collateral on loans.

2. Mitigating Drought

The seriousness of successive drought years has indicated the importance of KORAG's three components beyond their original production-oriented, marketing and transport focus. In 1984 northern Kordofan received approximately 37% of normal rainfall levels (a mean of 129 mm). Market incentives could have little impact on production. Most crops, including experiments on research stations, failed. The only adequate production levels in the north were found on farmer field trials with improved

varieties of millet and sorghum which produced yields comparable to those in average rainfall years. Their performance holds some hope for stabilizing future production, but this year's drought has made Kordofan dependent on food assistance for over 50 percent of its grain requirements.

The costs and logistics of the food relief program have demonstrated that transport and marketing constraints can be as obstructive to moving food into the region as exporting it out. Out of USAID's FY 1985 total emergency food aid budget of approximately $200 million, almost $120 million will go to fuel and domestic transport.* The opportunity costs of high transport expenditures, in this case, are reduced food availability, malnutrition and sometimes starvation. Storage is an obvious food security measure to buffer against poor harvests and stabilize exorbitant price fluctuations such as the 500% price increase in sorghum since November 1983. It will also keep more food in the region and prevent expensive grain transfers like that in 1983/84 when crops were shipped out of Kordofan for lack of storage and later transported back at a 200-300% price increase when shortages arose.

Credit cannot reduce the impact of a drought, but it can help farmers rehabilitate their land and renew production. It will also help reestablish markets and trading centers that have deteriorated from lack of resources. The capital inflows will allow some farmers, though certainly not all, to purchase food and hire labor for land cultivation. Most farmers may still depend on food assistance for the majority of their needs, but some access to capital will allow them to purchase seeds to compensate for poor seed production during drought years. Drought will obviously have an impact on the financial viability of a credit system, but the problems with credit will only be symptomatic of a broader drain on the economy. The hope is that the financial costs will make the agricultural system more resilient.

C. Rainfed Strategy

While the components of this project may make sense under both drought and normal rain conditions, the risks inherent in rainfed cultivation require a brief revalidation of the Mission's agricultural strategy. The 1985 CDSS update argued for a rainfed focus because of the subsector's contribution to both domestic and export markets and its potential for growth. Given a resumption of normal rainfall patterns, the growth potential still exists. Even with the past three years of drought, the percentage of land lost permanently to desert will be small. One study on the impact of the 1964-1974 Sahelian drought on Kordofan concluded that "there was no creation of long

* Based on an exchange rate of LS 2.5/$1.00 for local costs.

lasting desert-like conditions....There was however a severe drought impact on crop yield."* Desertification due to poor land management is still a serious concern, but potential yield increases of 300-500% from field-tested hybrid sorghum and a new short-maturing variety of millet will balance the loss of cultivable land. In terms of rainfed agriculture's continuing macroeconomic importance, the key question is whether the subsector will retain sufficient impact on the domestic and export economies to merit the focus of an agricultural strategy. Three important considerations are population concentrations, responsiveness to production incentives, and the comparative advantage of rainfed versus irrigated crops.

Until the drought forced major population shifts throughout the rainfed areas, the rainfed zone employed two-thirds of Sudan's rural population in private traditional and mechanized agriculture. Although it is difficult to predict permanent relocation outside the rainfed subsector, observed migration patterns to higher rainfall zones and the lack of alternatives outside of rainfed cultivation suggest that the rainfed subsector will continue to employ the major share of the rural population. Permanent population shifts do not seriously threaten the major mechanized grain production areas in eastern Sudan. In Darfur, drought-affected populations have tended to move south to better climes rather than migrate to urban areas or the irrigated subsector. Migration from and within Kordofan has been more diverse. Displaced people have congregated in camps outside of Omdurman and along the irrigated schemes on the Nile; most have stayed in camps outside the region's major towns or moved directly south. Some displaced groups have found temporary employment on the irrigated schemes but will be left unemployed after the cotton harvest ends in March. No opportunities exist for obtaining plots within the schemes. Those displaced to urban areas have not even had a temporary reprieve from unemployment. If the rains resume in June 1985, their best option will be to return to their farms or relocate in other rainfed areas.

Regardless of population shifts, mechanized and traditional farmers in the rainfed subsector will continue to account for virtually all private sector agriculture in Sudan. Both cultivation methods have their limitations, but private farmers have shown a responsiveness to changing incentives that the public irrigated schemes have outlawed. Most irrigated schemes, except small private pump operations on the Nile, dictate each farmer's acreage and how much will be planted to each crop. Crop allocations usually do not change to reflect changing international and domestic prices or technology improvements

---

* The report was completed in 1984 by Lunds University, Sweden, and the Institute of Environmental Studies at the University of Khartoum. It also concluded that "the impact of the Sahelian drought was short lasting followed by a fast land production recovery....Its major impact is assumed to be a slow expansion of unpalatable species and annuals....accompanied by a reduction of fuelwood resources available." The study analyzed aerial photography from 1962 and satellite data from later periods for 77 villages in Kordofan.

that affect relative crop profitability. Input prices receive an implicit foreign exchange subsidy that often leads to their inefficient use or resale on the black market. The public marketing board for cotton, the major cash crop, further separates the farmer from international prices. In short, the farmer's only latitude for efficiency is to maximize income within the tight constraints of the scheme or to resort to unofficial markets. Given the distorted incentives farmer's face, such farm-level efficiency usually will not result in an economic allocation of resources on a national basis.

The government's lack of resources to finance the heavy foreign exchange component of the irrigated schemes' recurrent costs lends additional support to a private sector, rainfed focus. By early 1984 the GOS had accumulated a debt estimated at $9 billion with annual debt service obligations about equal to export earnings. Increased assistance to irrigated agriculture implies further dependence on a steady flow of foreign exchange for fertilizer, pesticides, fuel and spare parts to keep the irrigation infrastructure working. The level of capital investment per feddan far exceeds that of even the mechanized rainfed subsector, and certainly does not reflect the scarcity of capital versus labor in the Sudanese economy. The schemes' heavy dependence on imported inputs, moreover, diverts scarce foreign exchange to the public sector, causing an inefficient market allocation of hard currency that squeezes the dollar supply available to the private sector.

Most importantly, selected investments in rainfed agriculture will generate higher net foreign exchange earnings than equal investments in the irrigated subsector. The World Bank concluded in November 1983 that Sudan has a clear comparative advantage in producing nearly all crops for export and that most crops grown under rainfed conditions, particularly sorghum and sesame, show a higher comparative advantage than their counterparts grown on irrigated land. A USAID analysis of Sudan's exchange rate conversion formula for exports, completed in October 1984, reconfirmed the Bank's conclusions on both the general comparative advantage of Sudan's export crops (at a LS 2.2/$1.00 exchange rate) and mechanized rainfed sorghum's edge over its irrigated counterpart. The USAID analysis assumed yields of 6 sacks per feddan for the irrigated subsector and 2-1/2 sacks per feddan for rainfed sorghum. Both of these yields slightly exceed those experienced in 1984/85, but are comparable with yields during the 1983/84 drought. Widespread dissemination of hybrid sorghum seeds should result in the same or possibly a greater comparative advantage for mechanized rainfed sorghum where field tests have resulted in higher average yield increases than in the irrigated subsector (500% vs. 300%).

D. <u>USAID Program</u>

Within the rainfed subsector, USAID has concentrated its assistance geographically to the west and south. Both regions are important for their unexploited land, the types of crops and livestock raised, the large number of farmers, and the location of important market centers. The prevalence of private agriculture in this subsector also creates the potential for complementary public and private investments to achieve a large impact per

unit of public contribution. With Sudan's $9 billion debt, such limited dependence on government financing is critical to long-term, self-sustaining growth.

1. Policy Reform

Possibly the GOS's most important role in agriculture has been its efforts at policy reform. From early 1981 to February 1985, the GOS devalued its commercial foreign exchange rate by 312.5 percent. These devaluations have provided the principal price incentive for agricultural exporters. To be sure, the exchange rate regime remains complex and distorted. Until Februry 1985 there was an official government exchange rate of LS 1.3/$1.00. Exporters can now convert their foreign exchange at the commercial rate of LS 2.5/$1.00, but it is not clear who can buy foreign exchange at this rate. Recently, commercial banks opened a free foreign exchange window at LS 3/$1.00, but the term is really a misnomer. Individuals can sell foreign exchange at the "free" rate, but there are no opportunities to buy it back outside of the black market.

But for agricultural exporters, several changes have been positive. Most importantly, the GOS dropped its export foreign exchange formula which imposed a heavy implicit tax on private exporters. Before October 24, 1984, exporters were paid in pounds at a LS 1.42/$1.00 rate, based on 75 percent of export earnings converted at the old official LS 1.3/$1.00 rate and 25 percent at the old commercial rate of LS 1.8/$1.00. Exports are now fully priced at the commercial rate of LS 2.5/$1.00, which represents a 76 percent price increase.

USAID has participated throughout the GOS policy reform process. The Mission's internal analysis of the 75/25 exchange rate formula was the principal analytic piece that led to its abolition. Other agricultural pricing reforms have been linked with the PL 480 programs and the Agricultural Planning and Statistics Project. Most importantly, explicit budget subsidies and implicit foreign exchange subsidies (based on a LS 2.5/$1.00 rate) have been eliminated on bread prices. Technical and commercial trials have been made on blending wheat with sorghum flour to reduce the imported grain content of bread. All of these measures could have had a significant impact on substituting domestic sorghum for imported wheat had not the drought sent domestic sorghum prices on an unchecked climb. In fact, most GOS policy changes have been mitigated by inflation, tax distortions and market rigidities. Reforms have simply kept the economic environment from growing worse. Superficially, this may seem self-defeating. More constructively, it emphasizes the need for a continuous policy dialogue to complement project activities until the market is allowed to play a greater allocative role in the economy.

2. Western Initiatives

Within this complex policy context, USAID has sponsored a number of studies to identify several constraints to rainfed cultivation. The baseline strategy paper (an "Agricultural Strategy Assessment") was completed by a

consulting team from Development Alternatives and Research Triangle Institute (DAI/RTI) in January 1982. DAI/RTI concluded that the major production constraints in western Sudan were marketing, labor availability, technology, disease, and environmental degradation. The study also indicated that poor infrastructure hindered economic activity in all areas outside of the principal transportation network. Sigma One Corporation's analysis of "The Structure of Incentives in Sudan's Rainfed Agricultural Sector" emphasized that research, infrastructure and agricultural services must be combined with appropriate farmer incentives to have an impact on production.

These general strategy papers have been followed with applied research and narrower studies that have addressed technical issues affecting yields and marketing issues that influence farmer incentives. AID's Collaborative Research Support Program with International Sorghum Millet Breeders (INTSORMIL) has helped identify drought-resistant grain varieties suitable for north Kordofan. INTSORMIL also conducted some of the earliest research on economic and social factors that affect farm-level decision making in Kordofan. Louis Berger's March 1983 report, "Kordofan Region Agricultural Marketing and Transport Study," expanded on the social and economic dimensions of agriculture. The report stressed that more reliable, low-cost transit and access to storage facilities will improve producer incentives, access to markets and, in turn, income. Checchi and Company's "Kordofan Region Agricultural Credit Study" (November 1983) concluded that producer incentives are also greatly affected by seasonal cash flow constraints that reduce a farmer's options for selling his crops. The feasibility of the feeder road, storage and credit activities recommended in the Berger and Checchi reports was confirmed by Wilbur Smith (for roads) and Kansas State University (for storage and credit) in 1984.

USAID focused its initial agricultural activities in Kordofan on applied research. In 1978 AID joined with the World Bank and GOS to finance the Western Sudan Agricultural Research Project (WSARP). The project was designed to develop four agricultural research centers in Kordofan and Darfur that would adapt research to distinct agro-climatic zones. The research station in Kadugli has been fully operational for four years and the El Obeid research program completed its second year. Construction delays have impeded research in Darfur. Over the past six months the project has been reviewed extensively, and technical assistance will be limited for the time being to the Kadugli and possibly El Obeid stations. A research base now exists in Kordofan, and project staff have been instructed to focus their experiments on high impact activities that can be readily extended to farmers.

Research outputs will complement the price policy and marketing transport activities now at the focus of USAID's program. The transition from research to infrastructure was considered a prerequisite to agricultural activities that require extensive administrative and financial resources. For example, various external studies* and USAID analyses have concluded that even before embarking on traditional agricultural activities such as formal extension programs, the fundamental problems of reaching production areas and storing and moving crops and inputs must be resolved. Analyses have also shown that increasing production without providing transport to export sites and shortage areas will only depress producer prices in isolated production pockets. Agricultural benefits, however significant, represent only a portion of the impact of improved infrastructure; roads and other transport developments have extensive social benefits such as access to health centers and government services.

Two types of linkages in the transport system are necessary to provide access to markets for selling crops and purchasing inputs:

a. linkages to major urban and international markets to absorb cash crops, livestock and surplus food crops; and,

b. intra-regional transport links between major production and marketing centers.

In the west, transport initiatives have focused on connecting Kordofan with major transportation arteries on the White Nile and then connecting this inter· gional marketing link to production areas and storage sites.

The Western Agricultural Marketing Road between Kosti and El Obeid is the principal component of the interregional transport strategy. The Kosti-El Obeid road, authorized in 1984, is being cofinanced with the African Development Bank and the Norwegian Government. El Obeid is the capital of Kordofan Region and serves as an important marketing center for the entire west. Kosti, located 250 kilometers south of Khartoum (336 km by road), is served by all weather roads to Khartoum and Port Sudan. Kosti is also an important port on the White Nile River and is served by the national rail network. South from El Obeid, the Dutch are completing an all-weather gravel road to Dubeibat where a paved road extends south to Kadugli, the capital of South Kordofan Province. Rail lines from Dubeibat link Darfur, the westernmost region, with the rest of the country. Because of high traffic counts on the Dubeibat-El Obeid gravel road, USAID will provide imported equipment through the CIP to help the GOS and the Dutch upgrade the road to a paved standard. USAID also plans to commit local currency to help improve the El Obeid-En Nahud road, which reaches into Sudan's principal groundnut production area. By 1991, Kordofan Region will have access to all major domestic markets and points of international trade.

---

* Louis Berger (1983), Kordofan Region Agricultural Marketing and Transport Study; Checchi and Co. (1983) Kordofan Region Agricultural Credit Study.

3. Kordofan Rainfed Agriculture Project

KORAG is the second component of USAID's transport and marketing strategy. The project will address three interrelated problems -- farm-to-market transport, crop storage and seasonal cash flow constraints -- in order to increase production incentives and give farmers the means to increase production. Farm-to-market road improvements will bring production areas into contact with the interregional transportation network, thus maximizing the production impact of the Kosti-El Obeid road and other paved roads in the region. The improved feeder road network also complements other USAID activities in the region, particularly the distribution of improved seeds and dissemination of new technologies developed through WSARP. With USAID extending its CIP to target agricultural imputs to the regions, improved transportation linkages will become even more important to our overall program's success. Our Petroleum Initiative CIP will provide an important backdrop to our transportation activities by helping secure fuel supplies for rural areas. Road maintenance will be addressed as a long-term policy reform under a PL 480 Title III program scheduled to begin in FY 1986.

In addition, the proposed project will provide farmers with access to storage facilities and inventory loans that will allow them to hold their crops to capture profits from seasonal price fluctuations. The credit component also ties into our CIP and PL 480 programs by taking local currency generations and reinvesting them in revolving credit funds to support private production in rural areas. Another reform measure under the new Title III program will be agricultural lending policies, particularly recovery of capital and operating costs. The storage component will help restructure the agricultural marketing system since only merchants and large-scale farmers in Kordofan presently can afford to store their crops and sell them when prices rise several months after harvest. Most commercial storage facilities, moreover, are in poor condition and have post-harvest loss rates averaging 18 to 25 percent, depending on the crop and time of storage. The result is that most producers gain just a small portion of agricultural marketing profits and have little incentive to expand production once they have planted a minimum acreage to guarantee a basic income.

As a whole, the project provides a model for a two-tiered approach toward private sector involvement in our project activities. From an implementation standpoint, the project relies on private sector participation to maximize efficiency, reduce the administrative burden on government institutions, and limit bureaucratic growth. The private sector is also the target of our activities. When placed together, infrastructure investments for roads and storage should raise farmer income and enable farmers to adopt new technologies without the need for government subsidies. Demand for seeds and other agricultural inputs would then expand private trade. Increased incomes would provide a broader tax base that would help finance a more sophisticated range of development activities. Once market linkages begin to create interdependencies, an environment is established for self-sustaining growth.

E. GOS Policy

The Government of Sudan has increasingly acknowledged the importance of private, rainfed agriculture for Gross Domestic Product and exports, and has reflected this concern in its investment policy. Sudan's fifth (and most recent) Three Year Public Investment Program (TYPIP) restricts all new agricultural projects to the rainfed subsector. Two thirds of the agricultural budget still goes to irrigated agriculture, but only to complete ongoing infrastructure rehabilitation. Transport and Communication investments, the second largest budget category behind agriculture, will also benefit the rainfed subsector by creating access to production and marketing centers through road and rail improvements. New rainfed project priorities include multipurpose storage, livestock routes, and reforestation. New road construction will primarily affect rainfed areas since the existing transport network already connects the principal irrigated schemes with domestic and international markets.

In response to planned public investments and export policy incentives described earlier, the private sector is expected to spark Sudan's recovery from drought. The TYPIP projects that the private sector's share of GDP will grow from 70% to 72% from 1983/84 to 1986/87. Private rainfed agriculture is given a leading role. Over the same period its respective shares of GDP and total agricultural production are planned to increase from 20% to 23% and from 69% to 73%. These projections are only planning estimates, but the expected trends suggest growing confidence in the private sector and rainfed agriculture. Implicitly, the GOS has traded off the risk inherent in rainfed cultivation with the proven responsiveness of private producers to policy and infrastructure incentives.

The Kordofan regional government has developed similar attitudes toward rainfed agriculture and the private sectors. The 1983/84 regional budget highlighted rainfed agriculture and related infrastructure as the primary investments that will benefit most of the region. In practice, budgetary constraints mean that funds generally cover recurrent costs and salaries rather than new investments. But when funds have been available for small-scale projects, the region has allocated them to production-related activities such as feeder road improvements, resource surveys, and cooperative poultry farms. Regional cooperation with the private sector still must develop further, but officials appreciate the private sector's economic importance relative to the limited regional budget. Production-related infrastructure investments are considered a means to both stimulate agricultural and manufactured outputs and attract private capital.

The components of this project coincide with evolving regional and national priorities. Both levels of government have stressed the need for improved feeder roads to complement investments in main roads and to bring services to rural areas, now inaccessible during the 4-month rainy season from June to September. The central government already has a master plan for feeder roads completed by Norconsult in May 1980. This plan is being updated based on regional production levels and traffic counts. The regional

government does not have a feeder road improvement plan, but it identified all roads to be improved under the project. These roads coincide with the national master plan.

The regional and national governments have also called for increased storage capacity to improve food security and facilitate agricultural marketing. A grain storage study completed for the Ministry of Finance and Economic Planning in 1982 concluded that by 1985 the Sudan will have capacity for only 54 percent of total storage demand. The Agricultural Bank of Sudan finances some storage facilities, but is limited by capital constraints. The Kordofan government hopes to fill the regional storage gap through private sector investments and additional storage and credit programs run by the ABS. Its strategy for increased security and recovery from drought, released in February 1985, calls for regional stockpiles of sorghum, the staple grain.

At both national and regional levels, then, the GOS has given increasing policy and budgetary emphasis to rainfed production, particularly to private farmers and marketing channels. Both public and private sectors agree that basic infrastructure improvements are critical to stimulating growth. As long as policy decisions continue to maintain production incentives, complementarity between public and private investments in the rainfed subsector should continue and thereby reinforce recent developments in GOS planning.

F. Logframe Narrative

The goals of this project are to increase production in the rainfed agricultural sector of western Sudan, to increase producer incomes as a direct result of decreased transport costs and better access to markets, and to increase Sudan's export earnings while promoting foodgrain self-reliance. Because KORAG completes a set of marketing and transport activities in Kordofan that are preconditions to self-sustaining growth, the project's long-term goals are identical to those of USAID's other major marketing project in the West, the Western Agricultural Marketing Road. As indicated earlier, the two projects constitute a complete interregional and intraregional transport strategy. Research outputs from WSARP will provide a technical complement to improved market incentives, thereby promoting overall production and foodgrain self-reliance.

The project purpose is to complete an agricultural marketing and transport network in Kordofan. The purpose has three components tied to the project's feeder road, credit and storage activities. The purpose of improved storage facilities is to increase farmers' profit margins from current production levels. Increased profits will be a function of obtaining peak seasonal prices and reducing losses during storage. The credit component will alleviate cash flow constraints that preclude farmers from responding to seasonal market signals. Feeder roads are intended to improve linkages from production areas in Kordofan to the interregional transport network and key regional markets. Lower transport costs will also contribute to higher

farmgate prices. By constructing the feeder roads and storage facilities with primary inputs from Sudanese engineers and contractors, the project aims to develop the indigenous skills necessary to replicate similar transport and marketing activities in other areas.

The critical link between purpose and goal is that an improved agricultural transport and marketing network will translate into increased income for agricultural producers. Higher incomes are expected to give farmers the flexibility and incentive to increase production and, in turn, their marketable surpluses. Market improvements that translate into higher prices are also expected to encourage production and sale of food and cash crops, thus increasing export earnings and reducing import dependency. The current drought, however, has made it painfully clear that all of these relationships are predicated on adequate rainfall. Without sufficient rain for farmers to produce, the project assumes a food security focus as described in the project rationale. For planning purposes, we have left adequate rainfall as an uncontrollable assumption in the logframe with the assurance that the project still remains relevant under drought conditions.

Several studies suggest that improved road conditions will lower transport costs by reducing the time needed for travel and the difficulty of conditions, enabling greater use of more fuel efficient transport vehicles, and encouraging competition among trucking firms. A competitive trucking industry already exists in Sudan, plying the routes the proposed roads will take. At present, transportation costs account for a relatively large proportion of the retail price of agricultural commodities from Kordofan, mainly because of high operating and maintenance costs for vehicles. Louis Berger's 1983 analysis for the Western Agricultural marketing Road estimates that in the short term (1 to 4 years) less than half of the transport cost savings will be passed on to farmers, although even this is substantial. In the medium term (5 to 9 years) they should receive the full transport savings. Over the long run, foodgrain cultivators are expected to diversify into exportable cash crops once they have met domestic food demand.

AID-assessed road projects have reaffirmed that better access between farm and market has resulted in substantial increases in farmgate prices and greater profits if farmers transport their own crops to market. Farmers have also paid lower prices for inputs such as fertilizer and other chemicals, and often had more buyers of agricultural products coming to the farm gate. One recently completed study of the Southern Access Road showed, for example, that livestock producers along this route (connecting southern Sudan with Kenya) now receive higher prices for their cattle. Provided the transport industry is competitive, constructing new roads in areas dominated by the rural poor has increased the chances of raising incomes and improving living standards. When complementary services are offered, such as agricultural extension and credit, the poor partake more fully of potential benefits offered by improved roads.*

---

* Rural Roads Evaluation Summary Report, March 1982, AID.

A second link between goal and purpose is that farmers, with a more reliable outlet for their produce at higher prices, will increase production and be more willing to enter the commercial market. The basic assumption is that farmers are price responsive and will produce accordingly. Studies conducted in Kordofan by the Department of Rural Economy at the University of Khartoum have traced statistically significant links between expected commodity prices and acreage and crops planted. Economic assessments conducted by AID-financed consultants also give credible support to this assumption. New road projects have been followed by substantial and sometimes dramatic increases in agricultural production, especially where agricultural extension and transport services were available. New roads in Thailand and Honduras resulted in significant changes in farm financing and technology. These consisted of increased use of credit, new seed varieties and, in some cases, mechanized farm equipment. Improved road access stimulated both visits by farmers to local markets and visits by buyers to the farm gate.

It should be noted that in all of these evaluations the host country's trucking industry enjoyed open competition. This is currently the case in Sudan and indeed is a third important link from purpose to goal. Both intercity freight and road passenger vehicles are owned and operated largely by private companies. In 1970, 62% of all freight-carrying vehicles were owned by private companies and individuals and 38% by GOS agencies. By 1977, the proportion of private freight-carrying vehicles had increased to 69% and correspondingly that of the public sector had decreased to 31%. In 1979, the respective shares were 71% and 29%. Except for a few large companies, the majority of investors are small businessmen, usually owning fleets of 5 vehicles or less.

Overall producer capability to respond to price and income incentives will ultimately be determined by the extent of the sheil system's control over production and consumption patterns. A fourth link between purpose and goal is that production and inventory credit will give farmers an alternative to informal credit. By no means is the project expected to reduce all informal lending. Cash requirements are ever-increasing and the sheil system will always remain accessible and reliable. But once farmers can finance part of their production through alternative means, they will retain at least some control over their crops and be able to participate more fully in the market place. The Agricultural Bank of Sudan's project in Um Ruwaba has shown that sheil credit and formal banking can coexist. The growing demand for cooperative financing indicates that farmers have benefited from ABS credit.

Finally, the project assumes that fuel and spare parts will not be a constraint to achieving project objectives. While petroleum availability has been a continuing problem in Sudan over the past few years, recent developments give reason for optimism regarding future supply. USAID's planned Petroleum Initiative Commodity Import Program will help guarantee financing of petroleum imports. The Petroleum Initiative will also serve as leverage for acquiring additional financing for petroleum imports from private

oil marketing companies as well as from other donors and the GOS. As part of a policy reform package accompanying the financial assistance, the GOS has complete a study to deregulate the price of diesel, which is the major fuel in the rainfed agricultural sector for both transport and mechanized farm operations. Policy action on this study is imminent.

Judging from the activity of the private sector in El Obeid's industrial area where most regional truck repairs are done, the availability of spare parts for the trucking industry is not a serious constraint to the continued operation of the transport sector. Importation of spare parts for all types of vehicles increased greatly from 1974 to 1979, although proportionately the share of the value of spare parts in road vehicle imports decreased during that time. This, according to a study by the Ministry of Finance and Economic Planning, was primarily the result of the increased availability of better roads which has reduced the need for spare parts.

The proposed linkages between project purpose and goal are reasonable when viewed against USAID's agricultural strategy, the importance of Kordofan in Sudan's agricultural sector and USAID's project portfolio in the west. The Western Sudan Agricultural Research Project is providing a strong technical base in the west for increased crop production. Similarly, the Western Agricultural Marketing Road will create an all-weather link to Sudan's major markets and international outlets. In addition, the Agricultural Planning and Statistics Project is providing technical assistance to the Ministry of Agriculture in an effort to implement policy changes on consumer and producer prices for all agricultural products. Higher producer prices through policy reforms such as exchange rate devaluation will complement this project's efforts to increase profits and encourage greater production. Increased consumer prices for wheat will stimulate demand for its closest substitute, domestically produced sorghum. Finally, USAID is earmarking a portion of the annual Commodity Import Program to import agricultural inputs for private sector use in the rainfed sector. A significant share will most likely go to private producers in the Kordofan Region. Taken together, these USAID projects present a complementary package of development interventions for the agricultural sector which will lead to greater private initiative and production in the west.

III. Project Description

A. Introduction

USAID has based the Kordofan Rainfed Agriculture Project (KORAG) on its agricultural sector assessment and various strategy and technical papers discussed in the background and rationale section of the PP. Two components of the project, feeder road improvements and storage facilities, complete a marketing and transport network in Kordofan. Farm-to-market roads link production areas to transportation arteries. Storage sites provide a holding point between producer and consumer, allowing higher marketing profits from seasonal price increases. The third component, credit, gives farmers the financial flexibility to store their crops.

KORAG's regional focus creates both problems and opportunities. Project devolution to a regional level allows direct beneficiaries to plan and participate in project implementation. It capitalizes on the knowledge and interests of those with most at stake in a project's success. Regional governments, however, have limited financial and administrative resources. The central government has made it official policy to transfer power to regional governments, but much confusion remains about control over taxing authority, revenue collection and procurement channels.

In many cases it may prove more efficient to approach regionalization in stages to give inexperienced regional governments practice in basic contracting procedures and project management while cooperating with more experienced agencies and expatriate advisors. KORAG sets a precedent for national institutions to decentralize their responsibilities and cooperate with regional governments rather than recreate a new regional institution for each project activity.

As regional skills develop, the Kordofan government will incorporate some aspects of project management into the existing government framework. With feeder roads, for example, Kordofan's cooperation with a regional Roads and Bridges Public Corporation (RBPC) office would capitalize on RBPC's contracting, supervision and maintenance experience. Regional officials would supplement technical skills with administrative and clerical staff who would develop fundamental skills in project management. ABS/regional cooperation on storage and credit has similar advantages. The ABS provides procurement, management and financial experience. The regional government can act as a resource for agricultural extension once credit cooperatives are organized. Overall, project training is focused on the regional government, field based and practically oriented. Provisions are also made for formal short-term training to supplement hands-on experience. Training provisions under each project component and generalized training funds are summarized at the end of this project description.

By no means is regional/central cooperation a panacea for administrative efficiency. Even with optimal pooling of managerial and technical talents, the public sector does not have the staff to implement this

project. The Sudanese private sector is used for a sizeable portion of it. That, in fact, is the second objective of the project (after regional development)--to bring the private sector front-center in public service activities from which it has previously been excluded. Private Sudanese engineers and contractors, with expatriate managerial assistance, will build the feeder roads. Private management of the storage and credit programs is more difficult, but we have included a private sector activity, with lease/purchase options on three storage sites, to improve private markets for grain and oilseeds. Use of the Sudanese private sector entails risks not heretofore considered in most development projects. We consider taking these risks critical to creating the private skills necessary for self-initiated development in the Sudan.

B. Feeder Roads

1. Project Location

The feeder road component of KORAG links agricultural production areas to transportation arteries. The road area encompasses 900 square kilometers of agricultural land in Kordofan Region. The proposed feeder roads are an integral part of the overall regional development strategy. Currently there exists an all-weather road from Kadugli to El Obeid via Dilling and Dubiebat. Construction is scheduled to begin in 1986 on an all weather paved road from El Obeid to Kosti. KORAG project roads, to be completed in two phases, will extend from Kadugli to Talodi, turn north through Abu Gubeiha, Rashad and El Abbasiya, and connect to the El Obeid road near Umm Ruwaba (see project map next page) for a total distance of 455 kilometers. Phase 1, which will be financed under this project, consists of two sections totaling 292 kilometers: Kadugli to Talodi and Abu Gubeiha to Umm Ruwaba. Phase 2 completes the loop and consists of the section from Talodi to Kologi to Abu Gubeiha. The project will be evaluated in mid 1989 to determine if the construction strategy is successful and merits a project amendment to complete phase 2.

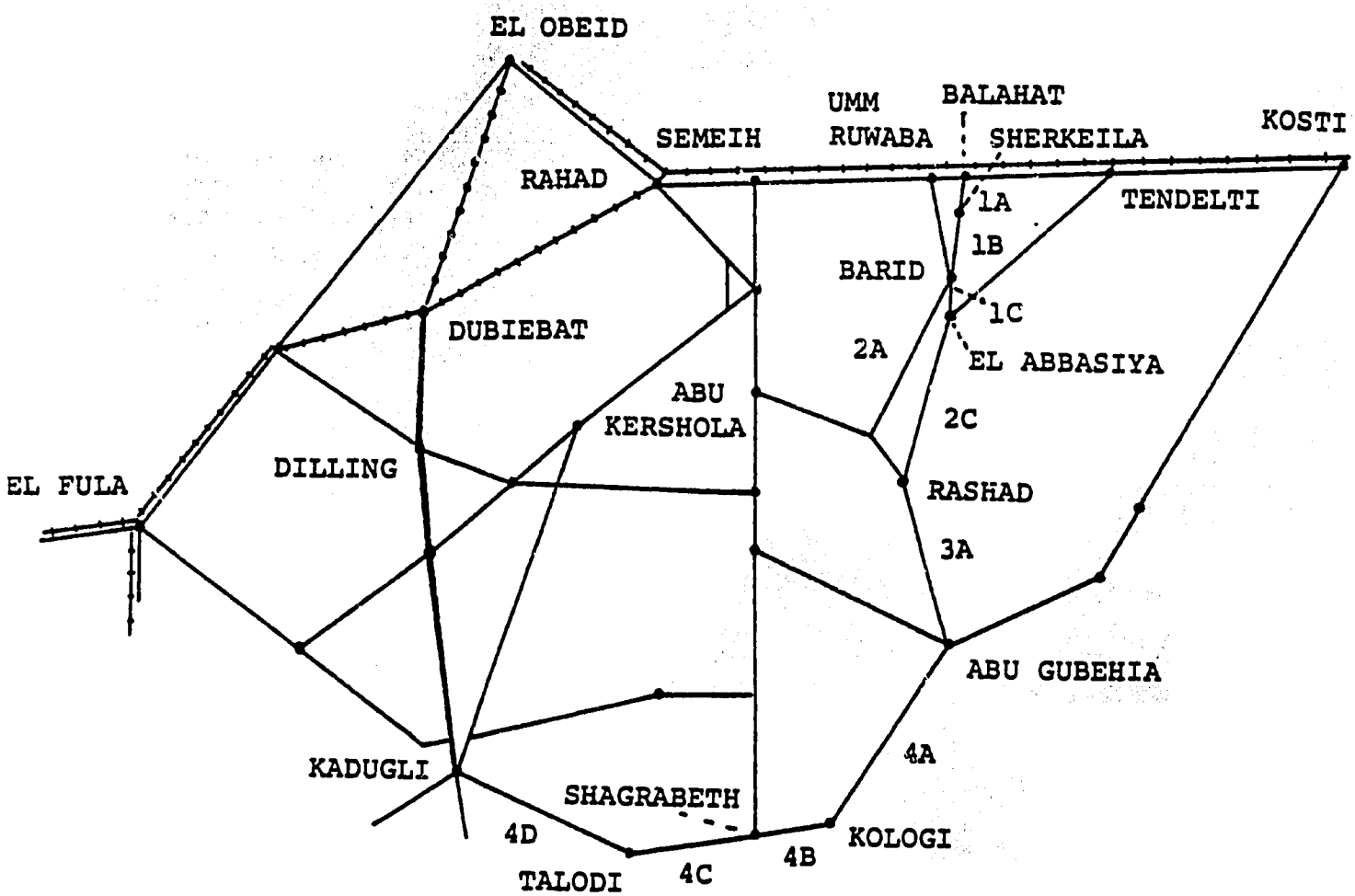
The route passes through areas of loose sand in the north which are difficult to traverse because of the lack of soil cohesion and black cotton soils in the south that are impassable during the wet season due to the inability to support vehicles. With the project feeder roads in place and the El Obeid-Kosti road constructed, the area will be more accessible to the main regional centers as well as from Khartoum and Port Sudan. Direct agricultural benefits will include higher farmgate prices due to lower cost transport costs, better access for extension staff, and easier dissemination of improved technologies. The roads are also expected to open new agricultural production areas and facilitate access to health, social and governmental services.

2. Design Standards

A November 1984 study by Wilbur Smith and Associates confirmed the technical and economic viability of the KORAG feeder road loop and updated the cost estimates in earlier studies by Norconsult in May 1980 and Louis Berger in March and November 1983. The design criteria and cost analysis for this project paper are based primarily on the findings and recommendations of the Wilbur Smith report.

FIGURE II

KORAG ROAD NETWORK



Phase 1 Roads: 1A, 1B, 1C, 2C, 3A, 4D

Phase 2 Roads: 4A, 4B, 4C

SCHEMATIC-STUDY AREA TRANSPORT NET

RAILWAY
PAVED ROAD
GRAVEL ROAD
TRACK
1A STUDY ROAD

36 43

The minimum road standard for the project has evolved since preparation of the PID. The original intent was to improve the tracks sufficiently to make them passable for 30 to 50 percent of the rainy season with routine maintenance but no major improvements after the initial investment. The consultant concluded that such an intermediate standard to improve accessibility during the wet season is not feasible.

Two major impediments are present which prevent vehicle passage during the rainy season - water courses and black cotton soils. During the dry season, some loose sandy areas (predominantly in the northern project area) make passage difficult, while in the southern portion, ruts formed during the rainy season in the black cotton soils harden and create barriers to traffic. Water courses will be made passable by a combination of fords and culverts. No deep, wide water courses were observed by Norconsult or Wilbur Smith and therefore bridges will not be necessary. Assuming rain patterns no greater than in the past, all culverts will be passable the entire year and fords will be passable except for short periods of high water flow, which may occur for 3 or 4 hours. The remaining problems are black cotton soil and loose sand. Approximately 50 percent of the project roads' surface soils are black cotton. The roadway over those areas must be improved with a road formation constructed of rock base material overlaid with a pit-run gravel surface sufficient to make the roadway consistently passable during the rainy season.

Reaching the PID objective of 30-50 percent access during the rainy season, then, requires virtually an all weather roadway. The roadway will have a 6.0 m wide gravel surface, including shoulder widths, constructed on an embankment of an average of 0.5 M height. The gravel surface will be 0.15 M. Side ditches will be located 6.5 M from the edge of the roadway and sloped to reduce erosion adjacent to the road bed.

3. Implementation Strategy

(a) Overall Strategy

Various implementing options for the feeder road component were investigated during project design by the project paper team and by Wilbur Smith & Associates (WSA). The basic objectives are to use and train private Sudanese engineers and contractors and to rationalize and limit government construction activities to contract management. To the extent possible, the implementation strategy should promote USAID and GOS policy to decentralize government activities and give regions a greater role in project planning and execution. Wilbur Smith concluded that private Sudanese road construction capability was untried but adequate to build roads to the proposed standard if provided with expatriate management assistance. Both Roads and Bridges Public Corporation and the Kordofan regional government were considered as possible implementing agents. While WSA felt that USAID was in a better position to select the implementing agent, they did comment that the regional government has no experience in construction contract administration. The regional government does not have a Ministry of Works and

would have to cooperate with an experienced technical unit to implement the project. The proposed implementation strategy is based on technical and administrative cooperation between RBPC and the Kordofan government. During the life of the project, regional staff will be trained in contract administration and basic technical skills, and implementation responsibilities will be transferred accordingly with increasing capabilities.

The engineering and construction contracts will be negotiated and executed by the Roads and Bridges Public Corporation, and they will provide all GOS engineering staff in the field. The regional government will be represented in the contracting process and will name an administrative manager and clerical staff to the implementing field unit. Specific implementation roles are discussed in Section V, the Implementation Plan. Generally, RBPC will have the lead responsibility for the standard components of contract management: selection and negotiations, contract execution, and inspection and acceptance of work. Local currency vouchers will be paid from a project account established in a commercial bank in Kordofan and will have both RBPC and regional government clearance. The A&E firm will assist RBPC with technical supervision of the construction contracts and provide the regional staff with on-the-job training.

Since Sudanese engineering and construction firms have little experience in the design and construction of feeder roads, it was decided that the design and supervision of construction would be carried out by a U.S. engineering firm in a joint venture with a Sudanese firm. Construction will be done by Sudanese firms with extensive managerial assistance from expatriate and Sudanese engineers. This assistance will include, but is not limited to: preparation of work plans, scheduling work, equipment utilization, and preparation of reports. The intended arrangement is for the U.S. firm to guide and supervise managerial aspects of engineering and construction activities while Sudanese firms take responsibility for physical project outputs. Final construction of project roads is weighted equally with development of local construction capabilities.

For the A&E to carry out both functions of representing the owner and at the same time provide assistance and guidance to the construction contractor may appear to be a conflict of interest and the PP team considered alternative arrangements. One option would be to engage two separate firms with the A&E under contract to RBPC and the construction assistance under contract to USAID. This arrangement has the disadvantages of additional cost and potential confrontation between the two technical assistance teams. The subject was discussed in detail with RBPC which chose to use one firm. It is common for the A&E to have a training responsibility and that is essentially what is entailed here. Moreover, the road standards are relatively simple and there is not nearly the potential for conflict over basic standards as in a complex design. It will be necessary for the A&E firm and the construction contractors to understand their relationship clearly: while the construction advisor will assist and guide, he will not execute and will not be responsible. If the contractor does not choose to follow the advise, he risks rejection of the work. At the conclusion of the feeder road component, it is anticipated that RBPC will have developed contracting experience and procedures with Sudanese firms that they can duplicate for simple road construction activities. Through their participation, regional staff will

have improved their capability to administer civil works projects. Sudanese engineering and construction firms will have improved their capabilities to design and construct feeder roads. The strategy will require somewhat more technical assistance than normally provided for such a simple design standard, and the project life may be longer than if the roads were constructed by U.S. firms. However, with the successful transfer of the technology, the benefits will far exceed the additional cost and time (See Implementation Plan, Section V and Administration Analysis, Section VI. C.).

(b) Contracting

The process of consultant selection, contracting and administration of contracts under USAID and GOS regulations is quite difficult and requires considerable experience. RBPC has frequently been through international contracting procedures and is currently doing so on the USAID/ADB financed Western Agricultural Marketing Road. For the engineering services, RBPC will execute a host country contract with a U.S. engineering firm in joint venture with a Sudanese engineering firm. A Kordofan regional government representative will participate in the process of contractor selection. Subsequently, the contract will be administered from a RBPC regional office in Kordofan, rather than the central office in Khartoum, with regional staff participating in administrative management.

The Engineering services will be procured using USAID procedures contained in HB 11. The engineering joint venture will be selected on the basis of experience, ability to furnish qualified personnel, provide full home office backstopping and their understanding of the project implementation strategy. The decision was made to limit the expatriate engineering services contract to U.S. firms because they will need to deal extensively with USAID regulations in addition to being a party in the overall project strategy of transfering skills to the Sudan. Funds have been budgeted for expatriate support of 36 person months short-term design assistance, 115 person months of long-term engineering services, and 90 person months of construction technical assistance. The actual engineering contract will be let for only four of the six budgeted years, and requirements for the final two years of assistance will be determined in a mid-term evaluation. Without a second TA contract, total expatriate assistance will be reduced by sixty person months. Because of the size and the unique implementation plan proposed for this project, a set aside for the principal contractors with small, minority enterprises is not appropriate. However, the U.S. firms may chose to subcontract to a small, minority firm, while maintaining responsibility.

The Wilbur Smith study identified seven Sudanese firms with varying construction experience, primarily as sub-contractors on earth moving projects. The local Caterpillar dealer has identified several others considered capable of handling the simple road standards. Most local contractors have never actually planned and executed a major road project as an independent private enterprise, but the major contractors have experience as former RBPC staff or with large firms in the Gulf States. These firms have varying amounts of equipment and some familiarity with contracting

procedures. However, as pointed out by the Wilbur Smith study, the proposed feeder roads are not difficult to construct, the terrain is relatively flat, its alignment is relatively straight, and no major bridges or structures are required. The segments of work under the contracts will purposely be small, approximately 40-50 km over a two year period plus six months mobilization, in order to minimize the risk of a long commitment with a poor contractor.

In addition to the construction assistance, USAID will make available assistance to potential construction contractors for preparation of bids. The Sudanese contractors are not experienced in preparing bids on a detailed bill of quantities. They will also need assistance in programming their work, selection and scheduling of equipment, and examining equipment leasing options described below. This assistance was recommended by the Wilbur Smith study and should result in the preparation of complete and responsive bids, thus potentially preventing an extended bidding period. Two U.S. multinational firms based in Sudan have already indicated their willingness to provide such assistance for local currency payment.

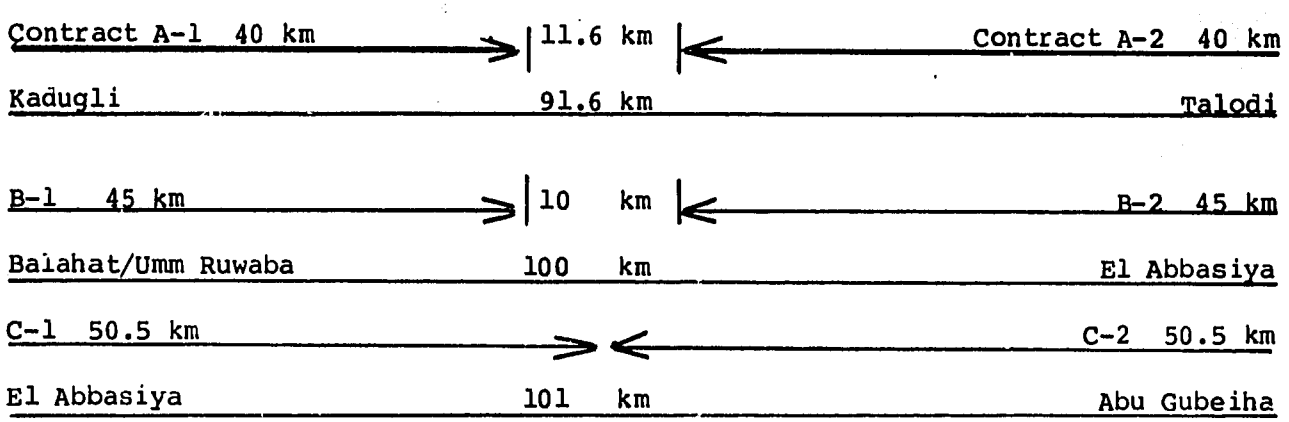
(c) Timeframe

As detailed later in the Implementation Plan (Section V), the first 1 1/2 years of the project will be used to obtain engineering and construction assistance services, prepare the design and specifications, survey and obtain right of ways, plus bid and award the first two construction contracts. After approximately 18 months, two construction contracts will be awarded 30 days apart for the 80 kilometers of the approximately 92 kilometer Kadugli/Talodi stretch (Contracts A-1, A-2 in Figure III). One contractor will start at the northwest end working east with the other working towards him. The middle portion will be retained as an incentive and awarded to the better contractor. One year later two more construction contracts will be awarded for the Balahat-El Abbasiyya segment (contracts B-1, B-2), again with the two contractors working towards each other to stimulate competition. Assuming improved contractor capability, the final segment will be fully awarded in two contracts following the completion of the Kadugli/Talodi segment. The middle portion of each segment will be used for extension of the construction contract prior to completion of the end sections to one of the contractors, depending upon their progress. Assuming completion of the Kadugli/Talodi segment in two and a half years (6 month mobilization plus 2 years construction), there will never be more than four contracts in progress at any one time.

Figure III

Construction Contract Distances

(Approximate distances)



USAID considered various alternatives for awarding the middle portion of each road segment that would maximize contractor incentives while minimizing the potential for escalating unit costs or graft. Our initial proposal was to award 30 kilometer contracts at the end of each segment and award the balance to the best performer. While this had maximum performance incentives, the short contract length would result in high unit costs. In addition, the contract extension would be subjective, and it would be difficult to guarantee reasonable unit costs without competition. A reasonable compromise between incentive and cost objectives is to extend the initial contracts to 40 kilometers and have the contractors submit a supplemental bid for the balance of the road with the original 40 kilometer bid. RBPC will reserve the right to award the follow-on contract, based upon the efficiency, speed and quality of the contractors, as well as the cost of the supplemental bid. This approach is consistent with Sudanese contracting law.

4. Equipment and Fuel

It will not be necessary for USAID to import construction equipment specifically for the project as now planned; the only equipment that will be purchased by USAID is the project vehicles. To construct the KORAG feeder roads to the required standards in segments of 45-50 km does not require a large fleet of earth moving equipment (see Annex 6A). A survey of local contractors shows that some presently have several pieces of the necessary equipment (See Annex 6A). One contractor has enough equipment to supply more than four other contractors and is willing to lease and maintain the equipment as long as he can meet his own needs. The local Caterpillar dealer is prepared to provide contractors with lease/purchase arrangements for any equipment needed with payment in local currency. Caterpillar would also maintain the equipment and provide training courses for contractor mechanics as part of their leasing arrangements.

During the prequalification of the construction contractors, it will be possible to determine the approximate quantity of equipment that will be leased, if any. At that time, USAID will formulate a policy regarding limits on advances for down payments on lease/purchase contracts since most constractors will not have the necessary funds up front. The size of the contracts are sufficient to permit contractors to retain ownership on lease/purchase arrangements during the life of their contracts. Sudanese contractors will need the technical assistance previously referred to in preparing their bids to take advantage of the options available for obtaining the equipment.

Fuel supply presents a problem. Normally the contractor is responsible for furnishing fuel. At this time in Sudan, the contractor cannot rely on purchasing fuel locally because of frequent shortages. It is impractical for Sudanese contractors to import fuel due to the tight foreign exchange market. The best alternative is to capitalize on the Western Agricultural Marketing Road (WAMR) project which will employ a relatively large U.S. construction contractor who will be responsible for importing and storing large quantities of fuel for use on the project from Tendelti to El Obeid. As now scheduled the U.S. contractor will have completed his mobilization prior to the mobilization of the KORAG feeder road contractors. During contract negotiations with the WAMR contractor, arrangements will be made for importing the fuel needed for KORAG feeder road construction. This could be done by having the KORAG bidders identify the cost and quantity of fuel in their bids. It would also be a separate line item included in the cost of the KORAG contracts for evaluation purposes but not a pay item to the contractor. RBPC would purchase the quantity of fuel identified from the WAMR contractor by contract or purchase order, with payment made through a Direct Letter of Commitment from USAID. Payment would be made on the basis of invoices certified by the contractor, A&E consultant and RBPC. The Wilbur Smith study estimates that 280,000 gallons of diesel fuel and 28,000 gallons of gasoline will be required for each 40 km of construction.

5. Maintenance

Maintenance was a major concern of the PP team. Road maintenance costs and possible approaches were addressed in detail by Norconsult, Louis Berger and Wilbur Smith in their respective studies. Particularly for feeder roads, Wilbur Smith stressed that local groups have both the interest and capability to contribute to routine maintenance. Wilbur Smith also detailed maintenance requirements and schedules for the life of the project. The biggest stumbling block for all consultants, however, has been describing an administrative plan for maintenance sometimes four or five years before actual maintenance work is scheduled to begin. If the construction contractors maintain the KORAG roads as they construct them, other administrative arrangements for routine maintenance will not be implemented until 1990. Periodic maintenance will not begin until 1995. Any plans envisioned now may become irrelevant or inoperable, depending on evolving local conditions, fiscal policies, and even this project's own success in training local contractors. Instead, we have adopted a two-pronged maintenance strategy that depends exclusively on contractors for routine maintenance in the short term and leaves long-term administrative plans for routine and periodic maintenance to be determined in conjunction with several major changes in national and regional road maintenance policies expected in the next three years.

Until recently, road maintenance was not a serious problem because 70 percent of the major highway system of 2,245 kilometers was constructed during the past decade. Initially road upkeep simply did not require a great deal of attention. With many roads beginning to deteriorate, donors and the GOS realize that something must be done. At a national level, general road maintenance concerns are being addressed through the IBRD's $18 million Third Highway Project that will provide technical and planning assistance, training, workshops, materials and equipment for maintenance. Highway Three will also consider RBPC organization, annual budgets for maintenance and new construction, and alternatives for financing maintenance costs. The extent to which the GOS implements the project's findings will set the macro context for financing and implementing road maintenance.

These macro or national policies will be incorporated into a Kordofan maintenance strategy as part of the Western Agricultural Marketing Road Project. In mid-1988 USAID will sponsor a regional road maintenance study to specify a maintenance approach for the Kosti-El Obeid-Kadugli paved road network. To capitalize on the opportunity to coordinate these national and regional activities with a local program for road maintenance, USAID will expand the 1988 WAMR study to recommend an administrative plan for maintenance of KORAG roads. The project budget includes $75,000 to expand that scope of work. This study will be the centerpiece of KORAG's long-term maintenance strategy.

One of the study's objectives will be to define the maintenance responsibilities of RBPC and the regional government. RBPC currently has a clear maintenance mandate for the Kadugli-Talodi road, but maintenance

responsibility for other roads is unspecified and by default rests with the regional government. As the principal implementing agent for construction, RBPC will have temporary responsibility for coordinating maintenance on all project roads and inspecting contractor performance on routine maintenance during construction. Once maintenance responsibilities are defined, RBPC will phase out those sections under the regional government's mandate based on a schedule acceptable to RBPC, USAID and the regional government.

Implementation options for each road segment's upkeep will also be recommended as a subset of maintenance responsibilities. For example, in cases where the regional government is responsible for maintenance, local groups or private contractors may do the work. Most likely, private contractors will have to perform all the heavier, periodic maintenance on regional roads. As the responsible entity, the regional government acts as a coordinating body. The implementation options will suggest who should carry out the maintenance requirements. These options will maximize beneficiary involvement in routine maintenance and possibly simple earthworks. Periodic maintenance, to the extent feasible, could be contracted out to firms trained under the project.

During the life of the project, routine maintenance costs will be financed from PL 480 local currencies, with the level of PL 480 assistance adjusted after the life of the project depending on GOS financing capability. GOS policy measures to raise revenues for maintenance will be encouraged through repayment forgiveness on Title III commodities beginning in FY 1986. Wilbur Smith estimated annual routine maintenance costs (both basic and variable) at LS 970 per kilometer or LS 283,820 for all Phase I roads in 1985 terms. The annualized cost of periodic maintenance done every five years beginning in 1985 is estimated at LS 1200 per km or LS 351,120. This gives an average annual maintenance cost of approximately LS 634,940 in 1985 terms. Given that the total RBPC maintenance budget in 1983/84 was LS 1.7 million, it is clear that the GOS currently cannot finance maintenance costs. Assuming that the construction contractor will be responsible for maintaining the road during construction plus six months afterwards, a total of LS 1.22 million in excess of the construction contracts is budgeted for routine maintenance. Periodic maintenance will not begin during the life of the project.

Routine Maintenance Cost

Year	Units	Total
1990	92 km X LS 1,787/km[a]	164,404
1991	192 km X LS 2,019/km	387,648
1992	293 km X LS 2,282/km	668,626
Total		1,220,678

a 1985 cost escalated at 13% per annum.

6. Maintenance of the Arterial Road Network: Kosti-El Obeid-Kadugli

Construction on a 301 kilometer road from Kosti to El Obeid is scheduled to start in 1986. The north end of the KORAG feeder roads as well as the existing road from El Obeid to Kadugli will intersect the Kosti-El Obeid highway. Maintenance of this main artery connecting western Sudan with the country's domestic and international markets is critical to creating the market demand necessary to stimulate agricultural growth in the project area. USAID will finance all maintenance facilities for the road as well as a regional maintenance plan under the Western Agricultural Marketing Road Project.

The 98 kilometer road linking El Obeid to Dubeibat was recently improved through Dutch financing from a track to an engineered gravel surfaced road. Due to increased traffic, the Dutch, GOS and USAID have decided to upgrade this section with a double surface asphalt chip seal treatment. Plans and financial arrangements are being finalized, and construction will commence in 1986. USAID will contribute equipment through the Commodity Import Program.

The 186 kilometer road from Dubeibat to Kadugli, constructed in 1976, has a single surface treatment which is deteriorating badly. The surface has worn its normal course, but needs immediate repair. With the current shortage of maintenance funds, this road has low priority compared to the Khartoum/Port Sudan road. RBPC does have a maintenance facility at Dilling, but its routine maintenance allocations have averaged just 20% of the requested budget since 1979/80. No periodic maintenance allocations have ever been made. Given the overall importance of the road for Kordofan's agriculture, USAID has initiated discussions with RBPC for a local currency project to rehabilitate the road. Expected cost of the project is LS 14 million over 4 years, with the equipment from the El Obeid-Dubeibat road being used for the surfacing.

C. Storage

Seven grain warehouses will be constructed under the storage component. The objectives of this component are to increase overall regional storage capacity, reduce losses, improve storage conditions and practices, introduce quality control into the marketing system and, together with the credit component, improve farmgate prices. Technical assistance will be provided to ensure proper design, construction and operation, in addition to facilitating ownership and operation of three of the warehouses by the private sector. Although there are currently storage facilities in Kordofan Region, the structures are used for multipurposes, are generally small, brick stores, and neither their construction nor their generally poor condition allows for proper grain storage or sound management processes. Kansas State University estimated that weight losses in sorghum are in the range of 6-7 percent and damaged kernels run from 12-13 percent, for an annual loss rate of 18-20 percent.

Of the seven warehouses, six will have 3000 MT (33,000 bags) capacity, and one 6000 MT (66,000 bags) capacity. Warehouses smaller than 500 MT with less than 50% usable volume would greatly increase the investment cost per MT of storage capacity. Units in the 10,000 MT range with 79-80 percent usable volume would be uneconomical and are not required at this time. All seven warehouses will be designed and constructed under the auspices of the ABS. The ABS has established planning, engineering and construction procedures for building grain storage warehouses. From 1981-83 the ABS built warehouses in five locations and intends to construct three in the near future. The ABS has experience contracting with a Sudanese consulting engineers for the design and construction supervision of similar warehouses financed by the Kuwaiti fund and British ODA.

Upon completion of construction of the seven facilities the ABS will own and operate four of the 3000 MT warehouses under their ongoing storage and credit programs in El Obeid and Dilling and new branches planned for Talodi and Abu Gubeiha. The four locations will serve specific groups of clients. The El Obeid warehouse will serve the traditional sector and the Dilling warehouse will serve the mechanized sector. The ABS currently plans to construct a warehouse at Dilling with World Bank financing, but the Kansas State University team concluded that another 3,000 MT warehouse is necessary for the volume of agricultural production in the area. The ABS is evaluating the Dilling location in relation to the needs of other possible sites such as Kologi or Rashad and will decide on the location prior to the final design. The facilities at Talodi and Abu Gubeiha will warehouse products from both the traditional and mechanized sectors. Generally, the traditional sector consists of small farmers who produce sorghum, sesame, groundnuts and millet. The mechanized sector is composed of larger farm units devoted largely to sorghum. Mechanized farmers may be the principal users in the opening years since they require little organizing and produce sufficient bulk to help fill the facilities in early project years. Storage space not fully utilized by project beneficiaries will be rented out to commercial operations or public entities.

During PP preparation, USAID and the KSU consultants considered various ownership and management options for the storage facilities before choosing the ABS as the implementing agent. The general objective was to maximize private sector ownership and management by either selling the facilities directly to the private sector, leasing them to merchants, or contracting out their management. The basic problem arose in combining private sector involvement with farmer credit programs. Local merchants were not interested in activities that may require close government supervision or regulation of trade. They are interested in storage facilities for their independent use, but such independence is impossible when stored commodities serve as the collateral under the ABS credit program. Commercial banks were considered as implementing agencies for the storage and credit components, but (as discussed in the credit section) their participation is restricted by current limits on commercial credit. (See the Administrative Analysis, Annex 6E, for a more detailed discussion.)

Instead of linking private sector storage facilities with ABS credit, merchants in El Obeid suggested an alternative private sector project to help them upgrade storage and handling operations, introduce quality control and pricing into the local market, and improve the overall quality of storage facilities. Under the pilot project, three of the seven warehouses built under ABS direction, two 3000 MT units and the one 6000 MT unit, will be sold or leased to private merchants in El Obeid. This location was chosen because it is the major market center for agricultural commodities and trade in Kordofan. Lease/sale arrangements and training of private warehouse staff will be coordinated through the El Obeid Chamber of Commerce which represents a wide range of merchants and business people from the private sector. The Chamber, ABS and the regional government will receive and evaluate applications from merchants who wish to lease or buy the facilities.

The lack of information on private sector operating costs and investments in commodity storage and handling requires a pilot approach to the private sector component. Private merchants in El Obeid have expressed their interest in storage improvements and grain cleaning. Kansas State University consultants were able to estimate operating margins to indicate that a private sector pilot would be feasible. Yet many questions still linger about merchant practices which must be resolved under the initial technical assistance phase of the project. Based on the findings of the consulting team, one of the following options will be recommended to participating merchants: (1) outright sale of the facility, (2) sale through financing, (3) long-term lease, and (4) long-term lease with an option to buy. Additional technical assistance will be offered to the private sector during the life of the project to promote improved commercial practices. Whenever possible, technical assistance will be provided by U.S. private enterprises, involved in the handling and sales of similar commodities in order to promote professional, trade and technical exchange.

Both USAID and the ABS recognize that several risks are inherent in such a pilot activity: (1) private sector hesitance to participate in a government project, (2) resistance to accept training, (3) unwillingness to provide financial information, (4) reluctance to provide operating information on the new facilities, or (5) non-fulfillment of the ownership or lease agreements. The principal mitigating factor toward these risks is the interest merchants have already expressed. Through the Chamber of Commerce they raised the idea for a private sector storage and handling project. They insisted on assistance with grain cleaning and recognized the price implications for high quality grain. They also suggested that the ABS manage the construction and make arrangements for lease or sale of the facilities. The initial technical phase will build on this interest to develop financing packages. In a worst case scenario where merchants would not fulfill their commitments, the ABS is ready to take over the facilities and use them as supply buffers for Kordofan and Darfur. USAID's preference, however, is to provide for food security through normal marketing channels that already handle the majority of the country's food grains.

The storage component will utilize technical assistance on four levels detailed below. A total of 23 person months of short-term expatriate assistance is planned in Sudan, plus 2 person months in the U.S. to prepare training materials. An additional $200,000 are budgeted for a Commercialization Support Fund that will be drawn upon as required to support private sector marketing activities.

(1) While the ABS has employed Sudanese engineering firms for the design and supervision of storage facilities, two person months of a qualified storage management specialist from the U.S. will be provided during the design stage to review the designs and help the Sudanese engineering firm prepare the specifications and tender for the off-shore procurement of materials and equipment. The storage management specialist will also spend an additional month in the field to evaluate the cost and technical feasibility of underground pit storage. Two person months of an agricultural economist's services are budgeted to evaluate the storage returns. Based on this analysis, recommendations will be made to revise storage designs in southern Kordofan or undertake additional storage activities, either on-farm or through the ABS, with PL 480 local currencies.

(2) The Kansas State study emphasized the need for training the grain storage warehouse personnel since there are no common standards or practices of storage in Sudan. The success of the project depends on the ability of the warehouse managers to preserve the quality and quantity of the stored products. Early in 1987 consultants with the appropriate training experience will spend two person months in Sudan to assess specific training needs, select the training and demonstration sites and prepare outlines for training manuals. The manuals themselves will be prepared afterwards in the U.S. During this time, local arrangements and logistics will be discussed with the ABS and the El Obeid Chamber of Commerce.A definite training schedule will be agreed upon. The training course will be conducted over a two month period by two trainers to coincide with completion of the first construction phase, now scheduled for September 1987. This phase of training will apply to managers and personnel of both the ABS and private sector warehouses. ABS will appoint the trainees that will form the cadre of personnel to be employed in the ABS warehouses. The Chamber of Commerce at El Obeid will be asked to identify trainees who may be employed in the private sector warehouses. It may not be possible to identify the private sector trainers for the first training session. However, the training program will be conducted annually for two subsequent years for one month each time. This will be an opportunity to train new employees and to follow-up or upgrade the training of those previously trained.

(3) Specialized technical assistance will be required to facilitate the transfer of the three warehouses intended for the private sector. Two consultants for a period of two months will work with the ABS, El Obeid Chamber of Commerce, and the private sector to explain the details of the pilot project, to present the lease/purchase options, to analyze the costs and returns that can be expected and, in general, to maintain the private sector's interest in taking over the three pilot project warehouses. The

Commercialization Support Fund will supplement this initial phase of assistance to the private sector with technical assistance for specific marketing activities. To the extent possible, technical assistance will be provided through U.S. private enterprises involved in similar commercial ventures in order to establish trade and professional linkages.

(4) The fourth level of technical assistance will be furnished by the manufacturer or the distributor of the warehouse materials and equipment. The tender for off-shore procurement will require two advisors for two months during each of the two construction phases. These consultants will assist the construction contractor and the A&E firm in the construction of the warehouses. This is to ensure that the facilities are constructed as designed and manufactured.

D. Credit

1. Location and Implementation

KORAG will support three credit programs coordinated with the ABS storage facilities at El Obeid, Abu Gubeiha and Talodi. A recent review of private sector activities in Kordofan indicated that there is excess liquidity among mechanized farmers in the Dilling area, so credit will be withheld from the storage program at Dilling until further demonstration of cash needs.* The three credit programs will offer both production loans before planting and inventory loans at harvest. The total value of farmers loans will equal 70 percent of the harvest value of their crops. The rationale for both production and inventory loans, and the procedures for estimating requirements and administering loans are discussed in the following sections on credit mechanisms and capital requirements. Technical assistance will be provided through a Private Voluntary Organization under a Cooperative Agreement with AID to improve financial management and cooperative lending practices.

The credit program's overall objective is to allow farmers to participate in the market system and respond fully to price signals. While research on farmer behavior has confirmed annual responsiveness to price expectations in terms of acreage and crops planted, farmer ability to respond to price fluctuations within a given crop year is limited. As discussed in the project rationale, the sheil system forces farmers to commit, or essentially sell, their crops to merchants before they are even planted. Price expectations, then, can affect their annual cultivation patterns, but not their decisions on when or how much to sell. Marketing decisions are controlled by consumption requirements and cash needs. Merchants who can meet the farmer's cash requirements before planting can then dictate the terms of repayment--and become the only buyers.

---

* "Private Sector Review in Western Sudan," Sudanese Consultations Bureau, February 1985.

Formal production loans to farmers will give them an alternative to sheil loans and generate some competition with the informal credit system. The direct benefits are twofold: credit at lower interest rates and pressure to lower interest rates within the informal lending system. The indirect benefit is possibly more significant. Without a pre-commitment on when to sell their crops, farmers can combine responsiveness to seasonal price fluctuations with annual decisions on cropping patterns to maximize their income. Combining credit with storage facilities enhances the financial viability of small farmer lending since crop deposits in the facilities constitute de facto repayment of production loans while providing collateral on inventory loans. Loans will be channelled through farmer cooperatives to minimize the transaction costs of lending.

The ABS will administer the credit funds at all three locations. During project design the PP team considered commercial alternatives to ABS lending but found that all commercial banks in the region are constrainted by credit ceilings set by the Bank of Sudan. As a development lending institution, the ABS does not face the same constraints. No other public lending institutions have the expertise in agricultural credit or the regional lending emphasis of the ABS. Currently the ABS has several credit and storage programs in western Sudan: Um Ruwaba, El Obeid, Dilling, Nyala, and Zalingei. A new branch will open in the fall of 1985 in En Nahud, just west of the project area, with a contribution of Title III funds. Alternatives to ABS lending will continue to be considered during the life of the project based on changes in national credit policy and development of new institutions.

The ABS generally channels credit to small-scale farmers through cooperatives or other institutions such as farmers' unions to minimize transaction costs. Cooperatives in the ABS loan program are officially organized and registered by the regional branch of the Ministry of Commerce, Industry and Cooperation (MCIC). Each cooperative is formed around a village and will have variable membership depending on village size. An ABS branch such as that in Um Ruwaba could have 40-50 cooperatives. In practice, MCIC will second staff to the ABS or the ABS will use its own staff to set the groundrules for cooperative societies. Organizing the cooperatives has rarely been a problem. Most are self-formed and have come to the ABS and MCIC for official registration and credit. To date, capital availability has been the constraint to expansion.

While ad hoc cooperation between MCIC and the ABS has resulted in working cooperative lending programs, there have been problems. MCIC's interests are primarily political and social service oriented. The ABS has a narrow agricultural focus. It also controls all funds, which has created institutional jealousy. The ABS alone does not have enough staff to train cooperatives in basic bookkeeping and financial management. In many cases the cooperatives just coordinate crop storage and provide input on when to sell commodities. Despite its policies, the ABS must still channel loans to individual farmers since the cooperatives cannot manage group lending.

These institutional and group lending issues must be resolved to allow cooperative lending to work more efficiently. In the first stage of

implementation (January-June, 1986) the PVO technical assistance team will conduct a six-month review, with two short-term advisors, of financial practices and cooperative organization. The resulting recommendations will lay the framework for the three credit programs and set a scope of work to be implemented by long-term advisors planned for El Obeid, Talodi and Abu Gubeiha.

The first credit program will begin in El Obeid with production loans disbursed in June 1986. The short-term consulting team will recommend capital requirements and assist the El Obeid regional branch in planning its first disubrsements. The first long-term advisor will arrive to assist with implementation in July 1986. The credit programs at Talodi and Abu Gubeiha will begin with the completion of the storage facilities in June 1988. Long-term advisors for both sites will arrive in January 1988 to assist in cooperative organization during construction of the facilities and in the first disbursement of production loans.

2. Credit Mechanisms

The credit program has been expanded from the inventory loans described in the PID to incorporate production loans. The original focus on inventory loans was for their financial soundness--the risk is minimal since stored crops act as collateral. Rather than sell non-perishable surplus crops to merchants immediately after harvest, farmers would bring them to a central collection and storage facility in the village called a shuna. Village cooperatives would then gather sufficient produce to fill a lorry and transport crops to ABS storage facilities in major towns and receive an "inventory loan" based on 70 percent of the value of their crops. The loan would meet immediate cash needs and allow repayment of sheil loans. The cooperatives would retain the right to sell their crops for 6 months after which the ABS would act as their agent. The ABS would receive a fee directly from sales for maintenance, administrative costs, and other services such as pest control. The remaining revenue from crop sales would then go to the farmer.

It was always acknowledged that inventory loans would have a secondary impact on production. Sheil loans would still dominate production credit, but if farmers could repay these loans in cash and retain the profit from seasonal price increases, their growing income would mitigate demand for informal credit. The inventory loans would also minimize the risk of default due to drought. Experience in the ABS Um Ruwaba project indicates that drought is the principal risk to repayment, causing repayment rates to drop to 70% in the past two years and resulting in 50% decapitalization of loan funds in 5 years given current inflation and interest rates. Before the past two years of drought, repayment rates in Um Ruwaba were particularly good for small farmer loans, averaging approximately 95 percent.

The key problem with sole dependence on inventory loans is the starting assumption: that merchants would accept repayment in cash. As discussed in the project rationale, merchants have no incentive to forego possession of crops through cash repayment, and they are in a position to dictate against it. The possibility of cash repayment of sheil loans was carefully considered during PP design. Kansas State University, consultants from Crux Incorporated, and local credit experts at the University of Khartoum recommended against the risk. Their consensus was to offer production loans that would cover basic inputs: labor costs and seed dressing. As the production system grows more sophisticated, the credit requirements will increase.

The conceptual difficulty with production loans is that some decapitalization is inevitable under current lending policies and could require subsidies to restore loan funds to their real levels. Subsidies have already caused numerous problems in the agricultural sector. Undervalued land has caused poor land use practices on mechanized schemes. Credit subsidies have led to overinvestment in mechanized agriculture and decapitalization of ABS funds. A consistent theme in our policy dialogue with the ABS is that subsidized credit is unsustainable given Sudan's scarce resources. Contradicting this position on production loans would not help our overall position.

During a consultancy for the Regional Finance and Planning Project, Crux Incorporated suggested a useful counterposition to justify some form of subsidy based on the environmental realities of agriculture in Sudan. For uncontrollable hardships such as drought, they proposed that government and donors absorb part of the risk of production failures while adhering to the general policy that subsidies are unacceptable. Although feasible on the project basis, this approach is not sustainable country-wide or once donors terminate their financing commitments. For planning purposes we have accepted the Crux recommendation and provided a 10 percent drought contingency factor in the project budget. This is done only with the understanding that general decapitalization factors will be addressed through policy reform measures in the PL 480 Title III program beginning in FY 1986. Among other issues, the Title III program will examine the feasibility of a drought contingency fund that could be financed across all ABS lending programs.

Two other factors will also be incorporated to reduce the risk of default: small-group loan guarantees and in-kind production loans. The small-group guarantee complements cooperative lending. Each cooperative is subdivided into smaller groups of 5-10 farmers usually linked by familial ties. Each group guarantees that all its members will repay. If not, the entire group is excluded from additional credit. To date, the principle has worked with 99 percent repayment rates in Bangladesh. Sudan's strong muslim culture and the importance placed on family suggest that the concept is transferable.

In-kind production loans, to be channelled through merchants, will have to evolve with the project. Since there are few physical inputs in

current production methods, it would be difficult for the ABS to supply the key production requirement, food, without becoming a general merchant.

3. Capital Requirements

The combined value of production and inventory loans will equal 70 percent of the harvest value of crops. The production loan will be based on 30 percent of the value of estimated output (using historical yield, acreage and price data) to cover half of the farmer's production costs. The remainder will be financed through savings or informal loans. The inventory loan will equal the difference between 70 percent of the actual value of the harvested crop and the funds already lent to the farmer. As planned in the PID, the cooperatives can initiate sale of their stored crops for six months. Afterwards, the ABS acts as their agent.

To date, negative real interest rates plague ABS lending. Loans at 14% subsidize borrowers but also reduce the real value of capital and limit the extent of Bank activity. Assuming a 15% inflation rate for rural production costs*, real paid up capital decreased 11 percent annually without considering defaults. The advent of Islamic banking has had some positive impacts. Banks no longer charge interest under Islamic banking, but they are free to levy a service charge to cover their costs--including the cost of capital. Since May 1984 the ABS has increased its fees at various project sites and accepts the principle of variable fees according to the cost of providing credit at alternate locations. At an international credit seminar held in Khartoum in December 1984, the ABS gave unqualified endorsement for service fees that cover operational and capital costs. Given the high interest rates under informal credit, they perceive realistic service fees as financially feasible for the farmer and the only mechanisms to maintain the real impact of ABS programs.

The exact requirements for production and inventory loans are difficult to estimate since they depend on prices and availability of agricultural inputs, farming techniques, rural wages, and crop prices. For example, estimates on inventory loan requirements would have tripled since last year since loans are tied to harvest prices that have gone from LS 30 to LS 100 for a sack of dura. Such changes cannot be predicted, but for planning purposes we can estimate reasonable prices and correlate these with the expected volume of stored goods in the three ABS storage facilities to derive the capital requirements detailed in the cost analysis (Annex 6C). Storage volumes are taken from the Kansas State University report. Sack prices are estimated at LS 46 for sorghum, LS 87 for sesame and LS 43 for groundnuts. The base annual credit estimate equals 70 percent of the value of the crops plus a 25 percent factor for price fluctuations. Given the uncertain base prices and the volatile grain markets in western Sudan, it is impossible to estimate a realistic inflation factor. A 10 percent "drought factor" is then added to compensate for environmentally induced decapitalization. The capital requirement by the PACD is estimated at LS 3,209,000.

---

* A 15 percent inflation rate is well below national inflation rates of 30-40 percent in recent years. The rate is based on rural production costs which usually rise more slowly than urban costs. In any case, the use of a 15 percent rate is illustrative.

The final year's capital requirement is a minimum project estimate assuming no more than 10 percent annual decapitalization (obviously actual requirements may be much greater with continuation of the drought). Changes in inflation alone could quickly double or triple estimated requirements as could increases in stored volume. Yet two useful points can be drawn from these rough figures. First, total requirements for both inventory and production loans can easily be accomodated within our PL 480 local currency generations. Second, the project must make provisions to reevaluate loan requirements each year and adjust capital allocations to each facility accordingly. PVO assistance for such financial reassessments is discussed below.

4. Technical Assistance

USAID considered providing technical assistance for the credit component through a private voluntary organization, a private firm, and an educational institution. We concluded that a PVO with agricultural credit and cooperative experience is best suited to provide the type of practical advise required in a rural environment. A private firm could possibly recruit qualified personnel, but the isolated location would make the cost forbidding. An educational institution was not considered appropriate since the job demands more of a practical than a theoretical orientation toward rural credit.

The PVO's services will be acquired under a cooperative agreement for an estimated 111 person months of assistance. During January and February 1985, USAID conducted a survey of all Africa Missions to solicit recommendations on capable organizations. AID/W has also been in contact with various PVOs to assess their interest and capability. Four PVO's have been widely recommended for their work in Africa. There are several others that show promise. USAID will issue a Request for Proposals to the most promising firms and evaluate them on institutional experience, the quality of proposed staff and their emphasis on private sector and regional development. Handbook 13, Chapter 1B indicates that the Assistant Administrator or his/her designee must give approval to restrict competition to PVOs.

The PVO will have 5 major responsibilities and will be given leeway in the RFP to suggest additional functions or innovative implementation strategies. The cooperative agreement would allow for 15 person months of short-term assistance and 96 pm of long-term assistance. Individual responsibilities of team members are detailed in the implementation plan (Section V). General objectives are discussed below.

a. Financial Review of ABS Practices. During the life of the project ABS will open two new branches and expand its activities in El Obeid. Another branch should open in En Nahud as a separate local currency activity. This rapid growth should be accompanied with a review of ABS financial management and bookkeeping practices including the viability of current service charges. Short-term assistance to establish accounting systems in new branches may also be required. The focus of assistance should be at the field

level since the World Bank has provided the ABS with a Khartoum-based financial advisor and plans to establish a new position in the ABS in the next year. A short in-country training course may also be appropriate.

b. Cooperative Organization and Management. Although the ABS and MCIC successfully initiated a pilot project in Um Ruwaba, it is not a sound foundation for an expanded program. The PVO assistance would begin with a short-term analysis of the appropriate institutions and mechanisms to organize additional cooperatives in Kordofan. This analysis should lead to three long-term positions to implement recommendations. One advisor (36 pm) will start working in the second year of the project with the existing ABS branches in El Obeid. Two additional advisors could begin in year 3 to help initiate and run the new cooperatives in Abu Gubeiha (24 pm) and Talodi (36 pm). Alternatives to channelling credit through mechanisms other than cooperatives should also be considered and, if appropriate, worked into the project.

c. Traditional and Mechanized Storage. In order to make economic use of storage facilities, the new branches in Abu Gubeiha and Talodi will service both traditional and mechanized farmers. Such combined services are new to the ABS, and policies will have to be established to secure fair treatment of all clients. The field-based advisors in both locations would act as liaisons among the ABS, cooperatives and mechanized farmers to arrive at branch storage policies that suit local production patterns.

d. Yearly Loan Requirements and Service Fees. As already indicated, capital needs will fluctuate annually depending on program growth, prices, farming techniques and other factors. The field advisors will help the ABS and cooperative leaders take these factors into account to update annual loan requirements. As part of the budgeting process, the advisors will provide on-the-job training to assure that accounting recommendations developed early in the project are incorporated into branch operations. The annual financial review will also consider whether service fees are covering lending costs and make recommendations accordingly.

e. Maximum Use of Cooperatives. The initial role of the cooperatives will be to group traditional farmers into larger units that will maximize the efficiency of banking operations and provide an indigenous check and balance system for loan repayments. Once well established, the cooperatives would provide a vehicle for self-help rural development activities that can be financed through this project, undertaken with CIP funds to cover foreign exchange costs, or linked to local currency initiatives under the FY 1986 Title III program. One example would be for each cooperative to select and finance one member to attend improved technology seminars at WSARP and thus establish a village-based extension system. Another example is local currency financing to provide the CIP counterpart for cold storage facilities. The PVO team, through its long-term and short-term (3 pm) advisors, should make recommendations at specified intervals during the life of the project on how to utilize the cooperative structures to their fullest potential. For its part, AID will view the PVO technical assistance as a complement to its overall activities in western Sudan.

E. Training Summary

Because of the importance of developing regional capabilities to continue project activities beyond the life of the project and to plan and execute new activities, three levels of training have been built into KORAG. The first will be the exposure and hands-on training given to regional government staff participating in contracting and contract management under the feeder road component. These individuals will be exposed to engineering and construction contractor selection, and contract execution and administration. Regional government staff will participate in the shortlisting of A&E firms, preparation of the RFTP, review and evaluation of proposals, contract negotiations and administration, prequalification of the construction contractors, preparation of the IFB, review and evaluation of contractor bids, and negotiation and administration of the construction contracts. Selection of the A&E firm will be done with RBPC playing the lead role and with USAID guidance. The A&E firm will assist in construction contractor selection.

The second level of training is linked with the storage and credit programs. Although not directed specifically toward regional government staff, the training is critical to establishing and maintaining both programs on a self-financing basis and to assuring that recurrent costs are not saddled on the regional government. Formal training in storage management and commodity handling will help maximize reductions in storage losses and farmer returns on stored commodities. The higher the returns to farmers, the greater the flexibility to levy storage charges that cover operational and replacement costs. Credit training will be less formalized and more on-the-job oriented than the in-country storage management courses, but the objective is similar - to increase farmer income sufficiently to keep loan programs operating on a self-sustaining basis. The PVO providing technical assistance will be concerned with both ABS financial practices and cooperative disbursement and collection procedures to assure that loans have a productive impact that can pay the cost of operating the program while leaving farmers with a net gain in income.

The third approach to training will be participant courses for current and new regional government employees associated with the project or critical to basic planning and contracting activities. Since the life of the project extends over seven years and the regional government is in a continual process of building up its staff, new employees will be given the opportunity to partake in specialized short-term courses (2-6 months). Longer-term courses to upgrade technical skills will also be financed. Once USAID and the regional government agree on regional personnel to participate in project administration, decisions will be made on which staff require training in contract administration and basic technical skills before starting feeder road construction. A generalized approach for selecting trainees and courses to support other project, contracting and planning activities will be developed with the regional government during the first year of the project. Its size and execution will depend upon the planned and actual expansion of the

regional government staff. For planning purposes it is now anticipated that the program may include such courses as: basic civil works design, planning, project design and documentation, project execution, contracting, procurement, and accounting. USAID will request the assistance of AID/W in providing a training specialist for approximately two months to develop the training program with the regional government.

IV. Cost Estimates and Financial Plan

A. Introduction

The financial objective of the project design was to minimize the use of foreign exchange and to maximize the use of local currency, primarily to facilitate replication but also to accomodate the limited foreign exchange budget. To this end, the project utilizes, to the extent possible, local engineering and construction services, Sudanese project management, indigenous materials and equipment, lease/purchase arrangements (in Sudanese pounds) with local firms for many imported construction items, simplified designs and specifications, and Sudanese personnel for audit and environmental purposes. To carry out the strategy, the following project components will be implemented by Sudanese with the assistance of a limited amount of expatriate assistance: design and supervision of construction of the feeder roads, feeder road construction, and design and construction of the storage facilities. Training in warehouse management and operation will be limited to short-term in-country consultancies. The credit component will be administered by ABS with expatriate technical assistance focused on institutional and managerial development.

B. Estimated Cost

1. Feeder Road Component

Cost estimates for the feeder road component are based primarily on the Wilbur Smith Associates study. WSA updated earlier unit cost estimates made by Louis Berger International, Inc. and Norconsult, Consulting Engineers. The Western Agricultural Marketing Road project costs were based primarily on the same earlier sources. WSA escalated the unit cost figures to January 1985. For the purpose of this project paper, all costs were escalated to the mid-construction point. In analyzing their quantities and cost figures, WSA judged that their final total cost could be in error by ± 7%; the PP team analyses indicated that the WSA estimates may be off by as much as 16%. Therefore, a 15% contingency was added to the WSA construction cost.

Feeder Road Cost Estimate			
		(000's)	
	FX	LS in $	Totals
a. Construction Services	3,500	20,000	23,500
b. Engineering Services			
Design	1,130	711	1,841
Construction Supervision	4,020	5,074	9,094
Construction Assistance	2,500	375	2,875
Vehicles and Maintenance	315	488	803
Subtotal	11,465	26,648	38,113
USF	11,500	26,800	38,300

2. Storage Component Cost Estimates

Cost estimates for the storage component are based on Kansas State University's analysis of storage and credit in Kordofan. The KSU team prepared general specifications and developed the cost estimates from recent price quotations received by ABS for similar facilities. The final design and costs under the project may differ somewhat from KSU's design and price estimates, so a 20% contingency has been included. The technical assistance element follows the recommendations of the KSU study.

Storage Cost Estimates			
		(000's)	
	FX	LS in $	Totals
a. Warehouse Construction			
(1) 3000 MT warehouse (6)	900	1,084	1,984
(2) 6000 MT warehouse (1)	300	361	661
(3) Grain Stores (3)	36	10	46
(4) Pest Control chemicals	10	-	10
(5) Contingency 20%	240	291	531
Subtotals	1,440	1,746	3,186
USE	1,450	1,760	3,210

b. Technical Assistance

(1) Sudanese A&E Services	-	180	180
(2) Expatriate Design Services	46	20	66
(3) Agriculture Economist	27	12	39
(4) Construction Services	123	40	163
(5) Training Program	147	40	187
(6) Pilot Project Assistance	238	10	248
(7) Contingency 20%	116	60	176
Subtotals	696	362	1059
c. Total 1985 Prices	2,146	2,122	4,268
d. Total Cost Escalated to Sept. 1987 (Mid-Construction Point)	2,600	3,320	5,920

3. Credit Component Cost Estimates

a. Technical Assistance

Credit Technical Assistance

	FX	(000's) LS in $	Totals
1. Short-term advisors - (15PM)	200	44	244
2. Long-term advisors (96PM)	1,200	180	1,380
Subtotal - 1985 prices	$1,400	LS in $244	$1,624
3. 1985 Costs Escalated to mid-point of TA assignment			
Technical Assistance	1,660	356	2,016
Vehicles	60	4	64
Subtotal	$1,720	LS in $ 360	$2,080

b. Credit Fund

The capital requirements are based upon the feasible storage volumes for the four ABS facilities as estimated by KSU. They valued stored commodities at LS46/sack sorghum, LS87/sack sesame, and LS43/sack groundnuts. A 25% factor was added to cover price variations. The total loan fund equals

70% of the value of the stored crops. The loan fund is divided between 30% for production loans and 40% for inventory loans. A 10% contingency was added to cover defaults due to drought. Each year's capital requirements are illustrative and should be revised annually to compensate for variation in the factors that offset farmer revenue.

Capital Requirements
(LS in $000)

	'86	'87	'88	'89	'90	'91	'92
1. Production	48	57	148	229	308	399	501
2. Inventory	64	75	196	297	409	531	666
3. Total Annual Requirement	112	132	344	526	717	930	1167
4. With 10% Contingency	123	145	378	578	788	1023	1283
5. Incremental Requirements	123	22	233	200	210	235	260

c. Total Cost of Credit Component

	FX	(000's) LS in $	Totals
Technical Assistance	1,660	356	2,016
Vehicle	60	4	64
Credit Fund	-	1,283	1,283
Total	1,720	1,643	3,363
USE	1,720	1,640	3,360

4. Summary of Project Cost Estimates

(000's)

	FX	LS in $	Totals
a. Feeder Road Component	11,500	26,800	38,300
b. Storage Component	2,600	3,320	5,920
c. Credit Component	1,720	1,640	3,360
d. Participant Training	260	-	260
e. Project Management	420	160	580
f. Audit & Evaluation	100	40	140
Total	$16,600	LS in $ 31,960	$48,560
USE	$18,100	LS in $ 32,000	$50,100

C. Methods of Implementation & Financing

The following table and notes are presented in response to the Administrator's approval of sixteen Payment Verification Policy Statements. For details on RBPC's and ABS's technical and administrative capabilities to handle the implementation process, see Section VI.D and Annex 6E, Administrative Analysis.

Methods of Implementation	Method of Financing	Approx. Amount (000) $
1. Feeder Road Component		
(a) Host Country Contract for Engineering Services	Direct L/Comm for FX Payment by AID(2)	7,650
(b) Fuel for Construction Contract	Direct L/Comm(2)	3,500
(c) Vehicles	Purchase Order	240
(d) Subtotal		11,390
2. Storage Component		
(a) Host Country Contract for Technical Assistance	Direct L/Comm for FX Payment by AID(1)	425
(b) Imported Construction Mat.	Bank L/Comm(2)	1,440
(c) Subtotal		1,865

(1) The justification for the direct L/Comm is that the RBPC and ABS do not have the funds to pay for the services, materials and equipment and seek reimbursement from USAID. Therefore, USAID is approving a direct Letter of Commitment to the contractors.

(2) Bank Letter of Commitment is recommended because the procurement will involve a relatively larger number of transactions with staggered shipment dates and payments.

3. Credit Component

(a) USAID Cooperative Agreement with PVO	Direct Payment	1,400
(b) Vehicles	Purchase Order	60
(c) Subtotal		1,460
4. Total		$ 14,715

D. Payment of Invoices

In general, all contracts will be host country contracts, with the foreign exchange cost paid by USAID through a direct L/Comm and the local currency invoices paid directly by the implementing agency, with funds transferred from the GOS special account. USAID will sign the cooperative agreement with the PVO providing technical assistance on the credit component. The following table summarizes the contracting mode, method of payment and invoice certification for each project element:

Project Element	Contracting Mode	Method of Pay't	Certification
	Foreign Exchange		
1. Feeder Roads Component			
a) A&E Services	H.C./RBPC	Direct L/Com	RBPC
b) Fuel	Direct or P.O.	Direct	USAID
c) Vehicles	PIO/C	Direct	USAID
2. Storage Component			
a) Technical Assistance	H.C./ABS	Direct L/Com	ABS
b) Imported Material and Equipment	H.C./ABS	Bank L/Comm	A&E/ABS
3. Credit Component			
a) Technical Assistance	USAID Coop Agent	Direct Payment	USAID
b) Vehcile	PIO/C	Direct	USAID

Local Currency

1. Feeder Road Component			
a) A&E local support cost	H.C./RBPC	Direct	RBPC
b) Construction services	H.C./RBPC	Direct	A&E/RBPC
2. Storage Component			
a) Technical Assistance support	H.C./ABS	Direct	ABS
b) Construction service	H.C./ABS	Direct	A&E/ABS
3. Credit Component			
a) Technical Assistance support cost	USAID	Direct	USAID
b) Credit Fund		Direct	ABS
4. Audits	USAID	Direct	USAID

E. Audits

Annually, during the project life beginning in October 1986, USAID will request the Inspector General to arrange for a non-federal audit of the dollar and local currency accounts under the project for all contracts and the implementing agencies (RBPC and ABS). The scope of work and contract for the local accounting firm is limited to financial and compliance matters and will be approved by AID's Inspector General Office in Nairobi. The audit fundings, work papers and report will be reviewed by the same office. The Inspector General's office also ensures that the audit firm's qualifications and performance standards for non-federal auditors are met. Two man-months are budgeted for each annual audit with funds provided by CIP or PL 480 local currency generations.

F. Recurring Costs

Of the three project components only feeder roads will result in recurrent costs that must be budgeted for every year. The storage and credit components are self-financing in that the storage and loan fees will include operational, administrative and capital costs. The technical advisors on the credit component will specifically assist ABS in developing and operating the credit program on a self-financing basis.

Road maintenance is discussed, in detail, in Section III. B. above. The WSA study costed out the KORAG road maintenance needs and estimates that routine and periodic maintenance will require LS 2,170 per;km annually in 1985 prices. As explained in Section III. B., road maintenance must be approved on a regional and national basis. It is currently the focus of the Third Highway Project and will be the subject of a major study under the Western Agricultural Marketing Road project, which will include the KORAG feeder

road. The KORAG project budget includes sufficient funds for maintenance during the project life. Support for maintenance beyond the ACD will be considered in light of GOS progress on fiscal measures to finance maintenance costs.

G. Project Obligation in Relation to USAID OYB

The following table illustrates that KORAG can be fully obligated by FY 1987 while accomodating all current mortgages and allowing for a new $8.225 million design effort in FY 1987. Sufficient funds are available by FY 1986 to fully fund the construction contract for the Western Agricultural Marketing Road. There is no analogous constraint under KORAG since all construction contracts are denominated in local currency and sufficiently staggered over the course of the project to avoid straining PL 480 Title III local currency generations. Sufficient foreign exchange is available in the first two years to incrementally fund the A&E joint venture, storage materials and technical assistance, and the PVO credit advisors. The final column, pending obligations, shows that all current mortgages at planned life-of-project levels can be paid off by FY 1987. The OYB levels can also accomodate planned designed efforts for Contraceptive Retail Sales and an amendment to the Western Sudan Agricultural Research Project. In a worst case budget scenario, there is sufficient slack in the FY 87 OYB to remain at the FY 86 planning level and still have sufficient funds remaining for a $1 million obligation on a new project.

Project Obligations

	LOP Planned	Previous Obligations	1985	1986	1987	Pending Obligations
1. KORAG (650-0054)	18,100	-	2,000	3,900	12,200	-
2. Mortgages						
a. Western Road (0069)	60,000	15,600	18,963	21,837	3,600	-
b. SORMAR (0043)	19,700	18,237	-	-	1,463	-
c. SRAD (0046)	10,100	9,820	-	-	280	-
d. Family Plan (0063)	1,796	1,296	500	-	-	-
e. Rural Health (0030)	16,182	15,100	1,082	-	-	-
f. Regional Finance (0012)	3,200	2,500	700	-	-	-

g. Renewable Energy (0041)	4,600	2,500	1,000	-	1,100	-
h. Energy Planning (0059)	8,450	4,355	1,100	1,763	1,232	-
Subtotal	-	-	23,345	23,600	7,675	-
3. New Projects						
a. Contraceptive Sales (0072)	3,200	-	1,900	-	1,300	-
b. WSARP Amend (0020)	31,000	26,000	-	-	5,000	-
c. Unplanned	-	-	-	-	8,225	-
Subtotal	-	-	1,900	-	14,525	-
4. PD&S						
a. ARDN	-	-	450	60	N/A	-
b. POP	-	-	40	-	N/A	-
c. Health	-	-	58	50	N/A	-
d. SDA	-	-	207	390	N/A	-
			755	500	800	
5. Total OYB	-	-	28,000	28,000	35,200	-

V. Implementation Plan

A. Project Interrelationships

The three project components--roads, storage and credit--are functionally interrelated and to that extent the timing of each component's implementation will affect their overall impact. Precise integration of implementation schedules, however, is not critical to each component's economic viability, although the credit program must be in place to make storage socially and financially feasible. The roads and storage facilities have been appraised separately, and their internal economic soundness gives some flexibility in the implementation plan.

Storage and road construction are timed to coincide as much as possible, but the longer construction period for feeder roads makes precise overlap unreasonable. For the El Obeid and Dilling warehouses, timing is not an issue. El Obeid is the major market center in Kordofan and, though access is still difficult to the east, there is enough economic activity in El Obeid to merit both the ABS and private sector storage activities. Dilling is already connected to El Obeid by an all-weather road. Storage construction at Talodi and Abu Gubeiha is delayed until the El Obeid facilities are built but it will still end well before thr road are completed: 1 year ahead in Talodi (June 1988 vs June 1989), and 3-1/2 years ahead in Abu Gubeiha (June 1988 vs. December 1991). Production at both locations is already sufficient to make the facilities viable. Once the roads interlink with the storage, they will raise the effective farmgate price available at the facilities by cutting the farmer's cost for transport.

Coordination of the storage and credit components is more sensitive than the roads/storage relationship since: a) credit gives farmers the financial flexibility to use the storage facilities, b) deposited crops will act as collateral on inventory loans, and c) storage is a de facto collection method on production loans. Credit funds and technical assistance are phased to maximize these complementarities. Initial credit activities (January-June 1986) will be limited to short-term financial appraisal and review of cooperative performance at existing facilities in Um Ruwaba and El Obeid. A long-term advisor will arrive to implement the recommendations of the initial studies in July 1986. Although arrival is timed before completion of the new ABS store in El Obeid, the ABS has rented facilities for provisional use. The Talodi and Abu Gubeiha credit specialists will be phased in six months (January 1988) before construction is completed at their respective sites in order to assist in the final stages of cooperative organization. Credit programs will begin at these locations with production loans in June 1988. Dilling, only 120 kilometers from El Obeid, will receive assistance from the El Obeid advisor. A study of private sector activities in Kordofan indicates that there is excess liquidity among mechanized farmers in the Dilling area, and additional credit to the ongoing ABS program will be withheld until increased cash requirements are confirmed.

This section lays out the schedules for each component separately in order to highlight the major steps in their respective implementation plans. Changes in the road program will not affect the other schedules. Any changes in storage construction will require adjustment of the credit funds and the arrival of the credit specialists. Annex 7 presents a master implementation plan that incorporates all project components.

B. Feeder Road Component

1. Overview

As stated in the project description, the implementation strategy for the feeder road component is designed to provide as much assistance and experience as practical to private Sudanese construction firms and engineers. Engineering services will be provided primarily by Sudanese engineers with assistance from their U.S. counterparts in the U.S./Sudanese joint venture. Construction will be by Sudanese contractors with expatriate construction assistance. The regional government will participate in the contracting process, provide a project administrator who will work with the RBPC field unit, and clerical staff. As the regional government develops its technical capabilities, it will provide an engineer to the field unit to exercise independent judgment for the region and transfer some responsibilities to regional authorities. RBPC will provide a chief engineer, 2 assistant engineers and clerical staff, all to be stationed in Kordofan Region. All aspects of administration such as the review of work plans and schedules, review of change notices, and payment of local currency will take place in the regional office.

The U.S. portion of the joint venture will provide a team leader for the life of the project and the services of a highway design engineer, a drainage engineer and soils engineer during the design stage . The Sudanese firm will provide location, drainage, structural and soil engineers in addition to the survey crews. During the construction stage the U.S. engineering firm will furnish the team leader, resident engineers and construction advisors. The schedule and budget presented in the implementation plan is for the complete design and construction period. However, the A&E contract with the joint venture will be for a maximum of four years, i.e. November 1985 through October 1989. In March 1989, during the midterm external evaluation the evaluation team will specifically evaluate, among other things, the performance of the joint venture and the capabilities of the Sudanese partner to carry on without expatriate assistance. The capabilities of the Sudanese construction firms will also be evaluated. If it is decided that expatriate assistance is still required, a RPFT will be prepared and the engineer selection process will be initiated in order to have the same or a new A&E firm in place for November 1989. Figure IV following the implementation schedule below juxtapoxes expatriate technical assistance requirements for design and construction on the construction schedule.

With the project agreement signed in March 1985, the Joint Venture engineering firm is scheduled to sign a contract with RBPC and mobilize its staff in November 1985. It will complete the design of segment one by May 1986, allowing contracts to be let and the first two Sudanese construction contractors to mobilize by December 1986 and January 1987. At this time, a

construction advisor will arrive at the project site. For planning and budget purposes, construction is scheduled in segments of 40 and 45 km for the first four contracts and 50 km each for the last two. Each contract has a two year construction period plus 6 months mobilization. This is different from the recommendation of the Wilbur Smith study which recommended more conservative 30 km contracts. Even considering the remote location of the project site and the apparent lack of road building experience of the Sudanese contractors, 30 km is too slow for the amount of equipment used. Given the relatively simple construction it may well be that several of the contractors can proceed at a much faster pace than 40 or 45 km in two years. However, for planning purposes, it was decided to schedule 40, 45 and 50 km over a two year construction period, plus mobilization.

During the first year of their services, the joint venture will prepare standard drawings for pipe, box and open-bottom culverts, fords, ditches, erosion control measures and other similar details. The standards will be used throughout the project. The design of segment one will proceed concurrently with the establishment of the alignment in the field. A centerline profile will be obtained together with additional topographic data and cross sections necessary for the application of standard culvert structures and fords. The soils engineers will locate sources of supply for select material, pit-run gravel, laterites, concrete, sand and gravel for all phase one work. The drainage engineer will assess all major stream drainage areas and estimate runnoffs plus size of drainage structures. Plan and profile drawings showing horizontal and centerline profile, standard detail drawings and bills of quantities of construction items will constitute the drawings, specifications and quantities for the contract documents. The design of segment two will begin immediately upon completion of the Kadugli-Taloai design. Any design work not completed in the first year will be carried on by the Sudanese engineers under the direction of the team leader and short term assistance as necessary.

The road from Kadugli to Taloai was at one time planned as part of the national trunk road network. In 1979 a detailed feasibility and design was made. Therefore alignment, structure locations and gravel deposits have been tentatively identified. Modification of the designs to the project standards should not be difficult or time consuming and will enable construction to start on this section by the end of 1986. The Kadugli-Talodi section has the highest economic returns.

The first two construction contracts, A-1 and A-2, are scheduled to begin 12 and 13 months, respectively, after the arrival of the team leader and the design team - in November 1985. While the design is being prepared as described above, the joint venture engineer and RBPC staff will proceed with prequalification of Sudanese contractors, prepare the IFB and select the contractors. Segment one is 92 km and therefore scheduled for a 2 year construction period plus 6 months mobilization. Since the design of segment two will be prepared during the first year of construction on segment one, and will also provide an opportunity to test and evaluate the implementation strategy and progress, construction on segment two is scheduled to begin one year later in December 1987.

The technical assistance will be phased in with the construction schedule. The resident engineer and construction advisor will arrive with the beginning of construction of segment one in December 1986. It is planned that by January 1988 when construction begins on segment two, contracts B-1 and B-2, the team leader will be able to relocate from Khartoum to the project site and fill the position of resident engineer. At that time the second expatriate construction advisor will arrive to assist on contracts B-1 and B-2. Construction of the final segment, contracts C-1 and C-2, is scheduled to begin after completion of contracts A-1 and A-2 in May/June 1989. Contracts C-1 and C-2 are scheduled for completion in 2 years plus mobilization in December 1991. Since the KORAG feeder road component requires the longest implementation period of the three project components, it determines that the PACD will be six months after completion of construction in June 1992.

Construction Sequence

Contract #	Location	Construction Date
A-1	Kadugli towards Talodi	Dec 86 to May 89
A-2	Talodi towards Kadugli	Jan 87 to June 89
B-1	Umm Ruwaba towards El Abbasiya*	Dec 87 to June 90
B-2	El Abbasiya* towards Umm Ruwaba	Jan 88 to July 90
C-1	El Abbasiya* towards Abu Gubeiha	May 89 to Dec 91
C-2	Abu Gubeiha towards El Abbasiya	June 89 to Dec 91

* Starting and finishing location is approximately 15 km south of El Abbasiya.

As explained above, the project life may be somewhat shorter if actual progress exceeds the scheduled 40, 45 and 50 km construction projections over two-year contracts. There is another factor that may influence the construction period as planned. Part of the route that the road will traverse is flat stone and provides a firm road base for relatively long distances and is reported to be passable year round under its present condition. There are various estimates of how many kilometers of the route are flat stone, but it may exceed 90 kilometers. For those stretches, minimal construction need be done. The exact locations and distance of these stone stretches will be determined during preparation of the final design, and distances for each contract will be adjusted accordingly.

In summary, the construction schedule presented is conservative based upon construction progress of 40, 45 and 50 km for the first four contracts over a two year period, plus mobilization, over terrain which in some parts may require little improvement. Some of the contractors may perform significantly better than scheduled. If this happens, subsequent starting and finishing dates will be adjusted. The engineering services contract will be for an intial period of four years with provision for an extension.

2. Implementation Schedule

	Actions	Date	Responsible Entity
1.	Project Agreement signed	March 1985	USAID/GOS
2.	CBD notice published requesting technical assistance services prequalification questionnaires	May 1985	USAID/AID
3.	Short list prepared and RFTP available at AID/W for prequalified firms	June 1985	USAID/AID/GOS
4.	Closing date to receive technical proposals for technical assistance services, with proposals received in Khartoum	August 1985	USAID/GOS
5.	Selection of first consultant firm for engineering services contract. RBPC negotiates with top firm	Sept 1985	USAID/GOS
6.	RBPC executes technical assistance service contract. USAID approves	Oct 1985	USAID/GOS
7.	T.A. team leader and design team mobilized Khartoum	Nov 1985	GOS/USAID/ CONSULTANT
8.	Begin design, segment 1	Nov 1985	CONSULTANT
9.	Request for prequalification data from Sudanese contractors	Dec 1985	CONSULTANT/GOS/ USAID
10.	Receive prequalification data from Sudanese Contractors	Feb 1986	CONSULTANT/GOS
11.	Prepare Contract documents for Contracts A-1 and A-2	March 1986	CONSULTANT/GOPS

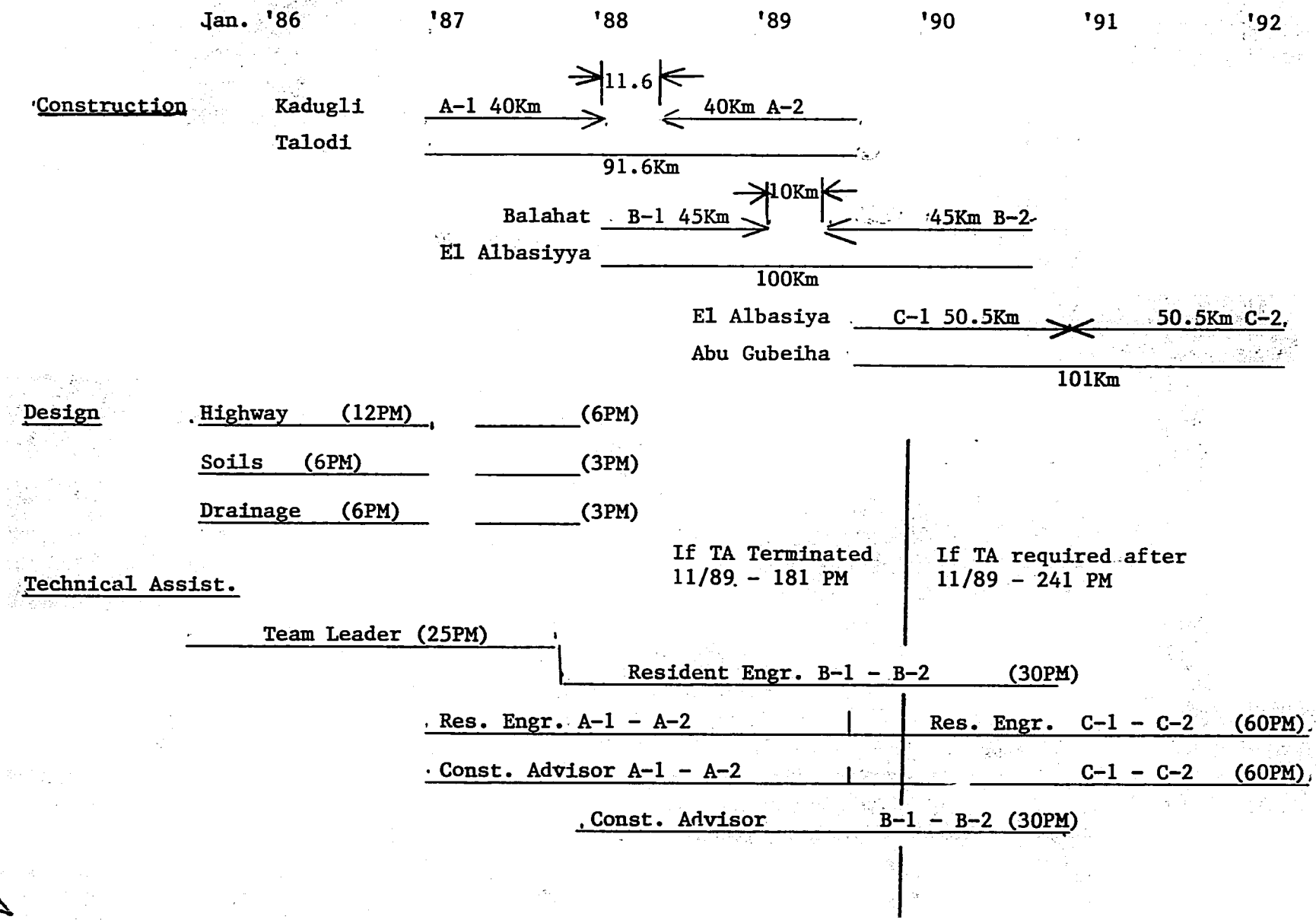
12. Prequalified list of Sudanese Contractors approved	April 1986	GOS/USAID
13. Complete road betterment designs for Construction Contracts A-1 and A-2	May 1986	CONSULTANT
14. Approval of contract documents and tendering and contract award procedures for Sections A-1 and A-2	June 1986	USAID/GOS/REDSO
15. Consultants to assist Sudanese consultants prepare bid	June 1986	
16. Documents for Contruction Contracts A-1 and A-2 furnished to prequalified Sudanese contractors	July 1986	USAID/GOS/ CONSULTANT
17. Sudanese Contractor's bids received	Sept 1986	GOS/CONTRACTORS
18. Evaluation of Sudanese Contractor's tender documents	Oct 1986	CONSULTANT/GOS
19. Award of construction contract	Nov 1986	GOS/USAID/ CONSULTANT
20. Award of construction contract A-2	Dec 1986	GOS/USAID/ CONSULTANT
21. Contractor begins mobilization for construction contract A-1	Dec 1986	CONTRACTOR
22. Contractor begins mobilization for construction contract A-2	Jan 1987	CONTRACTOR
23. Project Account Audited (annually)	Jan 1987	USAID
24. Resident engineer and construction superintendent at site A-1 and A-2	Jan 1987	CONSULTANT
25. Repeat steps #10 through #23 above for contracts B-1 and B-2	Dec 1986 Dec 1987	
26. Interim Internal Review	April 1987	USAID/REDSO/RBPC
27. Road Maintenance Study	Oct 1988	USAID/GOS/ CONSULTANT
28. External Project Evaluation	Mar 1989	IQC/USAID/RBPC

72 58

29. Make Decision on Additional TA	May 1989	USAID/RBPC
30. Repeat steps #10 through #23 above for contracts C-1 and C-2	June 1989	
31. Repeat Steps #2 through #7 above if additional TA needed	June/Nov 1989	
32. All construction completed	Dec 1991	
33. Final Project Review	Dec 1991	USAID/REDSO/RBPC
34. PACD	June 1992	

Figure IV

Feeder Roads Construction & Technical Assistance Schedule



74 81

3. Implementation Responsibilities Under the Feeder Road Component

a. RBPC

The primary GOS implementing organizations will be Roads & Bridges Public Corporation (RBPC) and the Kordofan Regional Government. RBPC will be the lead agency in the selection and contracting process to obtain the engineering services of a U.S. engineering firm in joint venture with a Sudanese engineering firm. RBPC will execute a host country contract with the joint venture in accordance with USAID's Handbook 11 and GOS contracting procedures. RBPC, with the assistance of the joint venture engineering firm will prequalify, select and contract with Sudanese construction firms for the feeder road construction. RBPC will appoint a senior engineer as project coordinator, furnish a RBPC engineer representative for each project construction segment, and part of the necessary office staff to administer the contracts from Kordofan Region (the regional government will also provide clerical staff). The regional office, among other things, will maintain the project files, and review and process change notices and invoices. Dollar invoices for the technical assistance team will be certified by the regional office and passed to USAID for payment. Local currency invoices will be certified and paid from the regional office. All files will be made available to periodic USAID and GOS audits. Prior to the completion of the project, RBPC, the regional government, the Ministry of Finance and Economic Planning and USAID, will agree upon a maintenance program for the KORAG feeder roads and the connecting road networks.

b. Kordofan Regional Government

While the Kordofan regional government has limited personnel, they will participate actively in the project implementation process in order to raise regional government capabilities in planning and implementing civil works projects. To this end, they will provide a minimum of one participant in the contracting process, one administrator assigned to field operations, and clerical staff for the field unit. The regional government administrator will review all payments with the RBPC chief engineer and supervise record-keeping and administrative procedures. Through on-the-job training, regional staff will receive experience in the contractor selection and contracting process and contract administration. Provisions have also been made for training in contract administration and basic technical skills. According to the results of the training and development of regional capabilities, some project responsibilities will be transferred to regional authorities. The project aims toward maximum regional participation by the time the final countracts are let.

c. Joint Venture Engineering Firm

The joint venture between a U.S. and Sudanese engineering firm will perform the usual function of an A&E firm: prepare the detailed road design, prepare the construction bidding documents, assist RBPC in the prequalification of construction contractors, and supervise construction. The joint venture will be expected to appreciate the overall project strategy of upgrading Sudanese engineering and construction capabilities and to this end will emphasize the use and training of the Sudanese firms. Because of the inexperience of the Sudanese construction contractors, the joint venture will be responsible for providing their own living quarters, office and logistic support. The budget has provisions for this additional expense.

d. Sudanese Construction Contractors

The construction contractors have the responsibility, in conformance with the construction contract, for mobilizing their forces and constructing the specified roadways and facilities in accordance with the contract plans, specifications, unit prices and contract conditions. The contractors are responsibile for providing their own equipment, spare parts and materials and follow-on support. Provision will be made for them to obtain fuel as indicated in the project description.

e. USAID/AID

In general the Khartoum USAID office is responsible for monitoring the project. This will be done by receipt of periodic reports, site visits, providing for periodic audits and evaluation and by establishing a working relationship with the RBPC and joing venture engineering firm management. USAID will participate in the selection process for obtaining engineering and construction services and review and approve all contracts. AID will assist in providing information and documents necessary for U.S. firms to submit their prequalification forms and proposals.

C. Storage Implementation

1. Design Phase

The implementation design for the storage component is based primarily on the findings and recommendations of the Kansas State University study, "Project Design, Storage and Inventory Loan Component, Kordofan Rainfed Agriculture Project," August 1984. Overall storage implementation will be under the direction of the Agricultural Bank of Sudan. The major activity will be construction of seven warehouses, six of 3,000 MT capacity and one of 6,000 MT capacity. Siting of the warehouses will be done by the ABS and take into consideration vehicle access, dry areas, strong soils, good drainage, non sloping site, east-west building axis, availability of water and electricity, sewage disposal, future expansion and nearness to commercial centers. The El Obeid Chamber of Commerce will participate in the siting of the three private sector warehouses.

In addition to general siting criteria, the KSU study includes a detailed list of design considerations, such as elevating the floor 1 meter above ground and part brick walling; that will be utilized in the final design. Design and supervision of construction (A&E engineering function) will be performed by a Sudanese A&E firm under contract with the Agricultural Bank of Sudan. ABS will select the A&E firm through pre-qualification procedures. The design recommended by KSU includes the use of approximately 100 tons of imported material consisting of I-section steel stanchions, portal rafters and gable posts, galvanized iron roof, galvanized side-wall sheets, steel doors, Z-section steel purlins and rails. The Sudanese A&E firm will be assisted by two months of technical assistance provided by a U.S. storage management specialist. The consultant will also assist in the preparation of the IFB for the off-shore procurement of the imported materials and equipment by ABS. The design phase of the project is scheduled to be completed by March

1986. All imported material will be purchased by competitive bids. Delivery will be taken in two lots to coincide with construction contract awards.

2. Construction Phase

Construction will be performed by prequalified private Sudanese construction firms in two phases. In order to avoid overtaxing any construction firm's implementation capability, it is currently planned to award two different contracts during each construction phase. If any firm demonstrates the capability to construct all of the warehouses during one of the two phases, the ABS may award a single construction contract. The first two contracts will be awarded in January 1987, one for the construction of two 3,000 MT capacity warehouses, and the other for one 3,000 MT and one 6,000 MT capacity warehouse. All four facilties will be in El Obeid. The construction period is from January 1987 to December 1987. The second construction phase will also be awarded in two contracts: one for the construction of two 3,000 MT warehouses (one at Dilling and one at Talodi), the other contract for one 3,000 MT warehouse at Abu Gubeiha. The construction period of the second phase is October 1987 to October 1988. A consultant furnished by the warehouse manufacturer or distributor will assist each contractor for a period of two months each.

3. Technical Assistance

The first input of expatriate technical assistance will be three person months during the design phase to assist the Sudanese A&E firm. An additional two person months are budgeted for an agricultural economist's input on the economics of alternative facilities for southern Kordofan. The design is scheduled for a six month period from September 1985 to March 1986. The designs, along with the other engineering functions, will be provided by a Sudanese A&E firm. The expatriate consultant, a storage management specialist, will help the A&E firm prepare the designs to ensure that they include KSU's design considerations. In addition, the consultant will help prepare the specifications and IFB for procurement of the imported material.

The IFB for the imported material will require that the manufacturer or the distributor include eight person months of construction assistance for the Sudanese construction firms. The manufacturer's assistance will supplement the primary construction supervision responsibilities of the A&E firm.

To meet training requirements on storage operations, a consultant will be selected early in the project who is a specialist in grain storage warehouse management and operations. The consultant will make a pre-training trip to Sudan to assess training needs with ABS staff, select the training and construction sites, prepare course outlines, discuss local arrangements and logistics, and set up a training schedule. The training will be scheduled to take place prior to completion of construction of the warehouses, and will include trainees for both the ABS and pilot project warehouses. The training program budget will include provisions for preparing the training program

materials in the U.S. and follow-up training for two years after completion of construction. Each of the three in-couuntry visits will last one month and require the services of a commodity storage specialist and a financial advisor. Eight person months are scheduled for this activity.

To facilitate the implementation of the pilot project, a grain marketing specialist will be provided for two person months to work with the ABS, El Obeid Chamber of Commerce, and private sector businessmen. The consultant will explain the details and implications of the pilot project and analyze the viability of the lease/purchase options. An additional $200,000 have been budgeted for a Commercialization Support Fund to provide marketing support and technical assistance to private enterprises.

4. Contracting Mode

The A&E services, which include preparation of the warehouse design, specifications and IFB for off-shore procurement, construction contractor selection, and supervision of construction will be obtained through a local currency contract between ABS and a Sudanese A&E firm.

The storage manufacturer's construction assistance will be part of the IFB off-shore procurement package and furnished by the manufacturer or distributor of the warehouse material and equipment.

If possible, the short-term design, storage operations training and the pilot project assistance will be contracted for with one firm. USAID will attempt to locate and contract for these services with a small, minority or disadvantaged business. The design of the training program is scheduled for October 1986, but this could be delayed a full year because the training program will not be required until shortly before completion of Phase I construction in September 1987. If there is a delay in locating a contractor to furnish these services, the short-term design assistance, which will be needed in the first quarter of 1986, will be contracted for separately under an Indefinite Quantity Contract or Personal Services Contract. All other services except for the construction assistance, which is combined with merchandise procurement, will be obtained through a host country contract administered by the ABS.

5. Storage Component Detailed Schedule

	Actions	Date	Responsible Entity
1.	Project Agreement signed	March 1985	USAID/GOS
2.	ABS pre-qualifies Sudanese A&E firm and executes A&E contract	March/Sept 1985	ABS
3.	All warehouse sites identified	Sept 1985	ABS/El Obeid Chamber of Commerce

4.	Begin detailed design and prepare specifications and IFB for imported material	Sept 1985	A&E firm
5.	Design Consultant arrives	Feb 1986	Consultant
6.	Complete designs and IFB for construction	March 1986	A&E/Consultant
7.	Advertise IFB for off-shore procurement in CBD	April 1986	USAID
8.	Prequalify and select 2 construction contractors for Phase I through competitive bids	Apr-Sept 1986	ABS/A&E/USAID
9.	Issue IFB-off-shore procurement	Mid-May 1986	A&E
10.	Receive bids for off-shore procurement	June 1986	ABS/A&E/USAID
11.	Execute purchase contract;order material	July 1986	ABS; USAID
12.	Pre-Training Consultant arrives	Oct 1986	Consultant
13.	Take delivery on first lot of material	Dec 1986	ABS
14.	Start Phase I construction	Jan 1987	ABS/A&E/Contractor
15.	Pilot Project Consultant arrives	July 1987	ABS/Consultant
16.	Conduct warehouse training program	Aug 1987	ABS/Consultant
17.	Construction completed Phase I	Dec 1987	Contractor
18.	Prequalify and select two construction contractors for Phase 2	Apr-Sept 1987	ABS/A&E/USAID
19.	ABS takes delivery of second lot of material	Sept 1987	ABS
20.	Start Phase 2 construction	Oct 1987	ABS/A&E/Contractor
21.	Internal Review	Nov 1987	USAID/REDSO/ABS

22.	Finish Phase 2 construction	Sept 1988	
23.	Conduct warehouse follow-up training program	May 1988	Consultant
24.	External Evaluation; Storage/Credit	Jan 1989	IQC/ABS/USAID
25.	Conduct follow-up training	May 1989	Consultant

Figure V

Storage Component Construction & Technical Assistance Schedule

	Jan. '85	'86	'87	'88	'89
Design & Construction					
Select A&E - Prepare Designs					
Offshore Procurement					
Select two contractors					
Cons't Phase 1					
Select two contractors					
Cons't Phase 2					
Technical Assistance					
(1) Design Assistance	(2PM)		(1PM)		
(2) Construction Assistance		(4PM)	(4PM)		
(3) Warehouse Operations Training		(2PM)	(4PM)	(1PM)	(1PM)
(4) Pilot Project Assistance			(2PM)		

6. Implementation Responsibilities

a. Agricultural Bank of Sudan

The ABS is the primary agency for implementing the storage component. This component, in all respects, complements the current activities of ABS. They will appoint a project manager who will coordinate the activities of all involved parties. ABS will contract for the A&E services, coordinate the ABS training program, contract for the off-shore procurement, and contract for the construction services. Upon completion of construction, ABS will operate the warehouses, with the exception of those turned over to the private sector, in conjunction with their ongoing credit program. ABS will handle the details of the transfer of the warehouses under the pilot project, to the private sector. Revenues from the pilot project will be incorporated into the project's credit program.

c. Technical Assistance

The technical assistance provided under the storage component, with the exception of the pilot project technical assistance, is not unusual and shall present no problems. The design assistance will require an expert who is knowledgable in warehouse design and operations and who has experience in preparing specifications and procurement documents. The construction assistance will be furnished by advisors who are familiar with the manufacture and erection of the facilities. The training program will be developed and carried out by a consultant, again familiar with grain warehouse management and operations. This activity will need to be coordinated between ABS and the El Obeid Chamber of Commerce. The technical assistance for the private sector pilot project is somewhat unique in that it will require the services of someone familiar with both financial and operational aspects of private warehouses. In addition, the consultant will have to gain the confidence of the local merchants to be successful.

d. USAID

The USAID project manager will monitor the component's implementation activities. The engineering office will have primary technical responsibility, but will require assistance from the agriculture office. The critical elements of the implementation are the A&E services, scheduling of technical assistance and off-shore procurement. The project officer will necessarily need to establish a working relationship with the ABS project manager and to ensure that the training program and pilot project consultants have the necessary local support to carry out their responsibilities. Monitoring the activities will be by personal contact with ABS and consultants, reports, site visits, audit and evaluations.

D. Credit

1. Implementing Agents

Effective project implementation will require varying levels of participation and cooperation among the ABS, the farmer cooperative socieities, the regional branch of MCIC, and the PVO providing technical assistance. The ABS will be the catalyst in starting and maintaining the credit programs. As the project develops other lending institutions may be incorporated into implementation depending on national restrictions on commercial credit. The cooperatives are equally critical to the project's success since they will eventually collect harvested crops, organize their transport, disburse farmer loans, and assist in their collection. Once formed, the cooperatives also have the potential to initiate self-help activities beyond the scope of the project. MCIC will help organize and register cooperatives, but the extent of its participation must still be determined. In part, assessing MCIC's role will be one of the PVO's initial functions. The PVO's overall responsibility is to upgrade financial and cooperative management.

The ABS branch in El Obeid is already fully staffed and functioning, although at low capital levels. The ABS will appoint new staff to the planned branch at Abu Gubeiha and expand the credit office at Talodi. Personnel requirements for administering the loan programs will be small: a branch manager, bookkeeper, clerk and secretary. The ABS will also have separate staff at each location to manage the storage facilities. Cooperative training will be the most difficult institution-building aspect of the credit component. An estimated 10-15 cooperatives are already organized and waiting for registration and financing in El Obeid, but all must be trained in basic bookkeeping. Cooperatives in Talodi and Abu Gubeiha are not yet formed. While this offers an opportunity to incorporate sound management practices from the beginning, the training effort will be extensive.

2. Timing

ABS access to storage facilities and organization of farmer cooperatives are the critical determinants of initial disbursements on production loans. During the final stages of storage construction and cooperative organization, loan funds will be secured for each ABS branch. Since the ABS already has rented storage facilities in El Obeid, the credit program can begin before completing construction of the new facility. Initial production loan disbursements are planned for June 1986. They will follow a six-month review of ABS financial management practices and cooperative organization procedures beginning in January 1986. The first long-term advisor will arrive in El Obeid in July 1986 to help implement the credit program and will remain through July 1989. The advisor will expand his responsibilities beyond El Obeid in his third year to help start new branches in Talodi and Abu Gubeiha.

Completion of the Talodi and Abu Gubeiha facilities is scheduled for June 1988. The long-term advisors at the respective sites will arrive in January 1988 to help organize the cooperatives and assess the first year's

capital requirements. The Abu Gubeiha advisor will remain for two years to January 1990. The Talodi advisor will have a three year assignment (through January 1991) and serve as a general consultant to ABS operations in Kordofan during the final year. Three person months of general development advisory assistance have been programmed and can be tapped at any point in the project, preferably once the cooperatives are well established.

3. PVO Selection

As stated in the project description, USAID based its decision to provide technical assistance through a PVO on cost considerations and the practical, rural orientation of the credit programs. A survey of all African USAID Missions has identified 4 PVOs with repeatedly good implementation records on agricultural credit and cooperative projects. AID/W has identified several others with promising capability. In May 1985 USAID will issue a Request for Proposals to 5 to 8 organizations and select the top PVO to assist the ABS. According to Handbook 13, Chapter 1B, the Assistance Administrator's approval is required to restrict competition. This authorization is expected in April 1985.

Short listed PVOs are expected to submit their proposals by July 1985. USAID and the ABS will complete the selection process by September and sign the cooperative agreement by October 1985. This should allow sufficient time for the short-term financial and cooperative consulstants to arrive in-country in January 1986. Eight full months are provided for mobilization of the first long-term advisor.

4. Implementation Schedule

Actions	Date	Responsible Entity
1. Project Agreement Signed	March 1985	USAID/GOS
2. Authorization to restrict t.a. to PVOs	April 1985	USAID/AID/W
3. Issue RFP to shortlisted PVOs	May 1985	USAID/ABS
4. Review and selection of PVOs	July-Sept 1985	USAID/ABS
5. Cooperative Agreement Signed	October 1985	USAID/PVO
6. Financial and Cooperative Assessment; Recommendations on Loan Fund	Jan-June 1986	PVO
7. First El Obeid Production Loans	June 1986	ABS/PVO/USAID
8. El Obeid Advisor Arrives	July 1986	PVO
9. El Obeid Production Loans	November 1986	ABS/PVO/USAID

10. Reassessment of credit requirements and fees.	Feb-April 1987	ABS/PVO
11. El Obeid Production Loans	June 1987	ABS/PVO/USAID
12. El Obeid Inventory Loans	November 1987	ABS/PVO/USAID
13. Abu Gubeiha and Talodi Advisors arrive.	January 1988	PVO
14. Abu Gubeiha/Talodi Cooperatives organized	Jan-June 1988	ABS/MCIC/PVO
15. Reassessment of Credit requirements and fees	Feb-April 1988	ABS/PVO
16. Production loans - all three sites	June 1988	ABS/PVO/USAID
17. Inventory loans - all three sites	November 1988	ABS/PVO/USAID
18. External Evaluation Credit/Storage	Jan 1989	IQC/ABS/USAID
19. Repeat steps 15-17 annually	1989-1992	ABS/PVO/USAID
20. Short-term coop. development consultancy	Feb-April 1989	PVO/ABS
21. El Obeid advisor leaves	June 1989	PVO
22. Abu Gubeiha advisor leaves	January 1990	PVO
23. Talodi advisor leaves; ABS assumes full implementation responsibility	January 1991	PVO
24. PACD	June 1992	

5. Implementation Responsibilities

a. Agricultural Bank of Sudan

The ABS will hold primary responsibility for administering production and inventory loans, but private commercial lending will be incorporated into the project if national credit ceilings permit. From the early stages of the project the ABS will participate with the PVO in reviewing its field-level financial practices and methods for cooperative organization and training. The ABS will incorporate these recommendations into its operational procedures. During implementation it will assess annually, with the PVO's assistance, capital requirements and fee structures (including the cost of capital), review these with USAID, and adjust lending policies accordingly. Both production and inventory loans must be disbursed to meet planting requirements and post-harvest cash needs. The credit administrators

will take responsibility for levying fees for both the credit and storage components of the project in order to minimize the number of financial transactions with the cooperatives. ABS will provide a minimum staff of branch manager, bookkeeper, clerk and secretary to each credit site. The ABS role in cooperative organization will be determined during the PVO's first short-term consultancy. Initially, the ABS will have to assist the cooperatives in basic bookkeeping and may have to increase each branch staff accordingly. Although AID will hold the cooperative agreement with the PVO, the ABS will participate in its selection.

b. Cooperative Societies

Cooperatives will be the principal mechanisms for channelling credit to the farm level, reducing the transaction costs of small farmer lending, and minimizing the risk of production loans. In practice, cooperatives are the starting point for the credit programs. They accept production loans and allocate them to their member farmers. Each cooperative will be formed around a village so total cooperative membership will vary with village size. Each credit branch will have numerous cooperative members, the exact number depending on the branch's practical geographic reach. Subgroups of 5-10 farmers within the cooperatives will guarantee repayment of each group's loans at the risk of the entire group being disqualified for additional credit in case of default. After harvest, the cooperatives will collect crops, transport them to storage facilities, and distribute inventory loans to member farmers. Once organized, the cooperatives will be the principal vehicle for initiating development activities that go beyond the scope of KORAG's objectives.

c. Ministry of Commerce, Industry and Cooperation

In the past, MCIC's regional office in El obeid has taken official responsibility for organizing and registering cooperative socieities. It is clear that MCIC must continue its certification role. Given staff limitations, particularly at the field level, it may be more efficient for MCIC to rely increasingly on the ABS to perform field-level functions and to reduce its role to registering cooperatives and specialized advice. As indicated above, the PVO will recommend institutional adjustments by June 1986, or six months after starting its first short-term consultancy.

d. Private Voluntary Organization

The PVO's principal role is to assist in and develop all institutional and management aspects of the credit programs through both short- and long-term consultancies. Its first function will be to provide a rural credit consultant and a cooperative advisor for six-person months each to establish the financial and cooperative management groundrules for the project. The short-term advisors will apply their recommendations directly to expansion of the El Obeid branch and will have specific recommendations on capital needs, fee structures and cooperative growth in addition to their general management analysis.

The branch advisors at El Obeid, Talodi and Abu Gubeiha will help the ABS implement institutional and management recommendations, facilitate cooperative organization, take a direct role in cooperative training, and assist in annual financial reassessments. The PVO will suggest how these general responsibilities may be staggered over its team members. The first long-term advisor's tour (El Obeid) will last three years, with responsibilities in the final year and a half generalized beyond El Obeid to help start the Talodi and Abu Gubeiha branches. The Abu Gubeiha advisor will concentrate specifically on that branch's formation and development for a full two-year tour. The Talodi advisor will extend one year beyond the Abu Gubeiha advisor to provide continuing advice on ABS operations in Kordofan. The PVO will also be allowed 3 person months of assistance for general development consultancies to provide technical advice on expanded use of the cooperatives.

e. USAID

In addition to standard monitoring and implementation requirements, USAID will hold the cooperative agreement with the PVO. Its execution will require shortlisting qualified organizations, issuing an RFP, evaluating proposals with the ABS, signing the agreement, and making payments through a letter of credit. During implementation, USAID will take responsibility for contracting for audits and the external evaluation. It will also review the annual financial assessments for each branch and work with the ABS and PVO to make adjustments that provide for the credit program's financial viability.

E. Project Evaluations

1. Evaluation of the Project Goal

In order to evaluate the combined impact of all project components USAID will assemble a team two years after the PACD (1994) to assess whether expected beneficiaries have moved toward the project goal of raising production and income in the area of influence. The evaluation will be conducted by Sudanese consultants under contract with USAID. The evaluation team for this Impact Evaluation will consist of an agricultural economist, a social scientist and a transport economist. The team will compare data on income and production levels before the project with conditions prevailing at the time of the evaluation. They will also compare the baseline amount of export earnings for the project area of influence with the amount prevailing at the time of the Impact Evaluation. Finally, they will compare the level of food grain imported to and exported from the project area of influence. Because of distorted production and import levels due to the drought, the evaluation team may have to use 1982/83 data as a baseline.

The team will also consider the socioeconomic impact of the project, such as population movements attributable to the road, changes in employment patterns and the effects of new population concentrations. Socioeconomic baseline data have been compiled through the Environmental Review done for the

project design and will be updated through a monitoring program. Additional baseline information is available from farm-level research done by INTSORMIL in north Kordofan, Louis Berger's agricultural transport and marketing study, and various road analyses done over the past ten years.*

Since the project components are interrelated and the goal of the project will be influenced by externalities such as weather conditions, the evaluation team will necessarily rely on subjective judgements regarding changes which can reasonably be attributed to each component. The consultants will, however, be asked to justify the rationale for their judgement. This can be enhanced by asking them to submit a methodology which will enable them to identify the required benefits of the project road.

No funds are allocated for this evaluation in the project budget since it is scheduled to be carried out several years after the PACD. Local currency generations, either CIP or PL 480, are a reasonable source of funding.

2. Evaluation of the Project Purpose: Feeder Road Component

The feeder road component will be assessed three times during the life of the project through two project reviews and an external evaluation. The assessments will consider the performance of the implementing agencies and identify problem areas associated with project execution . The first two evaluation exercises are intended to provide input into project implementation so that the original design can be readjusted as required. The final review will influence financing for ongoing maintenance and consolidate project experience with local contractors. Each exercise's focus and a tentative schedule, to be modified in light of project progress, are provided below. All three evaluations are carried out during the life of the project.

---

* The following reports contain useful baseline information:

a) Sudan Feeder Roads Master Plan Report, Norconsult, Hovik, Norway January 1980; b) "Environmental Review of KORAG Feeder Roads," Institute of Environmental Studies, 1985; c) "Technical/Economic Analysis, Feeder Road Component, Kordofan Rainfed Agriculture Project Paper," Wilbur Smith & Associates, November 1984; d) "Technical/Economic Analysis, Storage and Inventory Loan Component," Kansas State University, August 1984; e) "Kordofan Region Agricultural Transport and Marketing Study," Louis Berger, March 1983; f) "Kordofan Region Agricultural Credit Study," Checchi and Co., November 1983; g) INTSORMIL report series 1-3 under contract AID/DSAN-6-0149; h) "Private Sector Review of Western Sudan," Sudanese Consultations Bureau, February 1985.

a. April 1987: Interim Internal Review

This review should be conducted by USAID, REDSO and RBPC. It is scheduled to take place after construction under contracts A-1 and A-2 have started. The purpose of the review is to assess the performance of all the parties involved, (i.e., USAID, the Joint Venture A&E firm, RBPC, the regional government and the local construction contractors) in relation to the implementation schedule. Based on the findings of this assessment, some adjustment may be made in project management and the implementation plan. It will be particularly important to review the local contractors' mobilization time and equipment arrangements to gauge whether the planned 2-1/2 year construction/mobilization period is feasible.

b. March 1989: Midterm External Evaluation

This evaluation will analyze the same factors evaluated in the Interim Review as well as the following:

- Effectiveness of the project strategy;
- The adjustments made as a result of the Interim Review;
- The experience gained from construction under contracts A-1, A-2, B-1 and B-2; and
- Plans for the maintenance program and contractor performance on routine maintenance of their stretches.

The mid-point evaluation team may include a transport economist and civil engineer hired under an IQC, as well as Sudanese experts. The team will recommend whether to continue construction of Phase II roads and, if so, determine whether sufficient funds are available under the project to do so. Extension of the project will be strongly influenced by the team's recommendations on whether local contractors are capable of building project roads without continuing expatriate assistance. The evaluation has been scheduled three months after the external evaluation for the storage and credit; the project manager will have the discretion to combine the two external evaluations if it appears administratively more efficient.

c. December 1991: Final Review

The final review is scheduled to take place after completion of all construction contracts. Because of the project's innovative use of local contractors and the extensive training provided, it will be critical to assess their overall performance. Conclusions from the evaluation may have implications for AID projects in other countries as well as for continuation with phase II. Like the two previous exercises, the final review will be concerned with the success of the project strategy and performance of the implementing parties. The evaluation team will also review implementation of the maintenance program recommended by the 1988 regional maintenance study. The team will include representatives of USAID, REDSO and RBPC as well as a Sudanese engineer with extensive rural road experience and familiarity with the relevant local institutions.

3. Evaluation of the Project Purpose: Storage and Credit Components

In addition to the Impact Evaluation of all Project components, two baseline analyses (one related to credit, the other on private sector storage), an external evaluation and a final internal review are planned for the storage and credit components. Since implementation of the two components must be closely coordinated and the ABS has principal responsibility for both, they will be evaluated together. The baseline analyses will be part of the respective technical assistance contracts for storage and credit. The external evaluation will be done under an IQC with Sudanese experts participating. The internal review will be done by USAID, REDSO and the GOS, possibly with Sudanese contract assistance.

a. January-June 1985: Financial and Coop Review

As indicated in the project description, ABS field-level finances and cooperative organization practices have not been thoroughly assessed. The main purpose of this review is to make functional recommendations that will be incorporated into project implementation. For future evaluations, it will provide baseline information to determine whether financial management and cooperative organization procedures have improved and whether recommendations have been successfully implemented. The PVO providing technical assistance under the storage component will conduct the review.

b. July 1987: Private Sector Analysis

Kansas State University's 1984 study highlighted the importance of obtaining additional information on private sector investments and operating costs for storage facilities. This information will be used to structure lease and purchase options for the private sector pilot activity. Inevitably, the analysis must determine current loss rates in private operations. It will also review current handling practices and attention to quality control. Future evaluations will use this baseline data to determine whether assistance to the private sector has significantly reduced loss rates and improved marketing procedures. The analysis will be done by the firm responsible for technical assistance and training under the storage component.

c. November 1987: Internal Review

This internal review will be conducted by USAID, REDSO and the GOS when storage facilities in El Obeid have been completed and the second construction phase has just begun. It will measure the performance to date of USAID, ABS, the consulting engineer and the construction contractor. Adjustments may then be made in the implementation schedule for the remaining storage facilities.

d. January 1989: External Evaluation

The external evaluation will be done after construction has been completed at all storage sites, all three credit advisors have spent at least

a year in-country, and the three loan programs have initiated disbursements. The evaluation, conducted by an IQC firm with Sudanese assistance, will review storage operations, lending practices and fee structures. The team should make practical recommendations on further development of fledgling cooperatives. Lastly, the evaluation will consider the effectiveness of the private sector pilot project and recommend whether to continue similar activities using CIP funds. As indicated earlier, this evaluation may be combined with the external evaluation of feeder roads at the project manager's discretion.

VI. Project Analyses

A. Technical Analysis

1. Feeder Roads

a. Description of Roads

The proposed feeder roads form a loop that runs 455.6 Km from Kadugli south to Talodi and north through the major production areas in Kordofan to Um Ruwaba. Construction of these project roads will be carried out in two phases, with Phase I roads covering 292.6 Km at the two ends of the loop. The middle section of the loop will be built under Phase II as a separate project. The two ends of the loop, which will be constructed under Phase I, are composed of the following road links.

(1) Kadugli-Talodi. Its alignment is 91.6 km and follows one of the existing earth tracks linking the two towns. Generally, the terrain is flat and the soils vary from black cotton to silty and sandy clay. Drainage requirements along the proposed alignment are defined by the existing water courses. Material requirements of the construction work are available within a reasonable hauling distance.

(2) Abu Gubeiha-Rashad. Up to 40 km north of Abu Gubeiha, the terrain is flat while the remaining portion to Rashad is a rolling terrain. Fifty percent of the surface soils are estimated to be black cotton while the rest range from laterite to sandy clay and rocky. Two of the existing fords across water courses along this route are considered to be in poor condition.

(3) Rashad-El Abbasiya. Except the last portion towards Abbasiya (17 km), the terrain is predominantly rolling with numerous stream courses intercepting the alignment at an average spacing of 1.6 km. 40% of the soils are rocky and the rest vary from black cotton to sandy clay and laterite.

(4) El Abbasiya-Balahat/Um Ruwaba. The proposed alignment runs north of Abbasiya, passing to the west of Barid, through Sherkeila to Balahat. 75% of the surface soils are classified as black cotton and the remaining 25% are silt sand soils. Drainage structures are needed at five locations.

b. Design Standard

Two major impediments confront motorized traffic during the rainy season: water courses and black cotton soils. The minimum investments needed

to address these two obstacles define the minimum road construction standard. It was concluded that virtual all-weather access was required to guarantee the objective of 30-50 percent access specified in the PID. No intermediate standard was considered feasible.

(1) Road Dimension. A 6.0 m wide roadway, including shoulder width, has been selected in lieu of a 4.0 m or 5.5 m roadway because it reduces the depth of surface rutting due to channelization of traffic; it minimizes the impact of poor or ineffective maintenance; and it gives greater passing capacity for a relatively small cost increment (approximately 6%).

(2) Road Section and Ditch Plan. Figures 1 and 2 of Annex 6A show a cross section of the road as well as a typical ditch plan.

(3) Drainage Structures. Small drainage structures are required at fairly regular intervals beneath the road to pass the sheet flow collected in the side interceptor ditch. An average of two 600 mm diameter pipe culverts will be required per kilometer with every third installation being a double pipe culvert. Pipe culverts of this size were recommended to facilitate production on site as well as manual handling using local labor. Figures III and IV of Annex 6A depict the proposed sections of a typical culvert and a ford. None of the water courses are sufficiently deep and wide to require a bridge.

c. Design Methodology

Considerable latitude is provided in establishing the final alignment of project roads since existing tracks are not well defined. When setting the horizontal alignment, items such as established farms, villages, and areas of bad soils should be gien due consideration. The road formation will generally be fill (50 cm) rather than a cut section, since the area is relatively flat. The vertical alignment will therefore be simple to design and will depend on cross section rather than longitudinal slopes.

Due to the remoteness of the project and the lack of supporting facilities such as large scale mapping, the cost of detailed engineering plans for these low standard roads would be practically equal to those prepared for high standard roads. Accordingly, the A&E firm will prepare standard drawings of culverts, fords, ditches, erosion control measures and other details during the final phase of the project that can be applied throughout the project. While standard details are being prepared, the alignment for the first phase of construction will be established in the field, major topographic features noted and a surveyed centerline profile of existing ground obtained. Additional longitudinal profiles at major stream crossings should also be taken at the same time.

d. Cost Analysis

WSA developed the construction cost by using unit cost figures previously developed by Norconsult and later by Louis Berger in earlier road studies. From field observations they estimated the formation volume, haul distances to aggregate sources and the incidence of culverts and fords. They then applied unit costs to their field observations and escalated all costs to 1985. The PP team, in an effort to clarify these unit cost figures, requested backup data from WSA. In all cases, WSA referred to two or three sources (specific reports) to justify their estimates. The PP team concluded that the unit costs were derived by a reasonably methodology. Based on Wilbur Smith's preliminary engineering analysis, earthwork and surfacing combined account for 72% of the estimated construction costs with estimated earth quantities accurate with a range of ± 15% and surfacing + 5%. Overall cost estimates are considered accurate within a 16 percent range. A 15 percent contingency has been added to the Budget to compensate for the range of error.

e. Maintenance

Construction contractors will maintain their road segment during construction and for a minimum six months thereafter. Before the end of the project, USAID, RBPC, and the Regional Government will agree on a maintenance program. This program will be based upon the capabilities of RBPC for maintenance in light of developments under the Third Highway Project and the results of the Regional Maintenance Study to be conducted under the Western Agricultural Marketing Road in October 1988. Efforts will be made to involve local communities in routine maintenance. Specific maintenance options will be defined in the regional study. The KORAG budget provides funds to cover routine maintenance for the life of the project.

f. Contracting

RBPC will hold host country contracts with the U.S./Sudanese joint venture engineer and the local construction contractors. All contracting under the project will follow Handbook 11 and RBPC contracting procedures and practices. RBPC is accustomed to shortlisting contractors, reviewing technical proposals and competitive bidding procedures. USAID will review and approve all contracts. The Kordofan regional government will participate in the contracting process and contract administration.

g. Conclusion

USAID concludes that the project as studied by WSA and further amended in the Project Paper is technically sound. The implementation plan, schedule and cost estimates have taken into consideration the overall project strategy for private sector participation and the capabilities of RBPC and the Kordofan regional government. It is recognized that inexperience of Sudanese contractors and engineers will entail on-the-job training which will cost time and money.

the detailed engineering design. On the basis of construction experience of the ABS, a list of quantities is presented in Annex 6A for the local component of the warehouse.

c. Warehouse Operations

Preventative rather than corrective measures are prescribed for pest control. These measures can be attained through inspection, housekeeping, physical and mechanical methods and chemical methods. Inspection covers the storage facility, the grain and the area surrounding the facility. Among the different types of preventive pest control, housekeeping has been recommended as being the most effective means of control. More elaborate instructions on housekeeping are given in Annex 6A.

d. ABS Warehouses

The four ABS warehouses will be located in El Obeid, Dilling, Abu Gubeiha and Talodi. The locations conform to the calculated dispersion of the production of sorghum, the main crop. The foreign exchange cost of imported material for such a facility has been estimated at approximately $150,000. The cost was developed from an analysis of recent bids received from ABS. The local currency cost of construction was estimated at about LS 630,000 and was determined by the same analysis as used for the foreign exchange. KSU emphasized the need for warehouse management and operations training. Following their recommendations, a training program, as described in the project description Section V above, is included in the project component. The main objective of the training program is to train ABS warehouse manager and other ABS supervisors. The subject matter of the training should include (1) insect and rodent biology, (2) insect and rodent identification, and (3) integrated pest control measures dealing with inspection, housekeeping, physical and mechanical controls, and chemical controls, including chemical control methods and practices, grain protectants and fumigants, pesticide application pesticide safety, and rodenticides.

e. Private-Sector Pilot Project

KSU's discussions with the private-sector grain traders indicated the need for improved storage facilities. However, the merchants were not interested in building the warehouses themselves, because they do not possess the necessary expertise, experience, and supervision capability for such an undertaking. If the ABS builds the improved warehouses, the merchants would use the facilities under purchase or lease options. Besides storage facilities, the merchants also stressed the need to clean grain before marketing. Even though no grain grading factors exist in the Sudanese buying and selling norms, some subjective criteria as to grain cleanliness do exist in pricing the grain during a normal production year.

- Sloping sites should be avoided.
- The site should be accessible to vehicles.
- Availability of water, electric power, sewage disposal and general drainage may also influence the choice of the site.
- Future development of the site should also be planned.

Detailed specifications are provided in Annex 6A. Briefly, the specifications require a floor area of 1,600 m^2 with variable length and span (such as 57 M X 28 M or 80 M X 20 M) and a height of 5.5 m from floor level to the top of the stanchions. Floor level is 1 m above ground. The eaves overhang 1 m along the length, except over door where the overhang should be 5 m. The roof overhang at the gables is 1 M. The end door's awning is 3 m.

The building will have mild steel universal section columns and portal rafters, and galvanized iron roof and walls are recommended for the warehouse. Additional consideration will be given during final design to masonary walls because of the low foreign exchange component, but there are cost and environmental drawbacks described in Annex 6A. The roof and awnings may be covered with corrugated sheeting of 22-gauge galvanized steel or aluminium. The minimum longitudinal lap should be 0.2 m, the side lap 0.15 m, and all laps should be sealed with mastic beading to avoid leakage. A partial brick wall up to a height of 2 m above the floor may be used. Any gaps between the top of the wall and adjoining roof sheets should be sealed, preferably, with a flexible mastic substance which moves as the roof expands and contracts. Doors should be steel framed, or a double-leaf sliding design and clad with 22-gauge galvanized steel or aluminium. Ventilators should be located high on walls close to eaves. Windows may be incorporated into ventilators.

Foundations should have a firm base, which necessitates examination of the sub-soil at every construction site, and should be designed to suit local conditions. Foundations, columns, beams and flooring should be reinforced by mild steel bars (10 to 19 mm in diameter). Mortar for bricklaying and plastering should be mixed from cement and sand in a 1 to 8 ratio, plus mortar plasticizer. The floor area should never be filled with loose earth or topsoil. If infill is necessary, sand, stone, rubble or broken bricks should be used.

b. Estimated Imported and Local Component

Each warehouse will require approximately 100 tons of imported material. This estimate is based on a designed floor area of 1600 m^2 and the use of I-section steel stanchions, portal rafters, gable posts, galvanized iron roof, galvanized side-wall sheets, steel doors, Z-section steel purlins and rails. A detailed list of the materials is presented in Annex 6A. This list is illustrative, the actual bill of materials will be developed during

2. Storage Facilities

a. Design Considerations

The location and size of the storage facilities is dictated by five important elements: (1) road infrastructure, (2) the warehouses to be financed by the World Bank, (3) the current and proposed locations of ABS branch offices and secondary offices, (4) the projected growth patterns of ABS storage operations in the Kordofan Region, (5) the distribution of sorghum, sesame, and groundnut production, and (6) major market activities.

Based on all considerations, the proposed sites for the four ABS warehouses are Dilling, El Obeid, Abu Gubeiha, and Talodi. Warehouse positioning in the region conforms with the calculated dispersion of production sorghum, which is the major crop. Because of the estimated levels of sorghum, sesame, and groundnut production in the above areas and the growth patterns of ABS operations at Um Ruwaba, El Obeid, and Dilling, a warehouse size of 3,000 MT (33,000 bags) was selected. Construction costs indicate that a smaller warehouse unit would greatly increase the investment cost per MT of storage capacity. A larger unit would be totally uneconomical at this time. A standard size for all locations will facilitiate the construction process and should reduce or at least stabilize the expected cost of construction.

Usable volume and gross volume are not identical in a warehouse. The former is always less than the latter since air circulation and ventilation require clear spacing. Aisleways (min. 0.6 m) and headroom around and above stacks is essential not only for ventilation but also for access, housekeeping and fumigation. Because of these factors the useable volume in a small warehouse (500 MT or less) can be less than 50% of gross volume. The useable volume increases with size to 70-80% for 5,000-10,000 MT capacity. KSU recommended warehouses of 3000 MT capacity (1600 M^2 of floor area) with a building size of 57 M X 28 M, with a height of 5.5 M. KSU considered the viability of bulk facilities in El Obeid, and although they would be technically feasible in a major market town, a small bulk facility is currently not financially viable for the area.

The following factors will be taken into consideration in final siting of the warehouses:

- The soil load-bearing capacity should be high since weak soils can substantially increase building costs.
- Excessively wet areas are not desirable.
- Appropriate orientation of a warehouse will enhance good ventilation.

The pilot project will consist of three storage facilities: two 3,000 MT bag warehouses and a 6,000 MT bag warehouse. The size of the storage facilities is dictated by the fact that the ABS warehouses will have a capacity of 3,000 MT and so will facilitate the construction process. The 3,000 MT size fits the needs of an individual merchant, and the 6,000 MT size will allow a group of merchants to jointly use this facility to market their grain. The proposed 3,000 MT warehouse is identical to the ABS facility and is described in details in Annex 6A. The 6,000 MT facility is simply a multiple of the 3,000 MT design. In order for bagged grain to be cleaned, the bags must be emptied before the grain passes through the cleaner. After cleaning, the grain can be rebagged for storage in the warehouses. The managers and operators of the pilot project warehouses will participate in the same training program as offered for the ABS warehouses.

f. Contracting

The A&E services for the design and supervision of construction will be performed by a Sudanese A&E firm under a local currency contract. The construction contracts will be with Sudanese contractors selected using prequalification procedures. The procurement of off-shore material will be done by ABS's purchasing division. ABS has previous experience in all phases of warehouse design, construction and contract administration. Short-term technical assistance will be provided to review the final designs and tender documents and assure that they are in a suitable form for U.S. bidding.

B. Economic Analysis

1. Introduction

This analysis considers the overall returns from the project as well as the individual economic impacts of feeder roads and storage. A financial analysis of farmer income is done for agricultural credit. The interrelationships among project components in creating a regional transport and marketing network justify calculating overall project Net Present Values and Internal Rates of Return. Farm-to-market roads link production areas to regional markets and major transport arteries. The road networks are critical to year-round access to storage facilities and thus their economic viability. Conversely, the storage component will provide incentives for agricultural production, which is one of the factors used to estimate vehicle counts and the resulting operating cost benefits. From the farmer's perspective, the storage component is made financially viable through the flexibility provided by credit.

We have calculated the NPVs and IRRs of the overall project (roads and storage) for two different cases: a base estimate and a pessimistic estimate (a 15% decrease in benefits and increase in costs). As shown in the table below, the project is economically viable in both cases. The NPV under our base estimate is LS 12,049,000 at a 15% discount rate, and the IRR is 22%.

Table 6C-1
Overall Project Economic Impact

Scenario	NPVs (Ls 000) 15%	12%	18%	IRR
Base Case	12,049	24,294	6,244	22%
Pessimistic Case	2,202	10,668	-2,925	16%

Individual economic analyses for the feeder road and storage components, with similar sensitivity tests, are provided below. The internal rates of return using the base estimate for each component is 22% (roads) and 25% (storage). The NPVs at a 15% discount rate are LS 9.2 million (roads) and LS 2.8 million (storage). Since the credit program involves a transfer of resources within the economy rather than a net economic gain, we have only evaluated its net financial impact on farmer income. It is difficult to generalize the impact across Kordofan since farmers have different cropping patterns, areas under cultivation and loan requirements, so we have made illustrative calculations based on farm-level research in northern Kordofan. We have estimated that feasible increases in traditional farmer annual income are 23% from inventory loans and 14% from production loans.

2. Feeder Roads

a. Methodology

The proposed feeder road program will be completed in two phases, with Phase I financed under this project. Once completed the feeder roads will provide all-weather access from Balahat (near Um Ruwaba) on the Kosti-El Obeid road to the southern terminus of the El Obeid-Kadugli highway. Phase I will link Kadugli with Talodi in the south and Balahat with Abu Gubeiha in the north (sections 1A, 1B, 1C, 2C, 3A and 4D on the attached map). Phase II will close the feeder road loop. The Phase I roads (those at the outer ends of the loop) have higher rates of return than those in the interior.

A cost benefit analysis is conducted for each of the road segments separately since construction costs per kilometer are not uniform throughout the whole loop due to the different soil types, average haul of gravel deposits, water courses, slope of the land, etc. Benefits per kilometer are also different reflecting differences in traffic levels, composition of vehicle mix and wage rates. Estimates of project benefits are conservatively limited to savings on vehicle operating costs and passenger time. To avoid double counting VOC savings and induced agricultural benefits, the latter were limited to their generated traffic estimates rather than counted separately

(see Annex 6B for an extensive discussion). For normal and diverted traffic, the full savings on vehicle operating costs and passenger time are counted as benefits. Only half of these savings are counted as benefits for generated traffic to compensate for uncertainty in future projections. No allowances were made, however, for the effect of possible future fuel shortages.

b. Traffic Analysis

The economic analysis is based on a feasibility study completed by Wilbur Smith and Associates in November 1984. Wilbur Smith was able to draw upon and update an extensive body of literature on roads in Kordofan Region. The principal source of traffic counts is a Norconsult Study (dated 1980) which covered the alignment from Balahat to Talodi and a Carl Bro Study (dated 1979), covering the remaining alignment between Talodi and Kadugli. For recent vehicle operating cost information, the Louis Berger reappraisal of the Kosti-El Obeid road was utilized.1/ As will be discussed later, the present study shows all the segments of the road are economically viable. The Carl Bro study previously found the Kadugli-Talodi segment feasible. Unlike this analysis, Norconsult had concluded that the alignments connecting Balahat with Talodi were not economically sound.

Four factors explain the road's improved viability since the Norconsult analysis. First, a very low cost road has been proposed, making maximum use of economical stream-crossing structures such as fords or Irish bridges in contrast to Norconsult's fully engineered road. Second, the delay in opening (from 1985/86 to 1988/89-1992/93) has provided additional time for traffic to develop. Third, while the cost of construction materials has risen, there have also been countervailing increases in generated traffic. Lastly, diverted traffic has been keyed to revised forecasts, especially on the Kosti-El Obeid road.

As pointed out in Annex 6-B, very conservative traffic growth rates were used for both freight and passengers. These rates vary with each road segment. Diverted traffic is keyed to projected levels in the Kosti-El Obeid road at the north end of the loop, and is tied to Kadugli-El Obeid traffic on the southern end. Traffic diversions from the Kosti-El Obeid road stem from vehicles diverted to and from the main road at Balahat and vehicles that will now go north through the feeder loop to catch the paved road at Balahat rather than proceed cross-country to and from Kosti. There should also be some diversion of the current Shagrabeth-Semeih cotton traffic to the project roads.

1/ (a) Norconsult, A.S., Sudan Feeder Roads Master Plan, Final Report, May 1980.

(b) Carl Bro, A.S., Economic and Technical Study of the Kadugli-Talodi Road, February 1979.

(c) Louis Berger, International, Inc., Economic Reappraisal of the Kosti-El Obeid Road, November 1983.

In any event, diverted traffic levels were estimated conservatively. For example, a maximum of 4 percent of annual traffic to and from the Kosti-El Obeid road was allocated to the study segments, decreasing to 2 percent near the southern end of the routing. West of Shagrabeth, diversions were assumed to be towards the Kadugli-El Obeid road. On the Kadugli-Talodi segment, diversion was restricted to 10 percent of normal traffic. Generated traffic on all segments was limited to 10 percent of normal traffic, with only half of the resulting benefits counted.

c. Economic Viability and Sensitivity Analysis

Wilbur Smith estimated all benefits and costs in Sudanese pounds and calculated economic costs as a percentage of financial costs based on Louis Berger's approach in the reappraisal of the Kosti-El Obeid road. Calculations in Sudanese pounds implicitly use the free foreign exchange rate in determining the financial value of tradeable commodities since prices are based on actual market costs. These financial costs need to be scaled down for the economic analysis to exclude transfer payments (e.g. internal taxes) and to eliminate the differential between the free foreign exchange rate and the shadow rate. The conversion factor used in this project and the Western Agricultural Marketing Road is .84.

For each road segment construction costs are split 60/40 between the first two years. Engineering costs are included in the project total costs but are not allocated to individual road segments. Since each contract will be relatively small, the short construction period is feasible. From an economic standpoint the approach is conservative since costs are up front and still weigh heavily after discounting the time value of money. We have used a shadow discount rate of 15% (see appendix 6B for a more extensive discussion of discount rates). For sensitivity tests of the analysis we varied the discount rate to 12% and 18%. The following table shows the NPVs and IRRs for each road segment under our base assumptions. Tables summarizing the results of our sensitivity analysis are provided in Appendix 6B.

Economic Returns of Feeder Roads
Base Estimates

Code	Name of Project	Year of Construction	NPVs (LS000) 15%	12%	18%	IRR %
	Phase I					
1A	Sherkeila-Balahat	1987	1300	1915	854	40
1B	Barid-Sherkeila	1987	2551	4172	1536	30
1C	El Abbasiya-Barid	1987	1152	1915	666	27

2C	Rashad-El Abbasiya	1989	1707	3079	894	26
3A	Abu Gubeiha-Rashad	1989	1799	3150	995	28
4D	Kadugli-Talodi	1986	9273	13457	6450	40
	Total		17782	27688	11395	34
less: unallocated engineering costs			-7954	8769	7248	
	Grand Total		9828	18919	4147	22

At a 15 percent discount rate, NPVs with base estimates of costs and benefits range from LS 1.15 million for section 1C (El Abbasiya-Barid) to LS 9.27 million for section 4D (Kadugli-Talodi) and the IRRs range from 26 percent to 40 percent. The NPV and IRR of the overall road sections are LS 9.8 million and 22 percent, respectively. Overall NPVs at discount rates of 12 and 18 percent are LS 18.9 and 4.2 million, respectively.

The road project includes a large training component (LS 29 million in 1985 prices) whose costs are not included in the cost/benefit analysis of the roads. The purpose of the training component is to enable Sudanese firms to undertake road construction without foreign technical assistance, thereby reducing future construction costs. Thus, the benefit of the training component is separate from the road itself, and it is a function of the amount of construction undertaken by the Sudanese firms. The cost differential between Sudanese and foreign firm construction costs is estimated to be LS 21,000 per km. With this cost saving, the training component will have a positive NPV provided the construction output of the trained Sudanese firms is approximately 180 km/year beginning in 1992.

3. Storage Facilities

The cost/benefit analysis is based on estimated direct benefits of the storage facilities. Direct benefits are the monetary value of the reduced crop storage losses that result from improved storage facilities. Although storage and handling losses are not adequately researched, the best available information suggests that weight losses in sorghum are 7 percent and damaged kernels run 13 percent during a one-year period. Quality control should reduce weight loss by 3 percentand damaged kernels by 8 percent, for a total loss reduction of 11 percent. All crops are valued at harvest prices.

Farmers/merchants in the project area typically store sixty to seventy percent of each year's crop. In the Talodi area this amounts to 270,000-315,000 bags of sorghum. The project warehouse in that area has a capacity of 33,000 bags. There is sufficient demand to indicate that it will be used to capacity after each harvest. In the economic analysis it was assumed that each facility would be fully utilized for five months after harvest. In late summer/fall the utilization rate is reduced to fifty percent. As the project develops an increasing proportion of the storage space will be utilized by project credit participants.

Investment costs for the warehouses are direct construction costs, technical assistance and training. Technical assistance includes storage design, supervision and field assistance on handling techniques. Training costs include salaries and materials for in-country short courses.

All quantifiable costs and benefits were discounted at 15 percent over a project life of 25 years. The NPV under the base analysis is LS 2,800,750 with an IRR of 25%. The table below summarizes the base analysis as well as sensitivity tests with changes in costs, benefits and the discount rate. NPVs are positive under both assumptions.

NET PRESENT VALUES (NPV) AND INTERNAL RATES OF RETURN (IRR)

	NPV (LS 000) 15%	12%	18%	IRR (%)
1. Case I Base Estimates	2,801	4,663	1,567	25%
2. Case II: Benefits are 15% lower; costs are 15% higher	908	2,359	0	18

4. Financial Analysis: Inventory and Production Loans

This financial analysis of storage and inventory loans examines the increased returns that farmers can earn on current levels of production. The intent of increased income is to allow farmers to produce more by adopting new technologies. To maximize income yet make the storage facilities self-financing, fees paid by farmers are limited to cover the rental, operating (chemicals, supplier, labor), and maintenance costs of the facilities. Additional details on fees are provided in Annex 6B. For the financial analysis, the initial investment is treated as a grant, and no attempt is made to recoup its value since both objectives of increasing income and maintaining storage facilities can be met with a lower fee than necessary to cover investment costs. (The initial investment is considered in the cost/benefit analysis discussed earlier in this section). Interest rates under the project will be based on studies done by the implementing PVO in the first stage of implementation, but for illustrative purposes are assumed to be 14 percent as the ABS currently charged.

Two issues should be considered in evaluating inventory loans: do they offer farmers an advantage over selling at harvest prices, and will the combined storage and loan improvements exceed the net benefits under current ABS programs. Differences in cropping patterns, farming techniques and risk preferences prevent us from generalizing for all farmers, but we can draw on farm production data for north Kordofan to illustrate potential benefits in both cases.

Without formal financing, farmers could earn a net of LS 757 annually on their crops based on harvest prices and subtracting the cost of labor (currently the only major input) for each crop.* This is a high estimate since it does not include repayment of sheil loans or price limitations under the sheil system. To calculate farm revenue under the storage and credit program, USAID has estimated the amounts of groundnuts, sesame and sorghum which each farmer will store based on research data on marketing patterns.** Inventory loans, estimated at LS 763, equal 70 percent of the value of stored crops at harvest prices. The selling price is taken from the end of April when most crops hit their peak price in normal rainfall years. Amounts sold are adjusted for storage losses. Once storage, insurance and interest fees are subtracted and total revenue is adjusted to include unstored crops, net additional revenue to the farmer is LS 226 annually, an increase of 23 percent in income.

The financial advantage of the new storage and inventory loan program over current ABS operations is based on reduced losses covering the increased cost of improved storage and handling. Realized net gain by farmers under current ABS operations are: LS 10.03/bag of sorghum, LS 3.31/bag of sesame and LS 5.15/bag of groundnuts. These benefits represent 33%, 5% and 16% increases in the respective harvest prices. Realized net gain by farmers under the new storage facilities are much higher: 44% for sorghum (LS 13.08/bag), 13% for sesame (LS 9.09/bag) and 24% for groundnuts (LS 7.74/bag). Detailed costs are provided in Annex 6B.

Unlike inventory loans, production loans are more important for their social rather than financial impact. With inventory loans alone, the annual increases in farmer income could slowly provide sufficient farmer flexibility to break the village merchant's monopsony over farmgate purchases. The caveat is that farmers may not have the opportunity to take inventory loans if they have committed their crops to the sheil system in order to meet production expenses. If the merchant is the only source of production credit, he can also dictate that he must be repaid in-kind rather than cash as a condition for his loan. The farmer, then, would not have the opportunity to break the merchant's control on the marketing system.

Nevertheless, production loans also have a significant financial impact. We estimated above that annual farmer income, excluding repayment of sheil loans, could reach LS 757. Factoring in repayment of a LS 100 loan at 100 percent effective interest, income declines to LS 657. The financial advantage of providing a production loan at a lower interest rate is obvious.

---

* Based on the following prices for each crop: sorghum (LS 30), sesame (LS 72) and groundnuts (LS 32.4). Additional details are provided in Table 6B- in the Economic Analysis Annex.

** 25% of harvested sorghum; 83% of each the sesame and groundnut crops.

Using a 14 percent interest rate, the net cash flow increases by 14.1 percent to LS 743. The possible margin to increase ABS interest rates and still benefit the farmer is high depending on prevailing sheil profits in different areas and for different customers.

C. Social Analysis

1. Regional Overview

The majority of Kordofan's rural population lives in areas with little or limited access to urban market centers. During the rainy season transportation of goods is done almost exclusively with either camels or donkeys, resulting in high prices, damaged goods, and commodity scarcities. Seasonal flash floods combined with clay soils make movement difficult. Poor transit has a direct impact on production incentives, farmer income and overall agricultural production. In clay soil areas extension becomes impractical during the growing season when farmers require technical assistance to gain the full benefit of new technologies. Improved agricultural inputs, when they are available, are never certain to arrive before the critical planting days soon after the first rains.

The economic disincentives to production and the social costs of isolation are also persuasive. Net income from agricultural production is low, due to transit costs from farmers' fields and high-priced consumer commodities brought into the village. Because of low incomes and seasonal cash flow constraints, farmers must use the usurious sheil credit system and have no means of storing their crops after harvest. Possible income from local crafts and cottage industries is lost due to transportation difficulties. Access to medical care and schools is limited, as these services tend to be located only in urban market areas. The combination of these factors -- inadequate and expensive transportation, high interest rates, inadequate storage and limited social services -- has kept Kordofan from reaching its economic potential.

During the past three years poor rains have exacerbated the problems of isolation, poor infrastructure and limited capital. Southern Kordofan, the heart of the project area, has not experienced the full crop failures seen near El Obeid and further north. But drought has greatly affected population patterns, yields and labor availability. Population shifts may cause land tenure conflicts with mechanized farming, tribal land holdings and traditional grazing areas. If well accomodated, additional labor could be used constructively for agricultural expansion or to increase manual labor on civil works projects such as the feeder road component of KORAG. Declining yields will continue to accompany drought conditions, but normal rainfall levels are sufficiently high to restore the area's productive capacity.

2. Socio-Cultural Context

Kordofan Region has a population of 3.2 million. Sedentary farmers living in clustered villages of straw huts accessible to water points constitute 75 percent of the rural population. Transhumant households make up 10 percent of the population during the wet season when they often join sedentary communities and cultivate land. Nomads who raise cattle, sheep, goats and camels account for an additional 5 percent of the population. Mechanized farmers make up the remaining 10 percent.

The sedentary population is dispersed in villages that vary in size from 25 to 1,000 people or more. The average household numbers between seven and eight members. Nuclear family residences are preferred, but extended families, matrilocal families and other household arrangements are common. The household is the basic unit of consumption, but agricultural production rests with several decision makers in the household. It is common for husbands and wives to manage separate farms. Unmarried sons and daughters also manage small plots when land is available. The four most common crops are millet, sorghum, sesame and groundnuts.

Food grains are primarily produced on rainfed land using traditional farming techniques, although mechanized rainfed farming has been increasing in southern Kordofan. Millet is the primary crop planted in the north, and sorghum in the south. Both are primarily consumption crops with sorghum marketed more widely than millet, partly due to the surplus generated by the Habila scheme. Small amounts of maize are grown in southern Kordofan for local consumption. Agricultural yields in this region vary tremendously from year to year, largely because of variations in rainfall.

Besides farming, virtually every household has members who work in secondary occupations on a seasonal basis to supplement the family's cash income. Off-farm activities include charcoal manufacture, water-hauling, tailoring, carpentry, metalworking, and operation of village shops and bakeries. Possibly most important for supplementing income is dry season migration for wage labor on mechanized farming schemes at Habila and Gezira. On the mechanized schemes only land preparation and seeding is done by machine. Weeding, harvesting and threshing remain manual operations. Moreover, because labor and not land is the principal production constraint in the region, mechanized and traditional farming can be complementary activities. Traditional farmers provide labor, and mechanized farm owners provide jobs when other rural employment opportunities are not available.

3. Beneficiaries

The farming and employment patterns in the project area imply that Kordofan's rural economy is not just subsistence-oriented, but is dependent upon trade. Farm households purchase food and commodities, paying in either cash or kind. In the latter case a crop is usually offered to the merchant as payment, the price of the crop reflecting harvet prices minus the cost for transport and a profit margin for the storekeeper. Exchanges of this type demonstrate that crops and commodities have prices which are affected by the cost of transportation.

Traditional farmers, both men and women, will benefit from improved rural transportation by paying lower prices for their consumables and receiving higher prices for their produce. The proposed feeder road system will provide the rural population with improved access to the main road from Kosti to El Obeid and to the existing road link from Kadugli to El Obeid. Merchants will benefit from increased transportation which will make it cheaper to bring in goods and to export local produce. Reduction of transport costs and capacity constraints, when combined with price and policy initiatives being pursued by USAID and the GOS, should both stimulate production and help vent surplus crops. Interregional trade in food grains should also benefit once regional demand is met.

Women and dependent family members will benefit from increased cash revenue generated from higher produce prices. Access to schools, medical facilities and extension services will also increase. Better transportation will facilitate cottage industries, horticultural production and other income-generating activities done principally by women. Once cooperatives are initiated, financing for women-run cooperatives should be considered as a possible project component to complement the benefits of improved regional access. Agricultural credit and storage facilities will ultimately provide greater returns on farm production. This increased income will stimulate other areas of the local economy, including merchants and transporters. The income growth process is the first step in establishing a broader tax base that can finance improved regional services.

4. Participation and Feasibility

Road rehabilitation will be done with Sudanese engineers and contractors who will hire local labor for aspects of feeder road construction. Depending on the extent of permanent population migration south from north Kordofan, rural wages may drop sufficiently to merit revising the capital/labor mix on the construction program. Labor-intensive routine maintenance is certainly appropriate for the basic standard of the road and should be emphasized in the scope of work for the 1988 regional maintenance study. A seasonal labor surplus already exists in Kordofan and the concept of wage labor is well established. The Nuba Mountain Corporation, Mechanized Farming Corporation and District Councils currently use wage labor for road construction and maintenance although the extent of road activity covers just a fraction of the land area in Kordofan. Continuing labor opportunities on road construction will provide cash income to workers and their families. Working with local contractors will upgrade private Sudanese construction capability and increase the potential for additional labor-intensive civil works activities that are usually avoided by expatriate contractors who place a higher premium on time.

Village cooperatives with ABS and expatriate assistance, will organize storage and transportation of agricultural produce. Presently, village councils serve as a focal point for public or joint community efforts. Typical activities are the coordination and construction of public buildings such as mosques, clinics and schools. Community efforts in land

clearing and seasonal field labor demonstrate strong community cohesion which will lend itself to village administration of local storage facilities called shunas. Strong familial ties and traditions will make cooperative subgroups of 5-10 related farmers a useful complement to the overall cooperative structure by enhancing the incentive to repay production loans (see Project Description). By guaranteeing each other's loans, farmers in the subgroups add the weight of family tradition to the basic incentive of repaying a loan in order to be eligible for additional credit.

The original PID concept of restricting the credit programs to inventory loans was rejected because of the economic and social power of sheil merchants. The merchants, as the only providers of production credit, have sufficient sway over farmers to dictate repayment in-kind rather than cash. Farmers have no financial leverage to object. Under such circumstances, the inventory loan program would not be feasible. The farmer's crop would still be tied to the sheil merchant and there would still be no opportunity to respond to the market. As a result, production loans have been added to the credit program to allow farmers to retain control over at least part of their crop. It is unlikely that production loans can fully replace the efficiency and convenience of the sheil system since cash demands will grow and the village merchant is always accessible. But the availability of an alternative credit source will create competition with the informal credit system and drive down the cost of borrowing.

5. Impact

The immediate impact of feeder roads will be greater access to urban markets and products. Increased traffic in newly accessible areas will lower transportation costs, making it possible for producers to market their produce at lower cost. Consumer goods will be more readily available and at lower prices reflecting an increasing supply in rural areas. Access to social services (e.g., medical facilities, schools, and extension) will improve, and new agricultural technologies and inputs will be more accessible.

AID's discussion paper, Socio-Economic and Environmental Impacts of Low Volume Rural Roads (1980), states that the principal benefits resulting from feeder roads are not necessarily transportation-related or economic, but social. This will be particularly true in Kordofan where regional medical clinics are located only in major market centers such as Kadugli and Rashad. Presently, the rural population is cut off from medical and other services during the four month rainy season.

Most importantly, inventory and production loans will allow producers to break gradually from the traditional sheil system, thereby providing them greater returns from their own production. The combination of storage facilities and credit will provide producers the opportunity to retain greater control over their production. They will no longer be forced to sell their crops immediately upon harvesting, but can wait until seasonal prices are more favorable. Freedom from the sheil credit system, and greater control over post-harvest marketing is a pre-condition necessary for economic growth

of the traditional producers in the rural areas and increased market activity in the regional centers. In the long run, export commodities from the region should increase due to increased production and better transportation.

D. Administrative Analysis

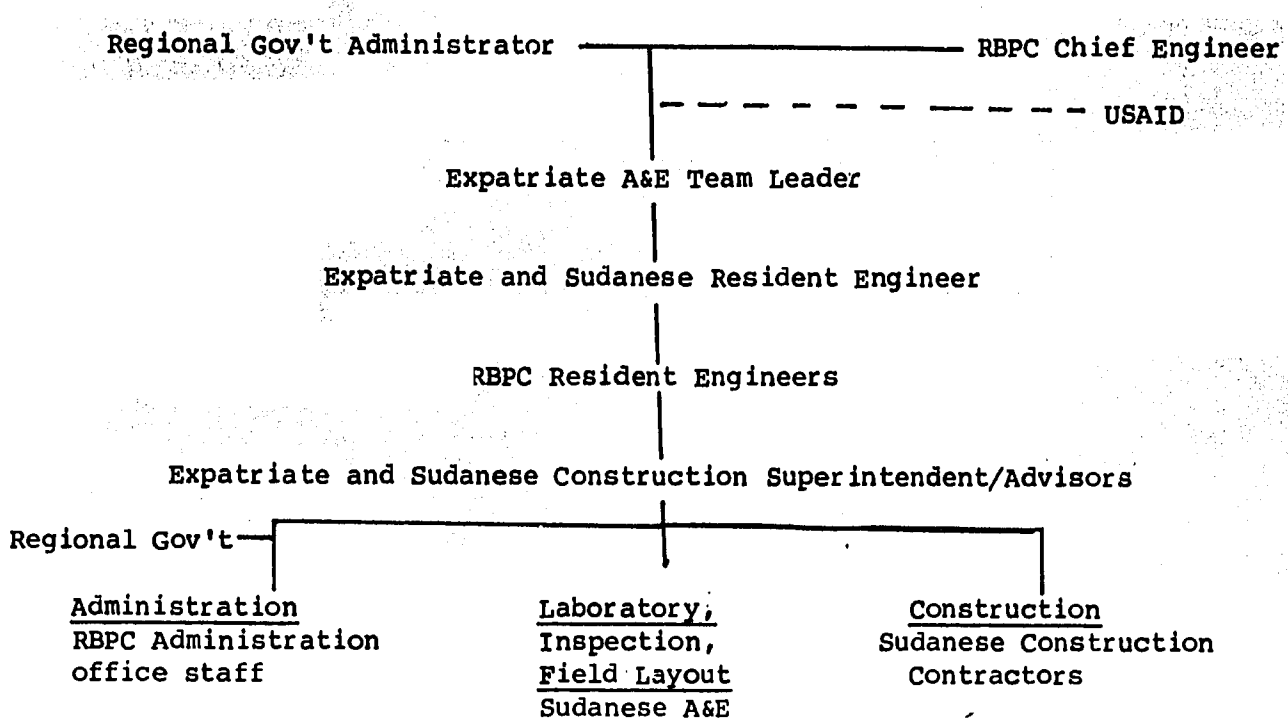
1. Introduction

The principal implementing agencies are Roads and Bridges Public Corporation and the Agricultural Bank of Sudan. As stated in section V.C above, these two agencies are currently involved in activities similar to KORAG's project components. Implementation of the feeder road component will utilize Sudanese engineering and construction firms, thereby reducing the direct manpower demands on RBPC for design and constrution but increasing supervision requirements. To alleviate that problem a U.S./Sudanese joint venture engineering firm will supervise construction, with the expatriate team members providing technical assistance to both RBPC and the local engineer. The storage and credit components will impose additional responsibility on ABS, but within reasonable limits. ABS's principal responsibilities on the storage component will be contracting for design, procurement and construction, and providing mangerial staff for the completed facility. The credit component will require improved financial management procedures, but technical assistance will be provided for on-the-job training and institutional development. Both the implementing agencies and the PP team believe that RBPC and ABS can absorb the growth.

2. Feeder Roads

Consideration was given to implementing the feeder road component exclusively under the Kordofan regional government. Logically, the regional government should be responsible for feeder roads and RBPC responsible for the national road network. Eventually, regional governments will plan and execute local civil works projects but they currently do not have the administrative or financial capabilities to do so. It was concluded that the only way to implement the project and still contribute to the overall development of the regional government was to utilize the experience and manpower of RBPC and involve the regional government in the contracting process and contract administration. RBPC will provide the Chief Engineer and Assistant Project Engineers in addition to the necessary office staff. The project will be administered from a RBPC field office in Kordofan and not from Khartoum. The regional office will approve all vouchers, make local currency payments, and pass foreign exchange vouchers directly to USAID for payment. The regional government will provide a project administrator and supplement RBPC clerical staff to give regional personnel experience in project administration and implementation. One regional official will participate in contracting for both engineering and construction services. Regional staff will also assist the RBPC regional unit in reviewing vouchers and basic backkeeping. The complete staffing pattern for the RBPC regional unit, with the extent of regional government participation, will be finalized with the assistance of the U.S./Sudanese joint venture. The feeder road component organization chart is shown below.

Feeder Road Component Organization Chart



The organizational structure is designed to provide experience to Sudanese engineering and construction firms. The implementation plan will permit RBPC and regional government staff to go through the entire process from contractor selection through construction eight times during the project life with expatriate assistance and guidance. It is expected that at the end of the project the capabilities of the regional government, Sudanese engineers and Sudanese construction firms will be greatly improved. Depending upon the successful implementation of the project strategy, Phase 2 of the project, construction of the road segment from Talodi to Abu Gubeiha (163 km), will be done with little or no expatriate assistance.

The PP team has concluded that RBPC has the technical and administrative capability to participate in implementation of the feeder road component. RBPC has been through the entire process of contractor selection and contract administration several times. They understand the process and are capable of carrying it out. RBPC recently completed the reviews and evaluations of engineering proposals for the A&E services for the Western Agricultural Marketing Road Project. This was done in a professional manner. The Construction Directorate, under which KORAG will be administered is headed by an experienced engineer who received his B.S. Civil Engineering degree in 1964 and M.S. in the U.S. in 1967. The designee Project Director received his B.S. in Civil Engineering in 1971. The workload of the Construction Directorate is light at the present time (the Western Agricultural Marketing Road is being implemented in the Projects Directorate). PP team members discussed the project strategy with RBPC personnel throughout the design process and they fully agree with the approach to involve the private sector and regional government.

accounting department is one would expect in a comercial bank. The accounting department is staffed by professionals, accounts are computerized, they have experience dealing with donor funds, processing invoices and maintaining special accounts. ABS have their own internal auditors who report directly to the Assistant Managing Director. In a conversation about AID audit requirements, ABS personnel said that they would welcome any auditing that AID wishes to have performed.

4. Credit Component

The ABS currently administers several regional agricultural credit programs, including two branches in Kordofan. The problem presented by KORAG is the ABS's capability to expand into new branches. Although the ABS has operated credit programs since 1959, its cooperative lending activities began only in the late seventies and have not been thoroughly evaluated. The cooperatives themselves, moreover, have played a minimal role in most credit activities--they collect and transport grain but most have not been sufficiently trained to receive ABS loans and channel them to individual farmers. Not only must ABS field-level financial practices be reviewed, provisions must also be made to upgrade the level of cooperative participation.

Technical assistance under the credit component is directed specifically at these areas. Initially, short-term assistance will be provided to review financial and management practices and assess cooperative organization procedures. Long-term assistance will then be provided to assist in new branch operations, help organize and train new cooperatives, and develop the capability to annually review capital requirements, fee structures and administrative procedures. The technical assistance team's responsibilities are detailed under the implementation plan, section V.

E. Environmental Analysis

The Initial Environmental Examination contained in the PID concluded that the project will not have a significant environmental impact. This negative determination fulfills all environemntal requirements as specified in Regulation 16. Above and beyond these requirements, the Mission has decided to conduct an environmental review of the feeder road area to establish environmental baseline data and to develop recommendations for final design that could enhance general conditions in the road area. Both the Bureau and Regional Environmental Officers confirmed the soundness of this approach in 84 State 267908.

USAID contracted with the Institute of Environmental Studies at the University of Khartoum to conduct the environmental review in November 1984. The scope of work is attached as Annex 8F. The review is currently in the final stages of completion and will be available for the Regional and Bureau Environmental Officer's review well before the joint venture A&E firm completes the prototype designs and sets the road allignments. Among other things, the contractor has been required to:

The special accounts will be administered under the Finance Directorate. The Finance Manager anticipates no problem administering these accounts. The office is familiar with certification and processing invoices. They will soon be setting up and administering special accounts for the Western Agricultural Marketing Road Project. Separate accounts will be set up for the local currency cost of the A&E contract and the construction contracts. Once construction starts on KORAG and the RBPC Project Manager relocates to the branch office in Kordofan, the accounting personnel will also relocate. Since the special accounts will be with RBPC and not the Ministry of Finance, they anticipate a delay in reviewing local currency invoices and making payment. RBPC does not have an internal audit group but their accounts are subject to audit by the GOS Auditor General. The accounts will be audited annually by USAID's Sudanese independent auditors.

3. Storage Component

As described in the Implementation Plan, section V above, all seven storage facilities will be constructed under the administration of ABS. The KSU team was required to investigate the possibility of involving the private sector in owership and management of storage facilities linked with ABS credit programs. KSU concluded that while local merchants were interested in additional warehouses and recognized the advantages of improved grain handling practices, including grading and quality control, they were not interested in facilities not fully under their control. Therefore a pilot project was recommended under which three of the facilities, after construction, would be made available to private merchants by a variety of lease/purchase options. Under the pilot project, the private sector will be given the opportunity to participate in the same training program offered to ABS personnel in warehouse management and operations. Specialized technical assistance will be provided to facilitate transfer of the three pilot project facilities to the private sector. If local merchants do not maintain their interest in improved storage and handling, ABS can and is prepared to utilize the facilities in their expanded program. In any case, the ABS storage activities are directed toward private farmers.

The design and construction of the facilities is straightforward and will be done under ABS direction. ABS has experience in procurement, construction and management of storage facilities. They have regularly employed a Sudanese engineering firm experienced in design and construction supervision to provide A&E services. Short-term expatriate technical assistance will be provided to assist the local engineer in completion of design and tender documents and in field supervision. ABS recognizes that they need assistance in the management and operations of grain storage facilities, and the project provides a training program to meet their needs.

In addition to the data in Annex 6E about ABS as an organization, from several discussions with ABS personnel, the PP team has confidence that ABS has the capability to implement the storage and credit component. They understand the terminology and procedures involved in engineering and contractor selection, contracting, and contract administration. Their purchasing department is familiar with off-shore procurement, and the

1. Review, define and describe the significant environmental implications of the project activities with an in-depth discussion of the primary and secondary effects of the project based on Wilbur Smith's technical and geographic classification of priorities for construction, rehabilitation, maintenance, or no activity.

2. Develop and outline a monitoring program to further define and track the resultant environmental effects. This should be phased so that Phase I (a two year program) would end just prior to the mid-project evaluation on the performance of local private contractors. Recommendations will be incorporated into follow-on or new local construction contracts. Phase II will be a one year program ending just prior to the end of road construction activities under the project. Resultant recommendations will guide on-going maintenance and replication of project activities in other parts of Kordofan.

3. Identify environmental "hot spots" in the region that are likely to be the focus of the monitoring program and for which enlarged Land Sat imagery will be a useful monitoring guide. USAID has ordered a full set of 1984 Thematic Mapper imagery for Kordofan which will be provided to an appropriate institution in Sudan. The 1984 imagery will serve as a visual environmental baseline for both KORAG and the Western Agricultural Marketing Road and help target future monitoring efforts.

4. Outline the process whereby results of the monitoring data can be incorporated into the efforts of the workshop designed for the Western Agricultural Marketing Road project with the aim of initiating a cooperative effort within Sudan to carry out future road monitoring programs. In addition, the contractor will draw up a long-term schedule to illustrate how the monitoring program for this project will be coordinated with the monitoring program for the Western Sudan Agricultural Marketing Road Project. The goal is to ensure that the monitoring programs do not duplicate efforts and that, where possible, the monitoring activity for both projects will go on simultaneously. The long-term schedule will be prepared in conjunction with AID's regional environmental officer.

Local currency funds have been budgeted to finance the environmental monitoring program. USAID is also evaluating the merit of an institutional support grant to the Institute of Environmental Studies to support activities such as environmental monitoring of key project areas. In addition, USAID and the Africa Bureau will provide funds to AID's cooperative agreement with the Land Tenure Center at the University of Wisconsin to review and identify critical land issues that will affect the project area or should be monitored to determine their impact.

G. Capital vs. Labor Intensive Road Construction and Maintenance

The design standards established for this road, especially building the road on an embankment and having gravel sources many kilometers from construction areas, minimize the use of labor-intensive construction methods. The technical requirements of compacted subgrade, embankments, base course and surfacing to meet minimum specification levels rule out the use of extensive hand labor for most road construction operations. In addition, culvert and ford work require the use of skilled and semi-skilled labor. The sparce population along the project routes and within the region further precludes the use of labor intensive methods. Some adjustments in rural labor participation may be made during design and construction if there is extensive unemployment in the area due to drought - induced migration.

In considering the labor/equipment mix, it is possible to reach an optimal balance for road and drainage construction, taking into account climate, population density and construction standards. For this project, reliance on equipment is preferable. Other than the possible construction of drainage structures and building facilities, it is not expected that labor-intensive construction methods will be used.

The tender documents will be restricted to private Sudanese contractors. All contracts will be denominated in Sudanese pounds. If local contractors do not have the equipment to do some elements of work they will be encouraged to lease or lease/purchase that equipment through local suppliers. It is intended to utilize majority-owned Sudanese contractors and labor to the greatest extent possible; the extent of practical experience provided to Sudanese operators and other construction staff will be a criterion in bid evaluation. This should result in the optimal use of labor intensive construction methods compatible with the design standards, specification requirements and construction contract time.

The REPC and the regional government will be encouraged to use contract labor for road maintenance. This will be a subject of the maintenance study that will be made in conjunction with the Western Agricultural Marketing Road Project.

G. Analysis of the Project's Energy Efficiency, Cost Implications and Appropriateness

The project requires a high capital cost in road construction equipment, vehicles, and equipment management. The road construction technology being applied, i.e. semi-intensive equipment road construction, was selected as the most efficient way to achieve project outputs considering potential constraints. The technology being applied is limited to the consumption of fossil fuel non-renewable energy resources. This represents a high capital cost in terms of equipment and equipment support, and high operational costs with regard to fossil fuel consumption and spare parts. All of these activities require foreign exchange. The use of capital-intensive technology is predicated upon: (a) seasonal labor constraints within the project area;

(b) physical problems which preclude the use of labor-intensive road construction, and (c) vast distances, low population densities and harsh climatic conditions which militate against the use of a high labor/equipment mix ratio. The selection of technology for the project was made on the basis that there were no effective alternative options.

KORAG feeder roads are not major roads and therefore built to a less demanding standard than a major road. This lower standard of construction requires considerably less equipment and therefore less foreign exchange. Through private sector training efforts undertaken in this project and the Third Highway Project, the maintenance component of the project should be both affordable and replicable. Not using fossil fuels is, of course, technically unfeasible for the work needed to construct the feeder roads. The formula for an optimal labor mix can only be determined by the construction contractor's response to the tender conditions and the labor/machinery mix adopted in doing the work.

VII. Conditions Precedent and Covenants

A. Conditions Precedent

Except for the usual CP regarding the signatures of authorized representatives, the only other CPs required under the project are to secure: 1) the rights-of-way for the feeder roads, 2) any necessary permits or other land rights for the storage facilities, 3) an agreement between the GOS and ABS which establishes the ABS as an instrumentality of the GOS. The first two CPs are common to construction projects. The third is necessary since the ABS is an independent banking entity even though publicly supported. The ABS commonly signs such an agreement for all donor activities. The Project Agreement, then, will include the following conditions precedent for disbursement for the feeder road and storage construction services.

1. Prior to disbursement under the Grant, or to issuance by A.I.D. of documentation pursuant to which disbursement will be made to finance construction services under the feeder road or storage components, as may be applicable, the Grantee will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(a) Evidence that all right-of-way and any necessary permits or other land rights exist for the roads and for the land required for construction camps and workshops.

(b) Evidence that any necessary permits or other land rights exist for the storage facilities and for any other required buildings or office facilities necessary to run and manage them.

2. Prior to disbursement for storage or credit activities, the GOS will provide evidence of an agreement establishing that the ABS is an instrumentality of the GOS and, accordingly, that the GOS is fully responsible for all actions undertaken by the ABS under the project.

In every other case where AID issues a document pursuant to which a foreign exchange disbursement will be made, AID has the protection of prior involvement and/or approval. The table below illustrates the checks and balances incorporated into the project.

Component	Action Requiring FX	AID Involvement and/or Approval
Feeder Roads	1. A&E Contract	USAID party to the selection process and reviews and approves the contract.
	2. Procurement of fuel	USAID reviews and approves the fuel procurement plan prepared by the construction contractor and the A&E.
	3. Vehicles	Vehicles will not be procured until after execution of the A&E contract.

Storage	1. TA Contract	TA contract will not be approved until after ABS has signed an A&E contract with a local firm, which will be reviewed and approved by USAID.
	2. Procurement of Materials and Equipment	The IFB will be reviewed and approved by USAID.
Credit	1. TA Contract	The first long term advisor will not be authorized to arrive until ABS has accepted the recommendations of the short term advisors. The second and third long term advisors will not be authorized to arrive until after construction has started on the ABS offices at Talodi and Abu Gubeiha.
	2. Vehicles	The vehicles for the long term advisors will not be ordered until after their definite ETA is know.

B. Covenants

Several covenants will be included in the Grant Agreement:

1. The Grantee will covenant to set up local currency project accounts using PL 480 or Commodity Import Program local currency generations as required to finance local currency costs. These specifically include: (a) financing the road construction contractors and the A&E local support costs, (b) financing the A&E services, construction contracts and technical assistance local support costs for storage, and (c) the ABS credit fund.

2. The Grantee will covenant to appoint qualified personnel to the project components as specified in the project description. These specifically include: (a) RBPC Chief Engineer, assistant project engineers, and office staff as required to administer the project in the Kordofan Region; (b) a Kordofan regional government project administrator and clerical support staff for the feeder road field unit; and (c) ABS project manager, personnel to operate the regional credit branches, managers and operators of the new warehouses, and trainees for the warehouse training program.

3. The Grantee will covenant to set up and administer the feeder road project from a branch office in the region and not from Khartoum. The regional office

will have authority to certify vouchers and make local currency payments. It will certify and pass vouchers for foreign exchange payments directly to USAID.

4. The Grantee will covenant to meet with representatives of RBPC, Regional Government, the Ministry of Finance and Economic Planning, and USAID prior to completion of the project to formulate a definite plan and source of funding for maintenance of the KORAG roads and the connecting road network.

5. The Grantee will covenant to establish ABS branch offices at Talodi and Abu Gubeiha.

6. The Grantee will covenant to obtain AID's approval of all warehouse sales/lease agreements between the ABS and private sector purchasers/lessors prior to their signature.

7. The Grantee will covenant to structure, and revise as necessary on an annual basis, the warehouse fees and credit fund service charges to cover the full cost of operations and capital.

8. The Grantee will covenant to turn over the proceeds from the sale or lease of the pilot project warehouses to the project credit fund or any other purpose mutually agreed upon with USAID.

9. The Grantee will covenant that the ABS will assume responsibility for any or all of the pilot project warehouses should lease and/or purchase arrangements with the private sector prove unworkable, unless USAID and the GOS mutually agree upon an alternative use for the warehouses.

10. The Grantee will covenant to establish an evaluation program as part of the Project. Except as the Parties otherwise agree in writing, the program will include, during the implementation of the Project and at one or more points thereafter:

(a) evaluation of progress toward attainment of the objectives of the project;

(b) identification and evaluation of problem areas or constraints which may inhibit such attainment;

(c) assessment of how such information may be used to help overcome such problems; and

(d) evaluation, to the degree feasible, of the overall development impact of the Project.

11. The Grantee will covenant to make funds available under the project for periodic audits of performance by the contractors and the implementing agencies. The timing of and funds to be provided for audits will be mutually agreed upon by the Parties in Project Implementation Letters.

12. The Grantee will covenant to monitor the impact of project activities and construction of the physical environment and will implement recommendations made for safeguarding the physical environment surrounding the project area.

PID APPROVAL CABLE

ACTION: AID INFO: CHGE' ECON

VZCZCKH0507
OO RUEBKH
DE RUEHC #1108/01 1721808
ZNR UUUUU ZZH
O 201757Z JUN 84
FM SECSTATE WASHDC
TO AMEMBASSY KHARTOUM IMMEDIATE 7290
BT
UNCLAS SECTION 01 OF 03 STATE 181108

21-JUN-84
TOR: 05:28
CN: 36741
CHRG: AID
DIST: AID

AIDAC

E.O. 12356: N/A
TAGS:
SUBJECT: SUDAN KORDOFAN RAINFED AGRICULTURE PROJECT PID ECPR GUIDANCE

A' SUMMARY

AN ECPR REVIEW OF THE KORDOFAN RAINFED AGRICULTURE PROJECT (KORAG) PID WAS HELD ON JUNE 12, 1984. THE PID WAS APPROVED. THE ECPR IDENTIFIED SEVERAL ISSUES WHICH ARE LISTED AND DISCUSSED BELOW. GUIDANCE DEVELOPED AT THE ECPR IS PROVIDED AFTER EACH ISSUE DISCUSSION AS QUOTE RECOMMENDATIONS UNQUOTE. IN ADDITION, SEVERAL CONCERNS WERE IDENTIFIED AND RECOMMENDATIONS WERE PROVIDED AS FURTHER GUIDANCE FOR THE MISSION IN DEVELOPING THE KORAG PP.

B. ISSUES

(1) IMPACT ON EXPECTED BENEFITS FROM THE KORAG PROJECT SHOULD THE SUDAN WESTERN AGRICULTURE ROAD (EL OBEID TO KOSTI ROAD, PROJECT 650-0069) BE DELAYED OR NOT FULLY FUNDED.

RE
KORAG PP BUT (1) THAT IT UNDERTAKE A SENSITIVITY ANALYSIS TO ASCERTAIN THE IMPORTANCE OF THE WESTERN AGRICULTURE MARKETING ROAD TO THE ECONOMIC BENEFITS ANTICIPATED UNDER KORAG, AND (2) THAT IT PURSUE OPTIONS OVER THE NEXT SIX MONTHS TO IDENTIFY OTHER DONORS FOR THE WESTERN AGRICULTURE MARKETING ROAD AND/OR TO EXPLORE ERNATIVE ENGINEERING DESIGNS FOR THE ROAD IN THE EVENT THE ADB WITHDRAWS FROM THE ROAD PROJECT'

(2) ABSENCE OF SPECIFIC FINANCIAL MECHANISMS TO PROVIDE FOR ROAD MAINTENANCEFINANCING.

RECOMMENDATION: THAT THE PP DESCRIBE SUITABLE MAINTENANCE FUNDING SOURCES FOR POST LOP MAINTENANCE OF KORAG FEEDER ROADS. THIS MAY REQUIRE THE MISSION TO WORK WITH THE GOS TO DEVELOP A NATIONAL POLICY ON THE SUBJECT OF FINANCING ROAD MAINTENANCE COSTS.

(3) THE ROLE OF THE RBPC IN IMPLEMENTING THE KORAG PROJECT WITH RESPECT TO ITS ABSORPTIVE CAPACITY, ITS TECHNICAL/MANPOWER CAPABILITIES AND ITS CHARTER.

RECOMMENDATIONS: (1) THAT THE PP DEVELOP MORE CLEARLY, AND WITH ADDITIONAL SUPPORTING ANALYSIS, WHAT THE RBPC WORKLOAD WILL BE TO DEMONSTRATE THAT THE CORPORATION WILL HAVE AVAILABLE TIME AND PROPERLY TRAINED MANPOWER TO ASSURE THE ORDERLY IMPLEMENTATION OF THE KORAG PROJECT. (2) TO THE EXTENT THAT ADEQUATE AND EFFECTIVE RBPC PARTICIPATION IN ROAD MAINTENANCE WILL REQUIRE LEGISLATIVE ACTION FOR CLARIFICATION OF THE RBPC CHARTER, THE PP SHOULD DEMONSTRATE THAT USAID HAS REASONABLE ASSURANCES THE GOS WILL MAKE THE NECESSARY MODIFICATIONS IN THE CHARTER. (611(A)(2) REQUIRES THAT IF LEGISLATIVE ACTION IS NECESSARY, THERE MUST BE A BASIS FOR REASONABLY ANTICIPATING, PRIOR TO THE OBLIGATION, THAT IT WILL BE COMPLETED IN TIME TO ALLOW FOR AN ORDERLY ACCOMPLISHMENT OF PROJECT PURPOSES.)

(4) MODIFICATIONS IN THE DESIGN AND ECONOMIC ANALYSIS OF THE STORAGE/INVENTORY CREDIT COMPONENTS.

AFR/TR/ARD QUESTIONED THE ASSUMPTIONS FOR THE PID CONCEPTUALIZATION OF THE STORAGE/CREDIT COMPONENT. STUDIES AND EXPERIENCE WITH SIMILAR PROJECTS ELSEWHERE HAVE TENDED TO SHOW THAT: (1) TRADITIONAL MERCHANTS' MARKETING MARGINS AND INTEREST RATES ARE NOT EXCESSIVE WHEN RISK AND OTHER FACTORS ARE TAKEN INTO ACCOUNT; (2) STORAGE LOSSES UNDER TRADITIONAL SYSTEMS ARE OFTEN LESS THAN ORIGINALLY THOUGHT TO BE THE CASE; AND (3) EFFORTS TO SET UP ALTERNATIVE STORAGE AND MARKETING SYSTEMS IN AFRICA HAVE MET WITH LIMITED SUCCESS. AFR/TR/ARD FURTHER POINTED OUT THAT: (1) THE ASSUMED STORAGE CAPACITY FOR THE UNITS TO BE BUILT MAY BE HIGH BY A FACTOR OF FOUR; (2) EXPERIENCE WITH THE DESIGN FOR CROP COLLECTION AND INVENTORY LOAN CREDIT RAISES SERIOUS QUESTIONS AS TO THE ABSORPTIVE CAPACITY OF LOCAL COOPERATIVES TO PLAY THE ROLE EXPECTED OF THEM; AND (3) THE PID CONCEPT OF A STORAGE UNIT MANAGEMENT SYSTEM WHEREBY WAREHOUSE OWNER/MANAGERS WOULD NOT ALSO OWN THE STORED PRODUCE, RAISES SERIOUS QUESTIONS REGARDING MANAGEMENT MOTIVATION (QUALITY CONTROL, STORAGE LOSSES, ETC.) AND LOGISTICS OF GRAIN CO-MINGLING OR MAINTAINING SEPARATE FARMER LOTS.

RECOMMENDATIONS: (1) THAT THE PP CONSIDER HOW THE EXISTING SHEIL MERCHANTS COULD BE INTEGRATED INTO THE PROJECT, RATHER THAN SEEKING TO BYPASS THEM; (2) THAT THE PP REVIEW THE SOCIAL AND ECONOMIC FEASIBILITY OF THE PROPOSED STORAGE/INVENTORY LOAN COMPONENTS IN LIGHT OF THE SHEIL MERCHANT SYSTEM AND ACCURATE STORAGE LOSS DATA

AND STORAGE CAPACITY ESTIMATES; (3) THAT THE PP REVIEW THE PROPOSED STORAGE MANAGEMENT SYSTEM AS IT RELATES TO OWNERSHIP OF THE STORAGE PRODUCE; (4) THAT THE PP ADDRESS THE NEED FOR LOCAL TRAINING IN STORAGE TECHNOLOGY AND THE NECESSITY FOR STORAGE EQUIPMENT IN OPERATING STORAGE UNITS; AND, (5) GIVEN THE EMPHASIS IN THE KORAG PID ON FUNCTIONING COOPERATIVES AS A LIMITING FACTOR IN THE EXPANSION OF THE STORAGE/CREDIT COMPONENT OF THE PROJECT, THE PP SHOULD DEVELOP MORE FULLY HOW TRAINING WILL BE PROVIDED TO ENABLE LOCAL COOPERATIVES TO DEVELOP, AND TO PLAY THE ROLE EXPECTED OF THEM IN THE ORDERLY IMPLEMENTATION OF THE PROJECT. (IT WAS RECOMMENDED THAT A KANSAS STATE UNIVERSITY TEAM GOING TO SUDAN TO HELP IN FINALIZATION OF THE KORAG PP ADDRESS THE ISSUES RAISED BY AFR/TR/ARD).

C. CONCERNS

(1) ESTABLISHING MINIMUM STANDARDS FOR ROADS AND PARTICULAR CONSTRUCTIONS FOR REHABILITATING/UPGRADING WORK.

RECOMMENDATIONS: THE PP SHOULD CLARIFY WHICH PART OF THE FEEDER ROAD LOOP WILL BE WORKED UPON, AND THE SPECIFIC KINDS OF CONSTRUCTIONS TO BE UNDERTAKEN. THE RBPC MAY HAVE ESTABLISHED STANDARDS WHICH THE PP TEAM COULD REVIEW FOR POSSIBLE ADOPTION. AFR/TR/ENG ADVISED THAT THE PP TEAM REVIEW COST ESTIMATES FOR FEEDER ROAD WORK, SUGGESTING THAT ADEQUATE DRAINAGE REQUIREMENTS TEND TO RAISE THE PER KILOMETER COST TO DOLS 75,000. THIS IS AS MUCH AS DOLS 15,000 BEYOND THE PID ESTIMATE.

(2) AFR/TR/ENG EXPRESSED CONCERN THAT SHOULD ALL ANTICIPATED CONSTRUCTION PROJECTS BE FUNDED IN THE GENERAL KORDOFAN AREA, THE LOCAL FIRMS WHICH USAID EXPECTS TO USE MAY BE ABSORBED BY SUBCONTRACTING ON OTHER ACTIVITIES AND NOT BE AVAILABLE FOR KORAG.

RECOMMENDATIONS: (1) THAT USAID CONSIDER JOINT VENTURING WITH OFF-SHORE AMERICAN FIRMS TO PROVIDE THE LOCAL CONTRACTOR WITH ACCESS TO A LARGER EQUIPMENT POOL, TECHNICAL ASSISTANCE, AND HELP WITH OFF-SHORE PROCUREMENT(S), THEREBY HELPING TO BUILD UP THE SUDANESE CONSTRUCTION INDUSTRY IN THE PRIVATE SECTOR. (2) THAT THE PP SPELL OUT MORE CLEARLY THAT CONTRACTING PROCEDURES WILL FOLLOW GOS STANDARD PROCEDURES FOR COMPETITIVE PROCUREMENT.

(3) REALISTIC CONSTRUCTION AND PROCUREMENT DEADLINES.

RECOMMENDATIONS: THAT THE PP TEAM REVIEW (1) PLANNED EQUIPMENT DELIVERY TIME TO WORK SITES; (2) ANTICIPATED LAG-TIME FOR COMPLETION OF STORAGE UNIT AND FEEDER ROAD CONSTRUCTION; (3) LOGISTICS FOR MOVING EQUIPMENT BETWEEN WORKSITES IN KORDOFAN, SPECIFICALLY DEPENDENCE ON THE RAILROAD; AND, (4) THE ABILITY TO COMPLETE AS MANY KILOMETERS OF ROAD AS CLAIMED IN THE PID.

(4) PROJECT ECONOMIC ANALYSIS.

RECOMMENDATIONS: AFR/DP/PAR SUGGESTED THAT THE P. PROVIDE CLEAR JUSTIFICATIONS FOR (1) THE DISCOUNT RATE USED TO ARRIVE AT PRCJECT NET PRESENT VALUES; (2) THE COSTS USED IN CARRYING OUT THE PROJECT ECONOMIC ANALYSIS (3) ESTIMATING THE DEPRECIATION OF EQUIPMENT PROCURED FC THE PROJECT; AND (4) FIGURES USED IN THE ANALYSES PROVIDED IN ANNEX E OF THE PID. AFR/DP/PAR RECOMMENDED THAT THE PP USE A LONGER PERIOD THAN THE LOP FOR DETERMINING THE ECONOMIC BENEFITS OF FEEDER ROADS AND OTHER CONSTRUCTIONS. IT WAS SUGGESTED THAT USAID SUDAN CONSIDER A TDY BY AN AFR/DP ECONOMIST TO ASSIST THE

MISSION WITH THE PP ECONOMIC ANALYSIS. AFR/TR/ARD RECOMMENDED THAT THE PP DESIGN TEAM ANALYZE STORAGE COST AS THEY RELATE TO THE ECONOMIC VIABILITY OF STORING CERTAIN PRODUCTS, PARTICULARILY GROUNDNUTS.

(5) SOCIAL SOUNDNESS ANALYSIS.

RECOMMENDATIONS: (1) THAT THE PP HAVE A MORE FULLY DEVELOPED ANALYSIS OF THE IMPACT THE PROJECT WILL HAVE ON LAND TENURE, FARMING PRACTICES, AND HOUSEHOLD DIVISION OF LABOR. (2) THE SOCIAL SOUNDESS ANALYSIS (A) SHOULD INCLUDE MORE DETAILED DISCUSSION ON THE SPECIFIC TYPES OF FARMERS (E.G., BY SIZE OF HOLDINGS, SEX, ETC.) WHO ARE EXPECTED TO BENEFIT FROM THE PROJECT; (B) SHOULD PROVIDE CLARIFICATION AS TO WHETHER AND HOW THIS TARGET GROUP OF FARMERS WILL BENEFIT; AND, (C) SHOULD IDENTIFY THE POTENTIAL NEGATIVE EFFECTS (AND WITH REFERENCE TO MECHANISMS TO MINIMIZE OR ELIMINATE SUCH EFFECTS.) (I) THE IMPLICATIONS OF IMPROVED FEEDER ROADS ON CURRENT LAND OWNERSHIP/ACCESS PATTERNS; AND, (II) THE IMPLICATION OF INCREASED FOOD COMMERCIALIZATION ON HOUSEHOLD FOOD CONSUMPTION.

(6) INTEREST RATES TO BE CHARGED FOR INVENTORY LOANS AND AVAILABILITY OF SUFFICIENT FUNDS TO EXTEND SUCH LOANS TO ALL POTENTIAL APPLICANTS.

RECOMMENDATIONS: (1) THAT THE PP DEVELOP VERY PRECISE INFORMATION AS TO THE INTEREST RATES SET FOR INVENTORY LOANS INCLUDING STRONG JUSTIFICATIONS FOR THE LEVEL IF IT IS LESS THAN MARKET RATE; (2) THAT THE PP COMMENT ON THE AVAILABILITY OF SUFFICIENT LOCAL CURRENCY TO ENABLE THE PROJECT TO RESPOND FAVORABLY TO ALL REQUESTS FOR INVENTORY LOANS FROM ELIGIBLE INDIVIDUALS IN THE PROJECT'S TARGETED POPULATION OF BENEFICIARIES.

(7) GC/AFR RECOMMENDED THAT ANY REQUIRED WAIVERS, SUCH AS FOR VEHICLES OR SOURCE/ORIGIN REQUIREMENTS, SHOULD BE IDENTIFIED IN THE PP AND OBTAINED PRIOR TO AUTHORIZATION IF THEY ARE NOT WITHIN THE MISSION DIRECTOR'S AUTHORITY TO APPROVE.

(8) GC/AFR SUGGESTED THAT ENVIRONMENTAL DETERMINATIONS (WHICH NEEDS TO BE APPROVED BY THE BUREAU ENVIRONMENTAL OFFICER) BE SUBMITTED WELL BEFORE PP COMPLETION. THIS WILL ALLOW TIME FOR ANY ADDITIONAL ACTION

(9) GC/AFR RECOMMENDED THAT PRELIMINARY DESIGN AND COST ESTIMATES FOR THE ROAD COMPONENT BE COMPLETED BEFORE OBLIGATION THE PID INDICATES THAT SUCH PLANS AND COST ESTIMATES FOR STORAGE CONSTRUCTION - BUT NOT FOR THE ROADS - WILL BE COMPLETED BEFORE OBLIGATION. THIS COULD RAISE A 611(A) ISSUE.

(10) THE ISSUES MEETING REVEALED SOME CONFUSION IN T4E PID AS TO WHETHER THERE IS A LABOR SURPLUS OR DEFICIT FOR IMPLEMENTATION OF THE KORAG PROJECT. IT WAS RECOMMENDED THAT THIS BE CLARIFIED IN THE PP.

SHULTZ
BT
#1108

NNNN

ANNEX 2

LOGICAL FRAMEWORK MATRIX

Long Range Goal	Verifiable Indicators	Means of Verification	Important Assumption
To increase production and incomes in the rainfed agricultural sector of western Sudan, to increase export earnings, and to promote food grain self-reliance.	1. Increased total production in Kordofan. 2. Increased sale of agricultural/livestock products. 3. Increased production of cash crops for export markets. 4. Expanded acreage under cultivation.	1. Regional and Central Ministry of Agr. Records. 2. GOS Trade Statistics.	Internal and external markets exist for Kordofan agricultural products.
Purpose			**Purpose to Goal**
1. To improve linkages from production areas in Kordofan to the interregional transport network and key regional markets. 2. To increase farmers' profit margins from current production levels. 3. To alleviate farmers' seasonal cash flow constraints. 4. To develop Sudanese private sector construction skills to replicate and expand similar marketing and transport activities in rural areas.	1. Linkages (a) Increased rural traffic and transportation of commodities and inputs. (b) Maintenance budget covers recurring maintenance costs. 2. Profit (a) Farmers obtain peak seasonal prices through storage. (b) Reduced crop loss from improved storage. (c) Higher farmgate prices from lower transport cost. 3. Cash Flow (a) Number and amount of loans. (b) Farmers participate in storage program. 4. Private Sector Replication Sudanese contractors begin Phase II road independent of t.a.	1. Project Evaluation. 2. Site Inspections. 3. Ministry of Transport/ RBPC records. 4. ABS records. 5. Regional Ministry of Agr. records and continuing dialogue. 6. Contractor audits. 7. A&E firm's reports.	1. Transport and marketing improvements result in increased farmer income. 2. Farmers respond to income and price incentives by increasing production. 3. Trucking industry remains competitive. 4. Loans mitigate sheil system's control over production and marketing 5. Fuel and spare parts will not be an increasing constraint to truck haulage. 6. Kosti-El Obeid road links regional markets to domestic and export outlets.

125 / 132

Outputs			Output to Purpose
1. Improved feeder roads. 2. Crop storage program. 3. Credit program. 4. Sudanese road construction contractor capable of building feeder roads. 5. Improved regional contracting capability for basic civil works.	1. Roads (a) Established rural road construction program. (b) Approximately 40-45 km of rehabilitated road completed each year by each contractor. 2. Operational ABS storage facilities at El Obeid, Dilling, Talodi, Abu Gubeiha. 3. Private sector operates pilot project stores in El Obeid. 4. Revolving credit fund for production and inventory loans at El Obeid, Abu Gubeiha, Talodi. 5. T.A. for contractors scaled down over project while maintaining productivity. 6. Regional government assumes greater responsibility in contracting for final construction segments (El Albasiya - Abu Gubeiha).	1. Site Inspections. 2. Contractor Reports/Work Plans. 3. ABS records. 4. Project Evaluation. 5. Contractor audits.	1. Decreased transportation costs will raise farm-gate prices. 2. National plan for financing road maintenance implemented during LOP. 3. Storage and loan program can absorb possible opposition from sheil merchants. 4. Sudanese contractors value the opportunity to obtain road building experience.

Inputs

1. Road construction

   (a) Materials, equipment, labor

   (b) Technical Assistance (short and long-term)

   (c) Training and Regional government trainees.

2. Storage Facility

   (a) Materials/Equipment

   (b) Local contract for construction

   (c) Technical Assistance (short-term)

   (d) Training and ABS/ private sector trainees.

3. Inventory Loan Program

   (a) Local currency loan fund.

   (b) Technical Assistance (short and long-term).

1. Road construction.

   (a) LS in $20 million for construction contracts.

   (b) 105 p.m. engineering assistance.

   (c) 150 p.m. contractor assistance.

   (d) Approximately 30 pm of training.

2. Storage Facility.

   (a) $2,000,000 in materials.

   (b) LS in $2.5 million for local construction.

   (c) 21 p.m. short-term t.a. including in-country training ($425,000).

   (d) $200,000 commercialization support fund.

3. Credit

   (a) Ls. 3,200,000 revolving credit fund.

   (b) $1.6 million t.a. (111 p.m.)

1. Contract reviews.

2. Site Inspections.

3. Review of GOS local currency account.

4. PIO/Ts.

5. PIO/Cs.

6. PIO/Ps.

7. Contractor lease/ purchase arrangements.

Input to Output

1. With TA and financial input Sudanese contractors can construct KORAG roads.

2. Regional government cooperates with RBPC.

3. ABS follows plans to expand operations in KORAG area.

121

5c(1) - COUNTRY CHECKLIST

Listed below are statutory criteria applicable generally to FAA funds, and criteria applicable to individual fund sources: Development Assistance and Economic Support Fund.

A. Country Checklist, Part A-General Criteria for Country Eligibility

1. FAA Sec. 481, FY 1985 Continuing Resolution. Has it been determined or certified to the Congress by the President that the government of the recipient country has failed to take adequate measures or steps to prevent narcotic and psychotropic drugs or other controlled substances (as listed in the schedules in section 202 of the Comprehensive Drug Abuse and Prevention Control Act of 1971) which are cultivated, produced or processed illicitly, in whole or in part, in such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully? — No.

2. FAA Sec. 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor or any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) the debt is not denied or contested by such government? — No.

3. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? — No.

4. ISDCA of 1981 Secs. 724, 727 and 730. For specific restrictions on assitance to Nicaragua, see Sec. 724 of the — N/A

ISDCA of 1981. For specific restrictions on assistance to El Salvador, see Secs. 727 and 730 of the ISDCA of 1981.

5. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction by mob action of U.S. property? — No.

6. FAA Sec. 620(l). Has the country failed to enter into an agreement with OPIC? — No.

7. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5.

(a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters? — No.

(b) If so, has any deduction required by the Fishermen's Protective Act been made? — No.

8. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the amount of foreign exchange or other resources which the country country has spent on military equipment?
(Reference may be made to the annual "Taking into Consideration" memo "Yes, taken into account by the Administrator at time of approval of OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

Yes, taken into account by the Administrator at time of approval of Agency OYB.

9. FAA Sec. 620(t). Has the country servered diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption?

The Sudan Government severed diplomatic relations with the U.S. in 1967, but such relations were resumed in 1972. The 1958 Bilateral Assistance Agreement was reconfirmed in 1971 and remains in effect.

10. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? (Reference may be made to the Taking into Consideration memo.)	Sudan was not considered to have been in arrears on payments of its U.N. obligations at the time that the A.I.D. administration approved the FY 85 OYB.
11. FAA Sec. 666. Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA?	No.
12. FAA Sec. 669, 670. Has the country after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device, after August 3, 1977? (FAA Sec. 602E permits a special waiver of Sec. 669 for Pakistan.)	No.
13. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Session of the General Assembly of the U.N. of Sept. 25 and 28, 1981, and failed to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the Taking into Consideration memo.)	Sudan was represented at this meeting and to date has not disassociated itself with the communique in question. This action on the part of Sudan has been considered by the U.S. Government (see Taking into account memo dated January 15, 1982) in approving the Agency's FY 85 OYB.
14. ISDCA of 1981 Sec. 721. See special requirements for assistance to Haiti.	N/A

15. FY 1985 Continuing Resolution. Has the recipient country been determined by the President to hav engaged in a consistent pattern of opposition to the foreign policy of the United States?

No.

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY.

1. Development Assistance Country Criteria

a. FAA Sec. 116. Has the Department of State determined that this government has engaged i a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

No.

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the country made such significa improvements in its human rights record that furnishing such assista is in the national interest?

No.

b. ISDCA of 1981, Sec. 725 (b). If ESF is to be furnished to Argentina has the President certified that (1) the Government of Argentina has made significant progress in human rights; and (2) that the provision of such assistance is in the national interests of the U.S.?

N/A
This activity will provide assistance using FY 85 DA to Sudan.

c. ISDCA of 1981, Sec. 726(b). If ESF assistance is to be furnished to Chile, has the President certified that (1) the Government of Chile has made significant progress in human rights; (2) it is in the national interest of the U.S.; and (3) the Government of Chile is not aiding international terrorism and has

N/A
This activity provides assistance using FY 85 DA to Sudan.

taken steps to bring to justice those indicted in connection with the murder of Orlando Letelier?

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects under the FAA and project criteria applicable to individual funding sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

Updated country checklist included

A. GENERAL CRITERIA FOR PROJECT

1. FY 1985 Continuing Resolution; FAA Sec. 634A; Sec. 653(b).

a. Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;

Congressional Notification expired on February 9, 1985 with no objection

b. is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that amount)?

Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000 will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

(a) Yes

(b) Yes

3.	FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	No further legislative action is required
4.	FAA Sec. 611(b); FY 1985 Continuing Resolution. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973?	N/A
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	Yes
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	The project focuses on agricultural marketing problems of a specific area of Sudan and is not susceptible to execution on a regional basis.

7. FAA Sec. 601 (a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce, and (f) strengthen free labor unions.	The goal of the project is specifically to encourage international trade by providing feeder roads that will connect to the national road network. Lower transportation costs will encourage increased production. The project is part of an overall USAID strategy in rainfed agricultural areas. The strategy includes transportation, research, storage and credit.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	U.S. technical assistance, equipment and commodities will be used.
9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	See financial plan. Local Currency generated through the CIP or PL 480 programs will be used in lieu of U.S. dollars to finance local cost. The project was designed to limit dollar costs and utilize local currency.

10. FAA Sec. 612(d) Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
12. FY 1982 Appropriation Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	No
13. FAA 118(c) and (d). Does the project take into account the impact on the environment and natural resources? If the project or program will significantly affect the global commons or the U.S. environment, has an environmental impact statement been prepared? If the project or program will significantly affect the environment of a foreign country, has an environmental assessment been prepared? Does the	Yes

project or program take into consideration the problem of the destruction of tropical forests?

14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)? N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward

All weather feeder roads will lower transportation costs and result in higher income for farmers, as well as open the area to agricultural inputs and social services. The credit and storage components will encourage development of cooperatives.

better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?	
b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?	Yes
c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	Construction will utilize local labor to the extent possible. Road maintenance will be developed using local labor.
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?	N/A. Sudan is a RLDC. However, Sudan is contributing at least 25% of the project costs from local currencies generated through the Commodity Import or PL 480 programs.

e. FAA Sec. 110 (b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	N/A; Sudan is a RLDC.
f. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?	Yes
g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.	The project strategy was specifically designed to develop local institutions and their capability to plan and exectue development projects.
2. Development Assistance Project Criteria (Loans Only).	
a. FAA Sec. 122(b). Information and conclusion on capacity of	N/A

the country to repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan? N/A

c. ISCA of 1981, Sec. 724 (c) and (d). If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec. 624(g)? N/A

3. Project Criteria Solely for Economic Support Fund N/A

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?

c. FAA Sec. 534. Will ESF funds be used to finance the construction of the operation or maintenance

of, or the supplying of fuel for, a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives?	
d. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	N/A.

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Yes
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes. U.S., 941 Countries and Sudan.
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	Yes
4. FAA Sec. 604(e); Sec. 604(g); ISDCA of 1980 Sec. 705(a). If offshore procurement of agricultural commodity or product is to be	N/A

	financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.)	
5.	FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent that such vessels are available at fair and reasonable rates?	No
6.	FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	Yes

7. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes
8. FY 1985 Continuing Resolution. If the U.S. Government is a party to a contract for procurement, will the contract contain a provision authorizing termination of such contract for the convenience of the United States?	Yes
B. Construction	
1. FAA Sec. 601(d). If capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interests?	Yes
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Yes
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million?	Will not exceed $100 million.

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the communist-bloc countries? — Yes

4. Will arrangements preclude use of financing:

   a. FAA Sec. 104(f); FY 1985 Continuing Resolution Sec. 527: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which — Yes

relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? Yes

c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes

d. FAA Sec. 662. For CIA activities? Yes

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes

f. FY 1985 Continuing Resolution, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel? Yes

g. FY 1985 Continuing Resolution, Sec. 505. To pay U.N. assessments, arrearages or dues? Yes

h. FY 1985 Continuing Resolution, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to Yes

multilateral organizations for lending)?	
i. <u>FY 1985 Continuing Resolution, Sec. 510.</u> To finance the export of nuclear equipment, fuel, or technology or to train foreign nationals in nuclear fields?	Yes
j. <u>FY 1985 Continuing Resolution, Sec. 511.</u> Will assistance be provided for the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?	No
k. <u>FY 1985 Continuing Resolution, Sec. 516.</u> To be used of publicity for propaganda purposes within U.S. not authorized by Congress?	Yes

ANNEX 4

GOS REQUESTS FOR ASSISTANCE

جمهورية السودان الديمقراطية
THE DEMOCRATIC REPUBLIC OF THE SUDAN
وزارة المالية والتخطيط الاقتصادى
Ministry of Finance and Economic Planning
(Planning

P.O. Box 2092, KHARTOUM
Cable : (EIMAR)
TELEX : 324

(التخطيط
ص ب ٢٠٩٢ — الخرطوم
تلغرافيا : (اعمار)
تلكس : ٣٢٤

Khartoum 5th. Zualgada 1405 H. — الخرطوم في : 22th July 1985
Ref. : MFEP/USAID/166 — الموافق :
النمرة :

The Director
USAID
Khartoum

AGR PO

Dear Sir,

Subject: Kordofan Rainfed Agriculture Project.

I refer to the above preoject proposal which has been prepared jointly by USAID and Government Staff.

I wish to advise that the above project proposal is acceptable to the Government of Sudan and I would be grateful if USAID could arrange the necessary finance in a form of grant up to $ 18.1 million as stipulated in the project document.

Your Sincerely

El Hadi Omer Mohamed
For/ Undersecretary for Planning
Ministry of Finance & Economic Planning

1\18 154-A

.../Najwa.

21.6.1405 H

El Obeid: 21/6/1405 c.t.

13 March 1985

REF.: 20/P/1/1

Undersecretary of Planning
Ministry of Finance and Economic Planning

Dear Sayed Zaki:

Subject: Kordofan Rainfed Agriculture Project

For the past several months we have been working with USAID to develop the Kordofan Rainfed Agriculture Project. The project will provide feeder roads, grain storage facilities, and an expanded credit program for the rainfed agricultural area of Kordofan. All are very important to the economic development of our region and fit within our regional development strategy.

Please request from USAID the necessary grant funds to implement the project.

Yours Sincerely,

El Fathi Al Figani
Minister of Finance and Economy

149 155

ROADS & BRIDGES
PUBLIC CORPORATION

OUR REF. RBPC/58/B/21/5.

DATE 11.3.1985.

THE UNDERSECRETARY FOR PLANNING
MINISTRY OF FINANCE & ECONOMIC PLANNING

Dear Sir,

SUBJECT: KORDOFAN FEEDER ROADS

RBPC and USAID have been working for the past few months developing a feeder road improvement program as part of the Kordofan Rainfed Agriculture Project. The Agricultural Bank of Sudan is also involved in other aspects of the project.

The feeder road component involves feeder roads through the rainfed agricultural area from Kadugli - Talodi - Abu Gubeiha to Um Ruwaba.

Please make a formal request to USAID for sufficient grant funds to finance the project.

Yours faithfully

OSMAN ELOBEID ELAMIN
FOR/DIRECTOR OF CONTRUCTOR

150/156

AGRICULTURAL BANK OF SUDAN
P. O. Box 1363

Tel. 77466
77424

Telegraphic Address :— "MASRAF"

Khartoum. 11. March, 1985.

Ref. 4/1/1/47.

THE UNDERSECRATARY FOR PLANNING,
MINISTRY OF FINANCE & ECONOMIC PLANNING,
KHARTOUM.

Dear Sir,

SUBJECT: AGRICULTURAL CREDIT & STORAGE FACILITIES.

The ABS and USAIL have been working for the past few months developing an agricultural credit and storage programme as part of Kordofan Rainfed Agriculture Project. Roads & Bridges Public Corporation are also involved in developing a fedder road component.

The credit and storage component will cover three to four sites in Kordofan Region which correspond with ABS expansion priorities.

The project aims to avail storage and credit facilities to the tradtional sector and complement the ongoing credit activities.

Please make a formal request to USAID for sufficient grant funds to finance the project.

Detailed project documents can be obtained from AID.

Yours Sincerely,

SID AHMED OSMAN,
MANAGING DIRECTOR,
AGRICULTURAL BANK OF SUDAN.

Sudan: Kordofan Rainfed Agriculture Project (650-0054)
611(e) Certification

The Kordofan Rainfed Agriculture Project will complete an agricultural marketing and transport network in Kordofan Region. Two project outputs will be 1) to construct and maintain approximately 300 kilometers of all-weather feeder roads and 2) to construct seven grain storage warehouses. The feeder roads will be completed in two segments: the Kadugli-Talodi section connects with an all-weather road to El Obeid, and the second section from Abu Gubeiha to Um Ruwaba will connect with the Western Agricultural Marketing Road. Four of the warehouses will be constructed in El Obeid (three of 3000 MT capacity and one of 6000 MT capacity); the others (3000 MT capacity) will be located at Dilling, Talodi and Abu Gubeiha.

To finance the project, AID will provide a grant of $18.1 million and the Government of Sudan will provide the equivalent of $32 million from PL 480 and Commodity Import Program generated currencies.

The Feeder road component will be implemented through local currency contracts between Roads and Bridges Public Corporation (RBPC) and Sudanese construction contractors. The engineering services will be provided by a host country contract between RBPC and a joint venture U.S./Sudanese engineering firm. One of the project's objectives is to provide private Sudanese engineers and contractors with sufficient training and experience to carry out similar construction activities independent of expatriate assistance. RBPC will appoint a chief engineer and administer the contracts with a limited number of personnel from a field office in Kordofan Region. The regional government will provide a project administrator and clerical staff for the field unit.

The project includes a five-year plan for road maintenance and is linked with other USAID projects and multi-donor activities in road maintenance to assure transition of full financial responsibility for maintenance to the GOS. The construction contractors will maintain project roads during and for a minimum of six months after construction. The project's local currency budget provides funds to maintain KORAG roads through the end of the project. RBPC has a large workshop and maintenance center 100 kilometers north of Kadugli and can maintain the Kadugli-Talodi section by force account. Periodic and some routine maintenance on other roads will be contracted out to local firms trained under the project. Villagers will be employed for simple construction activities and will be trained to perform many routine maintenance activities as self-help measures.

In the meantime, the World Bank has begun efforts to convene annual donor meetings on road maintenance under the auspices of the Third Highway Project. Highway Three will assure that all road maintenance costs are fully delineated and included in RBPC's annual budgets. It will also examine alternative user fees to raise revenues for maintenance. USAID will encourage the GOS to adopt

such fiscal measures to finance road maintenance through self-help measures under a PL 480 Title III Program scheduled to begin in 1986. A covenant in the KORAG Grant Agreement requires the GOS to meet annually with USAID to review progress on maintenance of KORAG roads. These meetings will also provide a forum to pursue implementation of Title III Self-Help Measures. Should any additional technical guidance be necessary to supplement policy discussions and the IBRD's Highway Three Project, we have provided funds to incorporate KORAG road maintenance into a major road maintenance study to be performed under the Western Agricultural Marketing Road Project.

The seven grain storage warehouses will be constructed under a local currency contract between the Agricultural Bank of Sudan and Sudanese construction contractors. The engineering services will be provided by a local currency contract between the ABS and a Sudanese engineering firm. ABS has previous experience with similar projects under donor financing and is capable of administering the contract. The project provides technical assistance for the design and construction phases and a full training program in warehouse management and operations. The warehouses are part of a crop storage and credit program that will collect fees to cover the full cost of operations and capital. A PVO technical assistance team will establish an annual fee review process with the ABS to assure that storage facilities are self-financing.

With the assistance described above, I hereby certify that the GOS has the financial and human resources to implement and maintain the project successfully and effectively.

William R. Brown
Director
USAID/Sudan

May 15, 1985
Date

AID/W Concurrence : 85 State 150336

Technical Analysis

I. Feeder Roads

A. Description of Project Roads

This analysis is based on the preliminary engineering study done by Wilbur Smith and Associates. The proposed feeder roads form a loop that runs 455.6 kilometers from Kadugli south to Talodi and north through the major production areas in Kordofan to Balahat. The project roads will be completed in two phases, with phase I roads covering 292.6 kilometers at the two ends of the loop. Once these outer links are completed the region's principal transportation arteries, the center section of the loop will be constructed under phase II as a separate project. The entire loop was analyzed as separate road segments that are described below.

1. Kadugli - Talodi (Phase I)

The proposed alignment is 91.6 km long and follows one of the existing earth tracks linking the two towns. Terrain is relatively flat. Soil investigations indicated that approximately 20% of the soils are black cotton, 60% silty to sandy clay, 10% silty fine sand and the remaining 10% gravelly silty sand. There are also ten well defined narrow water courses without any drainage structures. There are six sources of natural gravel deposits which can provide 0.5 million cubic meters of pit-run gravel with an average haul distance of 15 kms. 80% of the soils along the alignment are suitable for the formation construction. The material from these sources can easily be used as a fill source for the areas of black cotton soils.

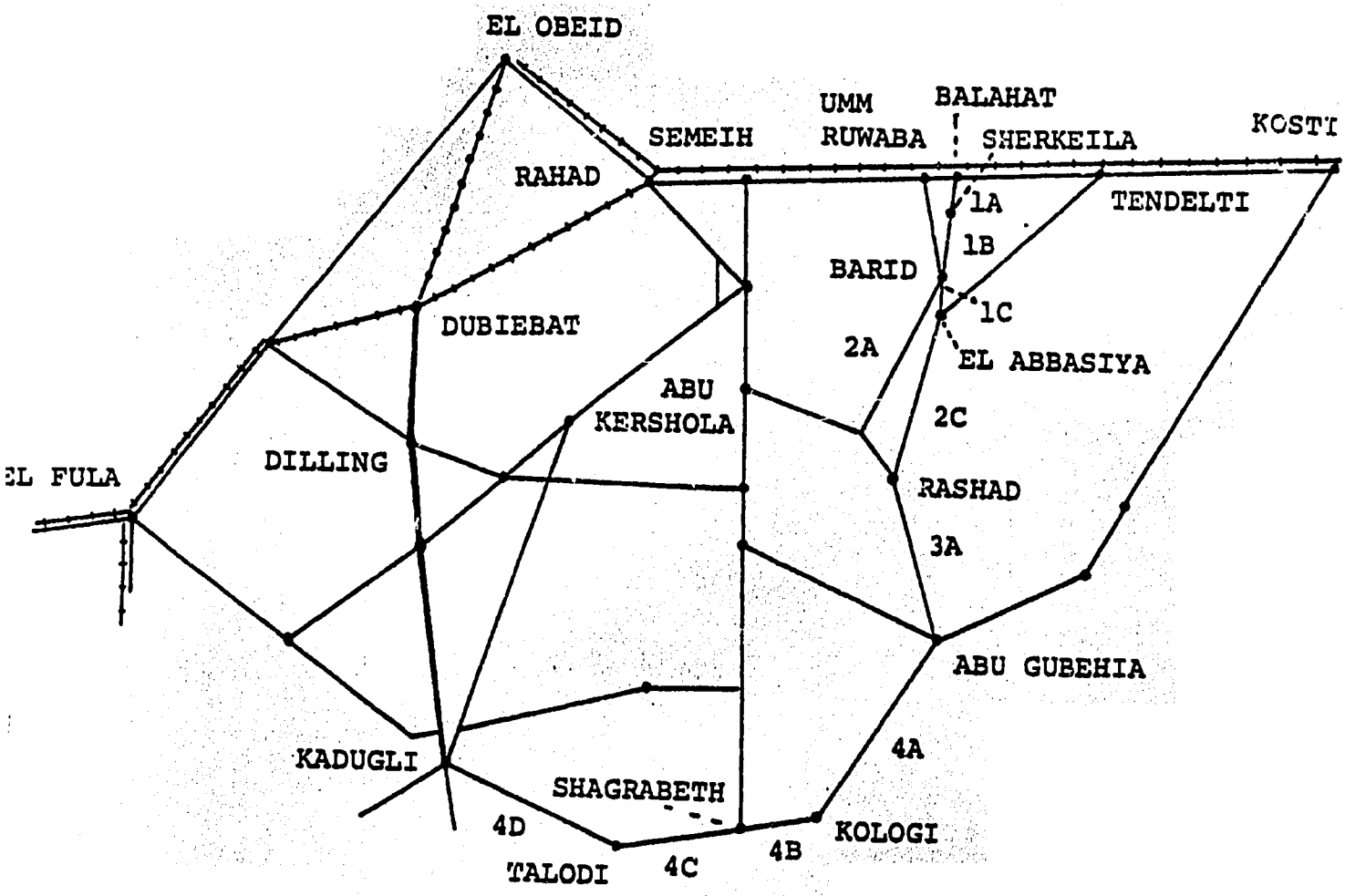
2. Talodi-Kologi (Phase II)

The terrain on this alignment is predominantly fl t with a few rocky hills rising approximately 100-300 meters above the plain. The plain rises gradually in elevation from about 430 meters at Talodi to 600 meters at Kologi. The present track is 87 km long. The surface soil is estimated to be 70% black cotton, 20% sandy clay and remaining 10% sandy to rocky soils. Natural gravel deposits were available in the area and with an estimated average haul distance of 15 kilometers for sub-base material. Ten water courses were observed. Of these only two warrant construction of a bridge structure or ford while the remainder just culverts.

3. Kologi-Abu Gubeiha Road (Phase II)

Generally, the terrain between Kologi and Abu Gubeiha is flat with a few rocky hills extending 100 to 300 meters above the plain. The plain rises gradually from 600 meters at Kologi to about 700 meters at Abu Gubeiha. Surface soils were estimated to be 65% black cotton, 20% laterite and 15% sandy soils. For gravel surfacing laterite soils are available within an average haul distance of 15 kms. There are 14 observable water courses. Out of these only 3 require a bridge structure or ford while the remainder will require culverts.

KORAG ROAD NETWORK



Phase 1 Roads: 1A, 1B, 1C, 2C, 3A, 4D

Phase 2 Roads: 4A, 4B, 4C

SCHEMATIC-STUDY AREA TRANSPORT NET

RAILWAY
PAVED ROAD
GRAVEL ROAD
TRACK
1A STUDY ROAD

4. Abu Gubeiha-Rashad (Phase I)

For 40 kms north of Abu Gubeiha, the terrain is flat while the remaining 19 kms to Rashad are rolling terrain. The elevation of the road rises from approximately 700 meters at Abu Gubeiha to around 880 meters at Rashad. The adjacent area contains mountains. Surface soils were estimated to be 50% black cotton, 20% laterite, 15% sandy clay and 15% rocky. An existing abandoned road occurs at km 12. Pit-run materials are available at an average haul distance of 15 kms. The road alignment is crossed by 12 water courses two of which exist in very poor condition. One will ultimately require a bridge while the remainder culverts.

5. Rashad-El Abbasiya (Phase I)

For 40 kms from Rashad the alignment traverses a plateau with numerous stream courses crossing the alignment at an average spacing of 1.6 kms. Out of these 24 water courses, (one ford exists) only 3 may ultimately require a bridge while the remaining 21 will require a culvert. From km 40, the road starts to descend from elevation 880 to 640 meters, with 3 distinct areas having gradients of 15% to 20%. From km 43 for the remaining 17 kms up to Abbasiya, the terrain is flat. The surface soil types of this road are 10% black cotton, 25% sandy clay and laterite and the remaining 40% rocky. There are five more water courses after km 40, of which only one requires a bridge structure while the rest require culverts. Pit-run materials of gravel or laterite are available at an average haul distance of 5 kms.

6. El Abbasiya-Balahat/Um Ruwaba (Phase I)

The proposed alignment extends north from El Abbasiya, passing to the west of Barid near km 23, through Sherkeila at km 73 and, after crossing the railway, enters Balahat at km 95. Balahat is located 26 km east of Um Ruwaba. The terrain is flat and with few water courses. Surface soils are classified as 75% black cotton and 25% silty sand soils. Average hauling distance of pit-run, sub-base material was estimated to be 36 km. Drainage structures, generally fords, will be needed at five locations.

B. The Proposed Improvement

After completing its field analysis, Wilbur Smith concluded that water courses and black cotton soils are the principal impediments to motorized traffic, especially during the rainy season. The minimum investments that can overcome these obstacles dictate the minimum road construction standards.

There are three options for crossing major water courses: fords, culverts and bridges. Because of their high cost, single or multispan bridges normally are not considered for low cost roads except for large drainage areas having a deep defined water course or channel. Fords for deep channels require long approaches that increase costs to values comparable to the above bridge. Therefore, open-bottomed structure culverts (simple

small span slab bridge) with masonry abutments and a reinforced concrete slab are recommended for most (155) definable water courses in the project area. Fords are planned for 21 water crossings where runoffs exceed the capacity of culverts. Average monthly and daily rainfall data can be used as a guide for structural requirements. Based on previous trends, structure culverts would be passable year round and fords passable 94% of the year and 83% of the wet season. Fords will be impassable during high water flows for an estimated 3 to 4 hours.

Black cotton soils make portions of the road impassable for an average of four months during the rainy season to all vehicles except farm tractors. The black cotton soils exhibit a high degree of volume instability coupled with loss of strength when moistened. Tests on Atterberg limits and grain size distribution put this soil in the A-7-6 category of the AASHO classification system. Norconsult previously concluded, and Wilbur Smith agreed, that making these areas passable requires a road formation of suitable (non clay) material, pit-run gravel surfacing, and adequate routine maintenance. This assumes shallow-depth black cotton soils, with adequate road drainage and side ditches with outlets.

C. Design Standards

1. Road Width.

A 6.0 m wide roadway, including shoulder widths, has been selected in lieu of a 4m and 5.5 m roadway for the following reasons:

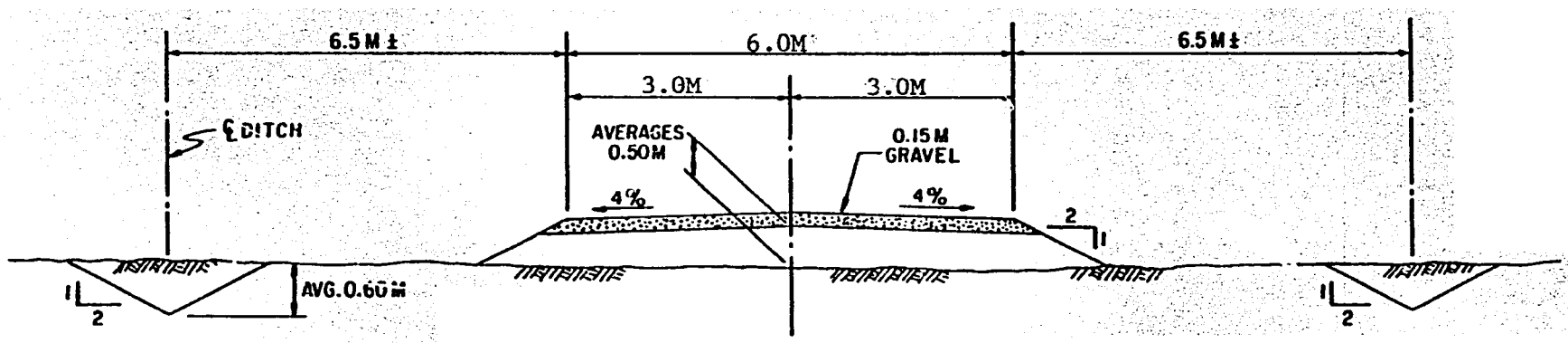
- it provides greater protection against deterioration of the road edges resulting from rain traffic using the road outer edges;
- it reduces the depth of surface rutting due to channelization of traffic;
- it minimizes the impact of poor or ineffective road maintenance; and
- the 6.0 m road gives greater passing capacity for a relatively small increase of cost (approximately 6%).

2. Road Section

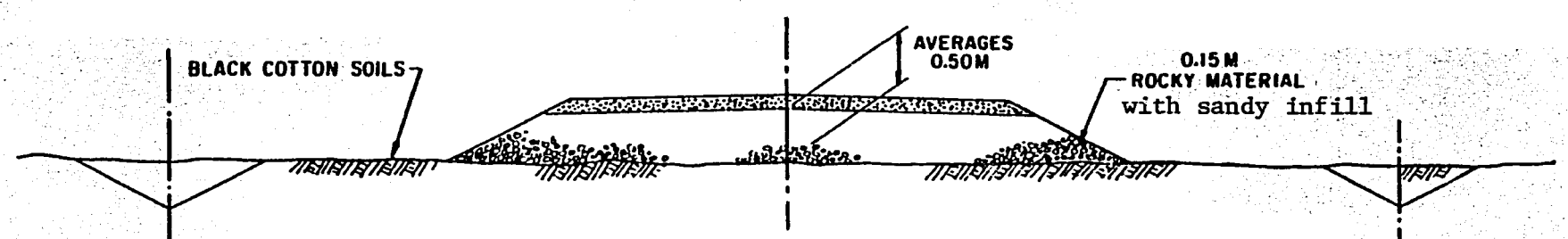
A typical section of the proposed road is shown in Figure 1 and delineates road widths, pavement thickness, formation height and ditch line.

3. Ditches

A typical ditch plan is presented in Figure 2. In order to reduce the likelihood of erosion occuring adjacent to the formation, the centerline of side ditches is located 6.5m from the edge of the roadway. The area between the top of the inside slope of the inside ditch and the toe or



TYPICAL SECTION

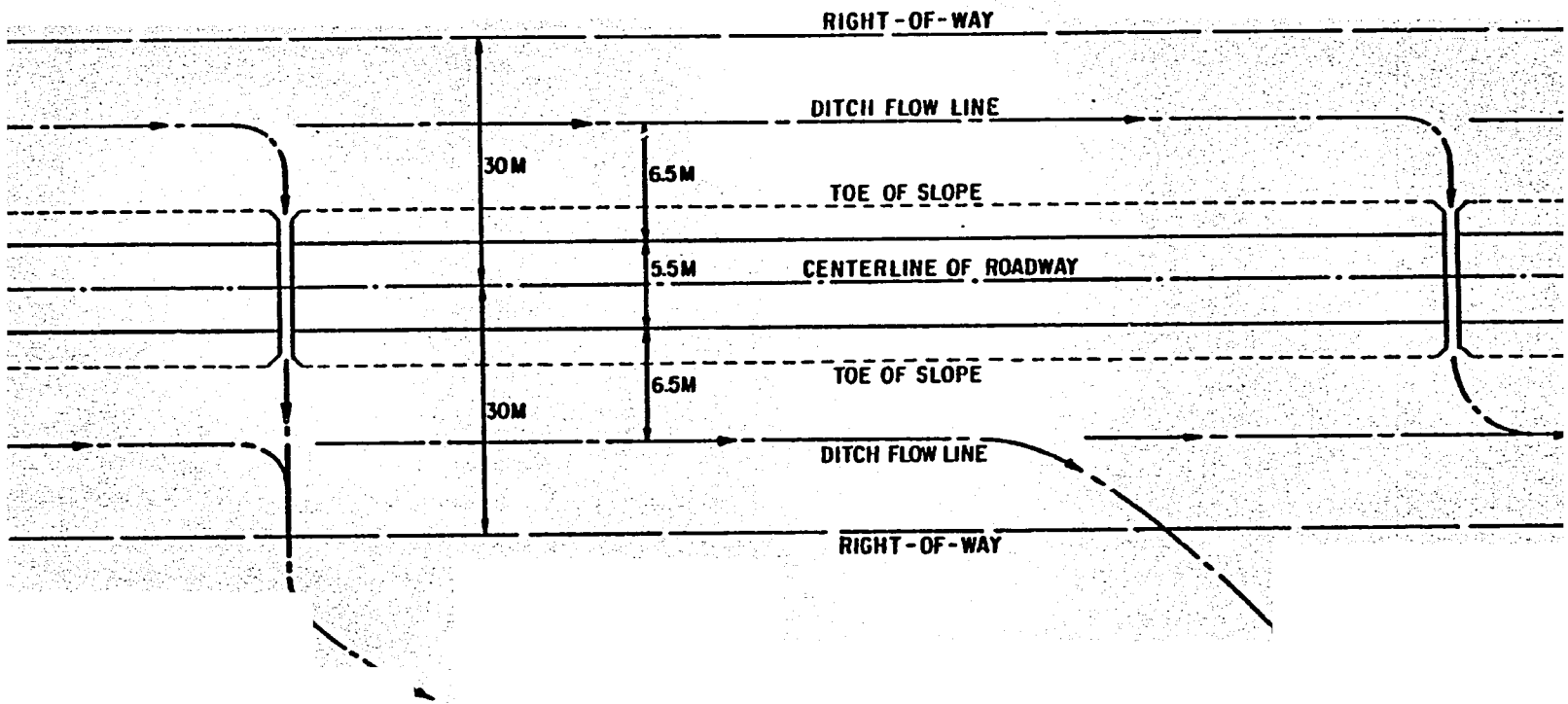


SECTION ON BLACK COTTON SOILS

NOTE:
NOT TO SCALE

TYPICAL ROADWAY SECTIONS

FIGURE 1



PLAN OF TYPICAL SIDE DITCH

FIGURE 2

bottom of the formation slope is approximately 4m which could be used by drivers in the dry season. This should be cross-sloped from the road toe to the ditch side slope. At the end of the rainy season the side ditches will keep traffic within the roadside area. Where soils are good enough for the road formation, dtiches can be rectangular for machine excavation and material used directly on the road. Laboratory tests performed on black cotton soils at different locations in the project area indicate a need for side ditches on each side of road formation to reduce the possibility of subsoil saturation beneath the embankments. Forty eight-hour soaked CBR tests performed on cotton soils along the Kosti-Um Ruwaba road resulted in values varying from 2 to 7. Other tests yielded an average plasticity index (PI) value of 23 and liquid limit (LL) value of 44. The PI of black cotton soils along the Kadugli-Talodi road averaged about 33 and LL about 59. Four-day soaked CBR values were not available, but a Norconsult report indicated that values were below 2. Based on these results, Wilbur Smith recommended side ditches on each side of the road as a treatment for subsoil saturation that can lead to formation failure.

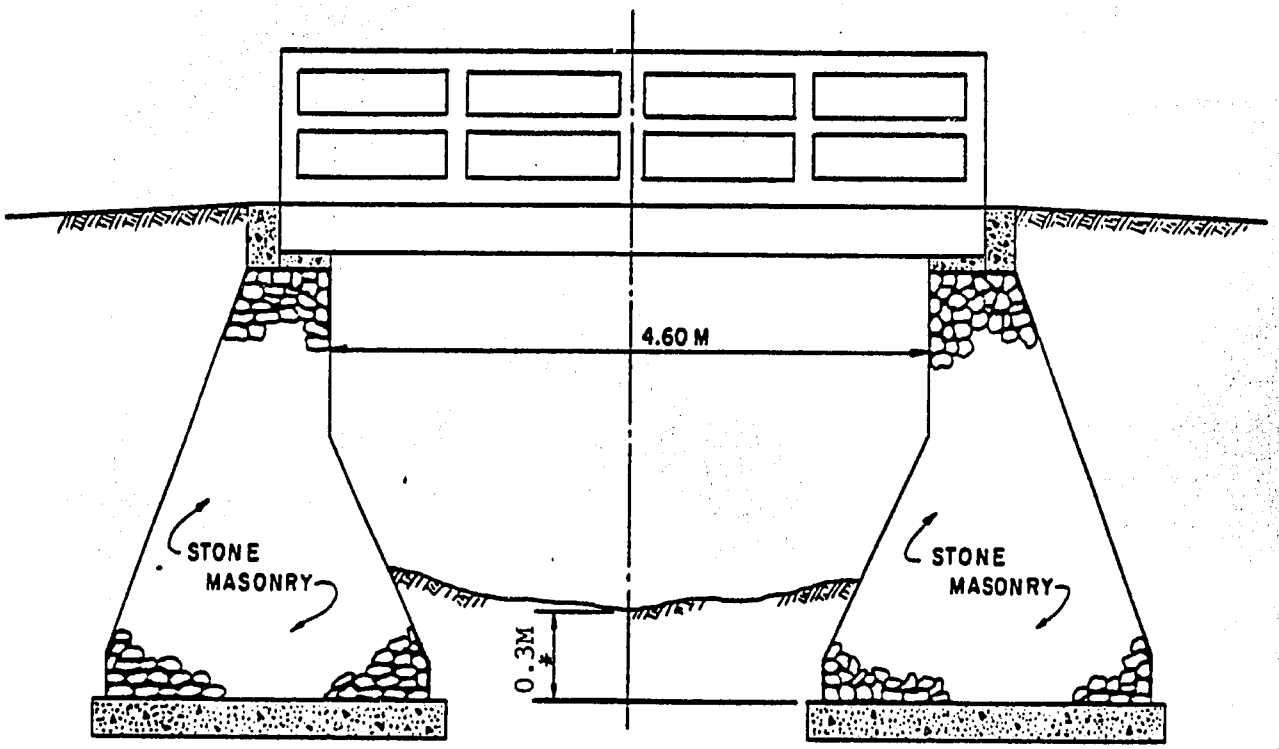
4. Drainage Structures

In spite of the relative flatness of the terrain, sheet flow runoff is common due to some cross slope and as such intercepted by side ditches. Small drainage structures are needed at fairly regular intervals beneath the road to pass the sheet flow collected in the side interceptor ditches and/or outlet it. An average of two 600mm diameter pipe culverts will be required per kilometer with every third installation being a double pipe culvert. Pipe culverts of this size reduce requirements on mechanized equipment since they can be produced on site and handled by local labor.

Based on the Wilbur Smith and Associates' observations, there will be 155 structure culverts (Fig. 3) and 21 fords (see Fig 4). The proposed cross section of a typical culvert is shown in Fig 3. A 4.6m span culvert has been assumed for estimating project costs. Larger or smaller variations can be developed in standard sizes during the final design and include the use of prefab r.c. planks. The smaller size may replace larger box culverts estimated in the construction cost. In comparison to box culverts, these structures are generally less costly where labor and masonry materials are cheap and readily available as in this project. They also minimize requirements for equipment, skilled labor, and forming and reinforcing steel, but they increase the demand for local labor.

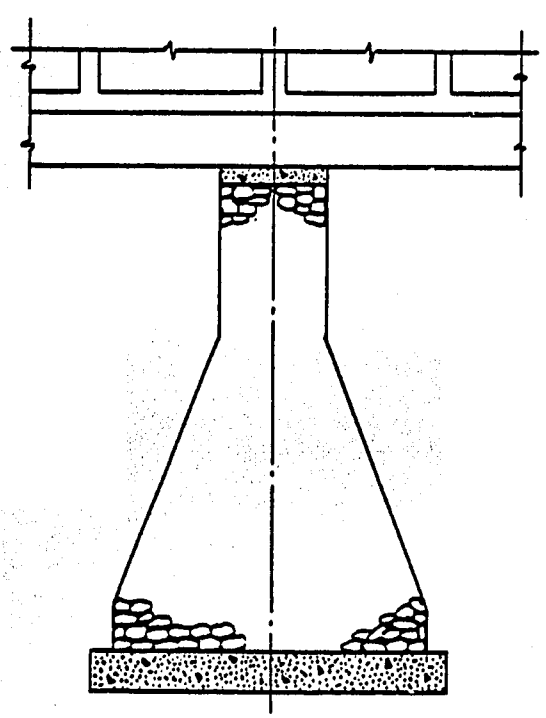
D. Design Methodology (WSA Observations and Recommendations)

The existing tracks following the route are not well defined and as a result there will be considerable latitude in establishing final alignments. Items such as established farms, villages, rock outcrops, stream crossing, and areas of particularly bad soils (black cotton and soft or shifting sand) will be considered in setting the horizontal design alignment. Problems with horizontal curvature should not occur. As the area is relatively flat the road formation will generally be fill (50 cm) rather than a cut section. The vertical alignment will therefore be relatively simple to design, and will rely on cross section slopes for drainage rather than longitudinal slopes.



SECTION OF SINGLE SPAN CULVERT

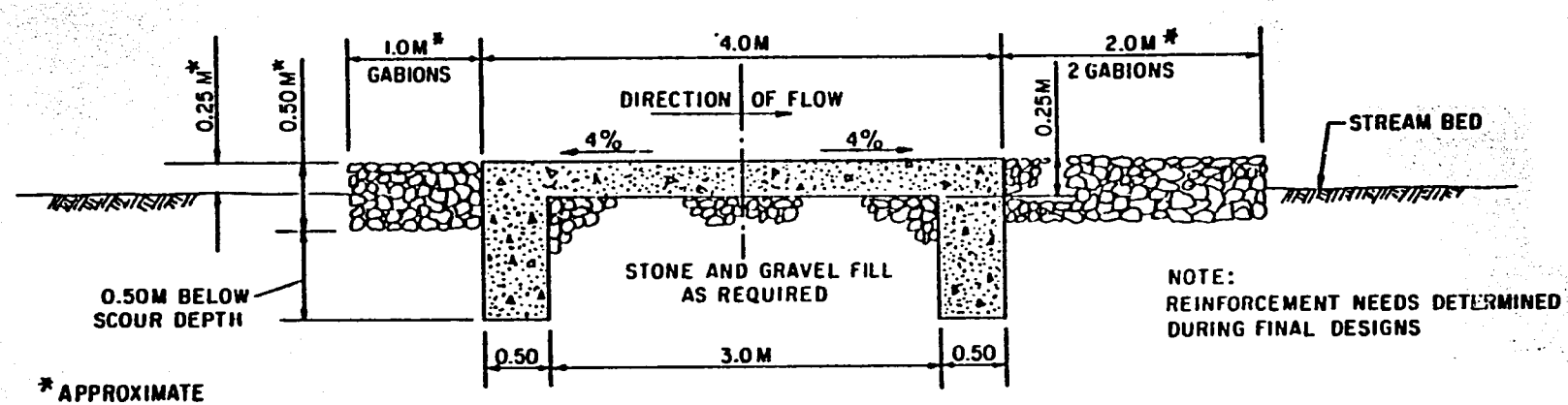
* Minimum Of 0.15M Below Scour Depth



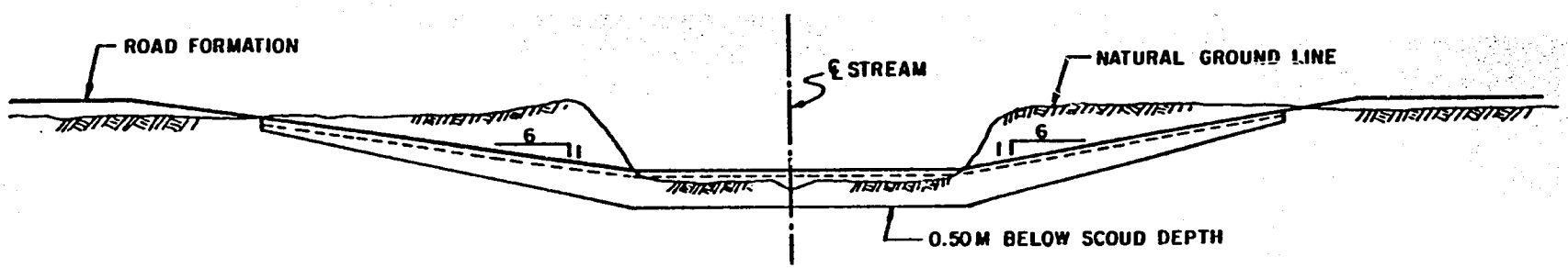
PIER FOR MULTIPLE SPAN CULVERT

TYPICAL OPEN CULVERT

FIGURE 3



TYPICAL SECTION OF FORD



LONGITUDINAL SECTION OF FORD

FIGURE 4

Earthworks and gravel surfacing combined account for 72 percent of the estimated construction costs, with estimated earthwork quantities accurate within a range of plus or minus 15 percent and gravel surfacing plus or minus 5 percent. A combined error of 25 percent in the cost estimates for the remaining work items would result in a total error of approximately 7 percent in the overall estimate. The confidence interval on the total cost estimate is plus or minus 16 percent. A contingency of 15 percent has been added to the construction costs to compensate for possible errors.

Because of the remoteness of the area and the lack of accurate and/or large scale mapping and soils survey data, the cost of detailed field surveys and final design plans for low standard roads would be practically the same as those prepared for high standard roads. However, for these relatively low cost roads, WSA considered the detailed plans normally expected and prepared prior to construction to be unnecessary and should be replaced by by visual and instrument field observations. They recommended that the A&E firm prepare standard drawings of pipe culverts, box and open-bottom culverts, fords, ditches, erosion control measures and other similar details for use during the first stage of the project. Quantities could be computed for multiple applications of these standard units and, because of the terrain, the number of different applications should not be significant. While standard details are being prepared, the alignment for the first phase of construction would be established in the field, major topographic features noted and a surveyed centerline profile of existing ground obtained. Additional longitudinal profiles at major stream crossing should also be taken at the same time.

All expatriate assistance during the design stage would be provided on a short-term basis. A highway engineer will lead the design effort, supplemented by a soils engineer and a drainage engineer. A total of 36 person months of short-term design assistance are provided for in the project; 24 person months will be required early in the project, with the remaining 12 person months drawn upon as required. The highway engineer (12 pm up front) would hold primary responsibility for the drawings and quantities.

The soils engineer (6 pm up front) will locate sources of supply for select materials, pit-run gravel, laterites, sand and gravel for cement mortars and concrete.

The drainage engineer (6 pm up front) will establish drainage areas and runoffs, having available mapping and agriculture aerial photos, for all major streams. Using the stream cross sections, high water marks from observation and discussion with locals, and flowline gradients, stream flow quantities will be determined for definable water courses. Because more than 170 water courses were noted during the WSA field reconaissance, it is probable that all stream flows will not be established during the drainage engineer's assisgnment. He will, however, design the major streams as well as establishing the procedures and methodologies so that resident staff can complete stream flows and culverts for the remaining minor streams.

Line drawings showing horizontal and vertical designs, standard detail drawings and a bill of quantity of construction items will form the

design input to the contract documents for bidding process with local Sudanese contractors. Exact positioning of pipe, box and open-bottom culverts and fords will be established during construction. Minor changes to vertical alignments may be required as drainage flow lines are finalized so that the road profile fits the drainage structures. Design conditions should closely follow local needs and conditions.

LIST OF MAJOR CONSTRUCTION EQUIPMENT FOR
TYPICAL 28 KM FEEDER ROAD

Item	No.	Unit Price	Amount (1000 US$)
Tipper Truck, $7m^3$	9	60	540
Grader, 125 HP	2	110	220
Loader, $1.0m^3$	2	70	140
Farm Tractor w/trailer	4	35	140
Towed Roller	2	20	40
Towed Water Tank	2	15	30
Dozer, D6	1	130	130
Towed Fuel Tanker	1	20	20
Service/Lub. Truck	1	40	40
Pickup Truck, 3/4 ton	2	25	50
Concrete Mixer, $0.4m^3$	4	5	20
Generators, Welders, Pumps, Air Compressors, Concrete Vibrators, etc.	-	60	60
Hand Tools	-	20	20
Subtotal			US$1,450
Procurement Shipping:			
US to Port Sudan (a)			250
Port Sudan to job site (b)			0
TOTAL			US$1,700

(a) Cost of US origin equipment available from International depots will reflect shipping cost in quoted unit prices.

(b) By contractor.

Source: WSA

165 / 71

BRIEF SUMMARY OF SUDANESE CONTRACTORS

Contractor	Percent Sudanese Ownership	Major Equipment Owned: Dozers	Graders	Loaders	Tipper Trucks	Rollers	Year Organ.
1. Hussein Musa's Enterprises	100	7	6	9	36	4	1981
2. Sayed Enterprises	100	10	-	2	-	2	1958
3. Africa Construction	100	8	2	9	-	2	1978
4. Factory Equipment	100	-	4	2	6	1	1968
5. Commandite International	100	4	1	3	17	1	1981
6. Soba Engineering & Trans. Co.	100	-	1	2	10	4	1081
7. Harbor Services, Trading & Engineering							
8. Sudanese Korean Const. Co.	35	2	2	3	15	4	1982
9. Sixco Limited	40	1	1	9	12	-	1977

Contractors	Remarks
1. Hussein Musa's Enterprises	Has done more earthworks than other contractors, including 2 million m^3 for RBPC and Chevron. Primary activity is earthworks and hiring his equipment to others.
2. Sayed Enterprises	In addition to stone quarry operations, main activities are route clearance and embankments for railroads, building earth dikes for ponds and canal excavation.
3. Africa Construction	Primarily engaged in building construction.
4. Factory Equipment	Specialize in steel fabrication but have diversified to pipe line track maint.
5. Commandite International	Worked as sub-contractor for Chevron on earthmoving and warehouse construction.
6. Soba Engineering & Transport Co.	Worked as sub-contractor on several small roads and other earthwork projects.
7. Harbor Services, Trading & Engin.	Works only in Port Sudan area. Has done several roads and earthfills.
8. Sudanese Korean Const. Co.	Since organization, work has been primarily construction and paving streets in Omdurman. All key engineering staff are Korean.
9. Sixco Ltd.	Firm is presently engaged in building construction, but plans to diversify into road construction.

Source: WSA

169 / 174

II. STORAGE

A. ABS Warehouses: Design Considerations

The determination of future storage locations and size of these facilities is dictated by five important elements: (1) the lack of road infrastructure over which to transport commodities during all seasons of the year, (2) the warehouses to be constructed by the International Development Agency (IDA) project, (3) the current and proposed locations of ABS branch offices and secondary offices, (4) the projected growth patterns of ABS storage operations in the Kordofan Region, and (5) the distribution of sorghum, sesame, and groundnut production.

Based on all considerations, the proposed sites for the four ABS warehouses are Dilling, El Obeid, Abu Gubeiha, and Talodi. Warehouse positioning in Kordofan Region conforms with the calculated dispersion of the production of sorghum, which is the major crop. Because of the estimated levels of sorghum, sesame, and groundnut production in the above areas and the growth patterns of ABS operations at Um Ruwaba, El Obeid, and Dilling, Kansas State University recommended a warehouse size of 3,000 MT (33,000 bags). Construction costs indicate that a smaller warehuse unit would greatly increase the investment cost per MT of storage capacity. A larger unit would be uneconomical at this time. A standard size for all locations will facilitate the construction process and should reduce or at least stabilize the expected cost of construction.

The usable volume in a warehouse is less than the gross volume. Space must be left clear for air circulation and ventilation. Aisleways, preferably 1 m wide but not less than 0.6 m wide, must be left between stacks of bags and the wall. The usable volume in a small warehouse (less than 500 MT capacity) can be less than 50 percent of the gross volume below eaves level. The usable volume increases with warehouse size to 70-80 percent for warehouses of 5,000-10,000 MT capacity. Space that appears to be wasted in aisleways and headroom around and above stacks is actually essential for ventilation, access, housekeeping, and fumigation.

The suggested dimensions for a 3,000 MT warehouse are 1,596 m^2 of floor area with 5.5 m of height. One building size is 57 m X 28 m. The dimensions have a short perimeter for the given floor area and thus reduce the area of side walls and the length of roads around the building. However, other considerations may override this criterion, such as the configuration of the site or the transportation serving it.

Several factors can affect the siting of the warehouse. First, the soil load-bearing capacity of the site should be determined. Weak soils can substantially increase building costs. Some soils, such as black cotton soils, should be avoided if possible. Excessively wet areas and areas which suffer from flash floods are not desirable. However, moisture permeation from the ground can be prevented by drainage channels. The long axis of the warehouse should be oriented on an east-west axis ($\pm$ 10°) with the main doors located on the north and south sides. This orientation will enhance the

airflow through the warehouse when the doors are open, and keep the warehouse cooler than with other orientations. Sloping sites should be avoided, since it is expensive to cut into them and dig drainage trenches across the slopes uphill from the warehouse without causing soil erosion. Vehicle access should be carefully considered in relation to the site. Roads should be at least 10 m wide, and turning circles and concrete aprons in front of doors need to be generously proportioned. The availability of water, electric power, sewage disposal and general drainage may influence the choice of site. Future expansion or development of the site should also be planned so that it can be efficiently incorporated.

The specifications for the building are as follows. The required floor area is 1,600 m^2, however the length and span may vary. Suggested dimensions are 80 m length, 20 m width and 5.5 m height at wall line. The floor level should be 1 m above finish grade to provide a truck dock. The eaves should overhang 1 m along the length, except over doors where the overhang should be 5 m. The roof overhang at the gables is 1 m. The end door's awning is 3 m. The estimated storage capacity is 3,000 MT.

The KSU report recommended an all steel structure with galvanized sheet steel (or aluminum) walls and roof cladding. This recommendation was based on a minimum cost consideration. The report did note that smooth masonry walls are more desirable as they do not trap as much spilled grain and dust as steel-framed walls. While the mimimum cost consideration is likely valid, the major component of cost for a steel structure is U.S. currency. Masonry construction would mainly utilize currency but could encounter environmental constraints from limited wood supplies to fire brick in the El Obeid area. This caused major construction delays on the Western Sudan Agricultural Research Project.

The Project Paper recommends that either steel or masonry walls be utilized. The selection will be made after further review of relative costs and environmental conditions. The cost comparison will be prepared by the design engineer prior to detailed design of the warehouse structures. Undoubtedly there will be changes in prices and availability of various materials of construction between now and the time for design implementation. The selection will also be influenced by the relative availability of local and U.S. funds. The project estimate is based on a steel structure to assure a dollar budget, even though local currency may eventually replace some of the dollar costs.

The roof and awnings will be covered with corrugated sheeting of 22-gauge galvanized steel or aluminum. The minimum longitudinal lap should be 0.2 m, the side lap 0.15 m, and all laps should be sealed with mastic beading (or a layer of bitumen) to avoid leakage. Ideally, there should be no transparent panels in the roof, but it is acceptable to have up to 5 percent of the total roof area in transparent panels. Many transparent materials deteriorate rapidly in strong sunlight and have a short life.

The overhanging roof extension at eaves and gable ends is extremely important in shading both walls and ventilator openings from strong sunlight. The overhang should be at least 1 m. Any gaps between the top of the wall and adjoining roof sheets should be sealed, preferably with a flexible mastic substance which moves as the roof expands and contracts. Gutters on the roof can become inadequate, so it may be best to let rain run off the roof onto a wide concrete path (which slopes away from the wall) or onto a stone path or grassed-in drains.

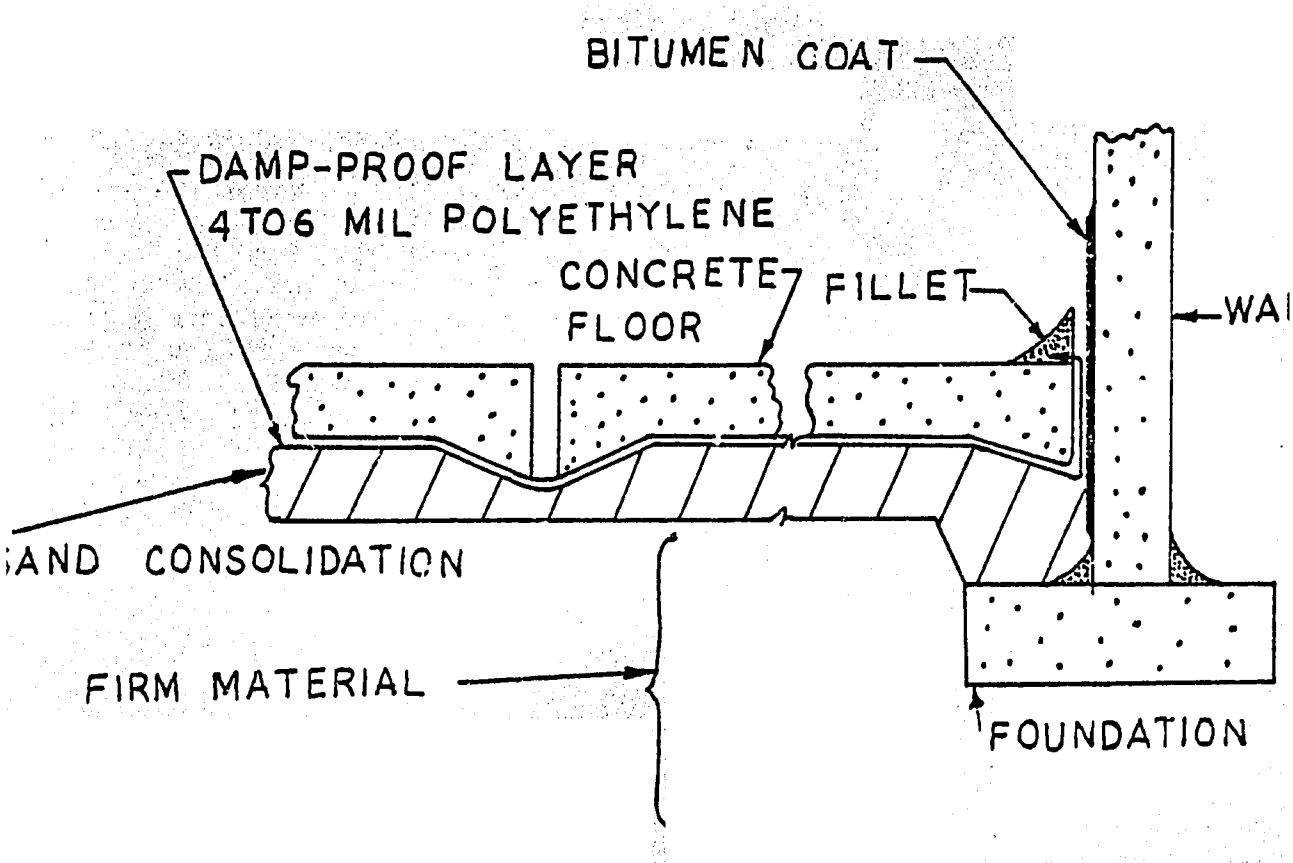
Doors should be steel-framed, or a double-leaf sliding design and clad with 22-gauge galvanized steel or aluminum, giving a clear opening of approximately 4 X 4 m. Four doors on each 80 m side wall and one on each 20 m wall are the minimum for a 3,000-MT warehouse. If the doors are separated by a longer distance, the labor requirement for hauling and stacking the sacks will be high. In addition, ventilation will be restricted. The doors on opposite walls shsould be aligned rather than staggered to facilitate easy air circulation. All doors should run outside the building and be supplied complete with all tracks and door gear, including locks, and door flashings.

The ability to control ventilation is crucial. Each ventilator opening should be shut firmly when outside air is damper than air inside the warehouse. The most effective location for ventilators is high on the walls, close to the eaves or a ridge vent. Ventilators 0.6-1 m high, running the full length of the building on the front and back sides, should be satisfactory. They must be convenient to open and bolt shut from ground level outside the store. The openings should be covered with a wire mesh fine enough to exclude mosquitoes. Windows may be incorporated into the ventilators. Windows may have galvanized steel frames with tropical-grade translucent sheeting. Exterior walls may be made of sheet steel cladding.

For the construction of foundation, floor, and walls, it is important to have a firm base. A loosely-compacted base will settle over time, most likely unevenly. Floors or walls not sufficiently supported eventually will crack. Cracks are impossible to clean and shelter insects which can carry over from one lot of stored grain to the next. The organic matter in topsoil shrinks as it decays, so all topsoil should be removed from the site. The weight of the roof is transmitted to the ground by steel or concrete columns which rest in specially-constructed concrete foundations. The subsoil needs to be examined at every construction site and identified as to type. Foundations must be designed to suit local conditions.

Foundations, columns, beams and flooring should be reinforced by mild steel bars. The usual bar size ranges from 10 to 19 mm in diameter. It is best not to build masonry walls on an extension of the floor slab, but to build them directly on a wide concrete strip foundation. Vertical columns to carry roof rafters should have foundation pads that are deep and wide enough for all anticipated loads and stresses. Walls should not be bonded to vertical columns. Bricks must be correctly bedded. Mortar for bricklaying and plastering should be mixed from cement and sand in a 1 to 8 ratio, plus mortar plasticizer. A thick coating of bitumen along the bottom of interior surfaces, from below the bottom of the floor slab to about 0.3 m above the final floor level, will ensure a dry wall (Figure 5).

FIGURE 5



SCHEMATIC OF FLOOR SECTION

The floor area should never be filled with loose earth or topsoil. If infill is necessary, sand, stones, rubble, or broken bricks should be used. These need to be thoroughly consolidated in layers 150-300 mm thick, using sand to fill in the gaps between larger stones. The surface may be covered with 5-8 cm of moist sand, well consolidated and firmly tamped. The floor concrete should be poured after the roof is built. The final floor level should be higher than the adjacent roadway and ground level (sloped away from the floor and walls) by about 1 m. An outfall slope to doors of 50 mm in 3 m is required for both the base and final floor surface. The final consolidated layer of sand or soil-cement (approximately 60-80 mm thick) should be treated against termites, and a moisture-proof membrane (Figure 10) of 4 to 6 mil thick polyethylene sheeting should be laid on top. The overlap of the polyethylene should be 0.5 m with ends being brought 0.3 m up the wall. The thickness of the floor concrete should be at least 0.15 m, and slightly thicker under the edges for additional strength. Expansion joints 10-20 mm wide (to be later filled with bitumen or plastic) should be every 5 m and around the bases of columns or pillars.

2. Warehouses: Estimated Imported Component

Each warehouse is designed for 1600 m^2 of floor area. The following estimate is based on the use of I-section steel stanchions, portal rafters gable posts, galvanized iron roof, galvanized side-wall sheets, steel doors, Z-section steel purlins and rails. Estimated tonnage of the imported material is given below:

1.	A maximum of 22 I-section steel stanchions with approximate dimensions 305 mm X 165 mm X 40 mm, 1.5 tons each	33 tons
2.	A maximum of 22 I-section steel portal rafters with approximate dimensions 203 mm X 133 mm X 30 mm, 1.2 tons each	27 tons
3.	A maximum of 6 I-section steel cable posts with approximate dimensions 254 mm X 146 mm X 31 mm, 1.0 ton each	6 tons
4.	Galvanized iron roof (corrugated)	15 tons
5.	Galvanized side-wall sheets (corrugated)	8 tons
6.	Z-section steel purlins and rails	3 tons
7.	A maximum of 12 sliding doors and fittings, 500 lb each	3 tons
8.	Miscellaneous parts, fittings, nuts, bolts, washers, braces, brackets	2 tons
	Total	97 tons

Approximately 100 tons of imported material will be required for each warehouse. It should be realized, however, that the actual tonnage of

materials will depend on the detailed structural and civil engineering design. In any case, the above estimate is expected to be close to the actual requirement.

Provision is made for pesticide application, safety, and inspection equipment under the technical assistance and training section.

C. Warehouse: Estimated Local Component

These quantities will depend on the final design and engineering. This estimate is prepared on the basis of construction experience of the ABS.

Item	Unit	Quantity
Excavation for foundation	m^3	180
Excavation for external platform	m^3	100
Hard-core filling under floors and platform	m^3	1,700
Sand filling under floors and platform	m^3	300
Lean concrete under foundation	m^3	10
Lean concrete under grade beam	m^3	15
Lean concrete foundation to platform wall	m^3	45
Reinforced concrete without steel in foundation	m^3	40
Reinforced concrete without steel in short columns	m^3	72
Reinforced concrete without steel to grade beams	m^3	80
Brickwork in cement mortar to floor level	m^3	675
Cement plastering	m^3	675
Brickwork retaining wall to platform	m^3	325
Plain concrete in floors, platform and ramps	m^3	425
Plain concrete final surface of storage area slab	m^3	60
Holes in columns for holding down bolts	m^3	92
Cement grouting to hold down bolts	m^3	92
Joint sealer between wall and floors	m^3	200
M.S. bars in column bases	kg	3,400
M.S. bars in short column	kg	3,400
M.S. bars in grade beams	kg	6,750
Materials for 5 X 5 X 3 m office	job	-
Materials and construction for security post 3 X 3 m	job	-

Materials and construction for latrines and showers (possible sites)	job	-
Materials and erection of fencing	m	360
Materials and fixing of steel gate	no	1
Transport and erection of steel structures	job	-
Painting steel structures	job	-
Lighting fixtures inside warehouse	no	40
Electrical outlets	no	10
Power distribution panel	no	1
Weatherproof external light	no	15
Lighting fixtures in office and lavatory	job	-
Ceiling fan in office	no	1

D. Warehouse Operations

Pest control emphasis is placed on preventative methods rather than corrective measures. There are four major types of control: inspection, housekeeping, physical and mechanical methods, and chemical methods. Inspection is used with both the grain and the storage facility in order to locate potential sources of infestation and contamination, uncover existing infestation or contamination, indicate the control measures needed, and evaluate pest control programs. Inspection is primarily a preventative measure.

Grain should be inspected when received for storage and regularly while in storage. The frequency of inspection depends on climatic conditions, the condition of the grain when placed in storage, and the potential for infestation. Inspection will determine the moisture content and temperature of grain; presence of insects, molds, and foreign material; and rodent and bird contamination.

The area surrounding the storage facility should be inspected for accumulation of grain, debris, tall weeds, and evidence of insects, rodents, and birds. The exterior of the storage structure should be inspected for openings through which rodents, birds, and insects can enter. The interior of the storage structure should be inspected for general condition of cleanliness, neatness of stacking, evidence of pest activity, and structural defects.

Housekeeping is the most important and effective means of preventive pest control. It includes eliminating accumulations of debris and grain around the storage facility, properly storing materials and equipment outside the storage facility, cleaning the interior of the storage facility, cleaning handling equipment, and properly storing equipment and materials inside the facility. Grain residues and dust should be removed from the storage areas before

restocking with grain for storage. Aisleways and areas between stacks and along walls should be cleaned regularly with emphasis on cracks, ledges, and obstructions. Roof support structures should be cleaned periodically. Cleaning emphasis should also be placed on ventilators and areas where the roof contacts the support structures. Handling equipment should be cleaned regularly to remove residual grains and dust. Grain in sacks should be stored on pallets off in from walls to prevent moisture or contaminant absorption from the floor.

Housekeeping must be conducted on a regularly-scheduled basis. The frequency depends on the type of operation and observed need. If grain is being handled on a daily basis floors and other areas should be cleaned daily. If grain is handled only occasionally, cleaning can be less frequent, but never less than once a month. Cleaning schedules should be in written form to provide a reminder of the cleaning tasks and facilitate scheduling of workers. Schedules and instructions should be changed as needed to improve their effectiveness. Once cleaning schedules are established, inspections will indicate whether the desired level of cleanliness is obtained. If not, the schedules should be changed.

E. Private Sector Pilot Porject: Grain Cleaners

Each of the three private sector storage facilities will have a grain cleaner included in the equipment. These grain cleaners are to be imported from the U.S. The specifications are given below.

All metal seed and grain cleaner (scalping and cleaning grain).
Capacity: Not less than 200 bu/hr of sorghum.
Charging hopper about 2 bu capacity and elevator required.
3 sets of two screens (one top and one bottom) for sorghum.
3 sets of two screens (one top and one bottom) for sesame.
Elevator-bagger complete with power attachement and two-way bag holder
Complete with 1 HP motor single phase 220V 50 cycle motor. Motor must withstand ambient temperature up to 120° F.
Caster mounting.
Spare parts: 1 motor belt, brush, and bearings used in the cleaner.

Economic Analysis

I. Overview: Shadow Exchange and Discount Rates

Economic analysis of a public project like KORAG requires estimation of a shadow exchange rate and a shadow discount rate. Since benefits are measured in local currency, investment costs should also be expressed in the same currency unit by converting the foreign exchange component of the costs with an appropriate exchange rate. Moreover, tradeable goods on the benefit side should also be valued at import parity prices to reflect their economic worth. Different methods for estimating shadow exchange rates have been developed, each presenting different recommendations:

(1) shadow exchange rates should reflect the value, in terms of welfare to the economy, of an additional dollar,

(2) shadow exchange rates should reflect the opportunity cost of a dollar in their use,

(3) the shadow price should be the "equilibrium" exchange rate - with varying assumptions about what the equilibrium rate may be.

Most writers of this subject recognize that the shadow exchange rate would ideally be estimated from general equilibrium programming models. Actual calculation of useful shadow rates, however, is almost impossible, even when input-output, tariff and other data are relatively complete. Consequently, a few partial equilibrium methods have been developed. Whatever the advantages and disadvantages of these approaches are, they will provide slightly different estimates and the actual estimation requires large amounts of resources in terms of time, budget, data and computer skills. More practically, a shadow foreign exchange rate may be determined by choosing a reasonable number between the official and the market exchange rate.

Currently, there are three exchange rates in Sudan: the official exchange rate, the commercial bank exchange rate, and black market rates which vary from dealer to dealer and day by day. A shadow price of LS 2.2/$, used in the project paper of Western Agricultural Marketing Road and the KSU report on Storage and Inventory Loan Component, was reasonable with the official and the market exchange rates prevailing when the documents were prepared: the official rate at LS 1.3/$, the bank rate at LS 1.8/$, and the market rate at LS 2.4/$. When the quantitative economic analysis was done for the PP in November 1984, the commercial bank rate had been devalued to LS 2.1/$ and the free market rate had fallen to LS 2.65/$. A shadow price of LS 2.4/$ was chosen as most appropriate and was used in the original draft of this analysis. In February 1985 the commercial bank exchange rate and the free market rate were unified at LS 3/$1 by the Bank of Sudan. Under the new regulations, only commercial banks can buy and sell foreign currency. Consequently, a black market exchange rate has developed.

As of March 1985 the black market rate has fallen to approximately LS 4/$, while the commercial bank rate is at LS 3/$. The economic analysis was redone using the commercial bank rate as the shadow exchange rate. Possible future declines in the value of the Sudanese pound are taken into account through the sensitivity analysis of the project. Even though devaluations increase investment costs, they also increase benefits from export crops and savings on vehicle operating costs. A rough estimate of the foreign exchange component of total investment costs is 50 percent (65% of the road component, 30% of the storage). Most project benefits, however, involve tradeables (sorghum, groundnuts, sesame, fuel, vehicle parts) that will increase in value with the devaluations. Since savings in passenger time are the principal non-traded benefit, estimating the tradeable component of project benefits at 80 percent is conservative. We expect that the net impact of the devaluations, then, will be to increase project returns rather than jeopardize the project's viability.

Estimation of the net present value of the project requires determination of an appropriate (shadow) interest rate to discount a stream of costs and benefits. The net present value of the project is sensitive to the discount rate since most of the investment costs occur in the early years and the benefits come in later years. The consensus among economists is that the shadow discount rate should approximate the marginal productivity of capital in the economy as measured in the economy's capital market. The Sudanese capital market is far from satisfying the conditions of a competitive market, suggesting that market interest rates may not represent the actual productivity of capital. The market interest rates are dominated by short-term trade financing rates that are not approximate to a thirty year capital project. Accordingly, Sudanese market interest rates are generally higher than capital's productivity.

Again, as the case of determining a shadow exchange rate, estimation of a discount rate is a difficult task whatever definition and estimation methodology are used. Currently, the interest rate charged by the ABS is 15 percent, and the commercial bank rate is 21.5 percent. A shadow discount rate of 15 percent is used in computing NPVs for the project. This is the rate used in the project paper of Western Agricultural Market Road. To determine the sensitivity of the estimated values, estimates of NPVs with different discount rates are included in the economic analysis of the project.

II. Economic Returns of the Overall Project

Table 6B-1

	Case I			Case II		
	(LS 000's)					
Period	Costs	Benefit	Net Ben	Costs	Benefit	Net Ben
86	1,878	0	-1,878	2,483	0	-2,483
87	6,143	0	-6,142	9,342	0	-9,342
88	10,493	1,059	-9,435	12,068	900	-11,168
89	6,292	4,492	-1,801	7,236	3,818	-3,418
90	7,523	5,541	-1,982	8,651	4,709	-3,942
91	5,816	6,908	1,092	6,688	5,871	-817
92	1,622	9,092	7,470	1,865	7,728	5,863
93	530	9,435	8,905	609	8,019	7,410
94	593	9,796	9,203	681	8,326	7,645
95	872	10,268	9,396	1,002	8,727	7,725
96	382	10,496	10,114	439	8,921	8,482
97	769	10,808	10,039	884	9,186	8,302
98	530	11,134	10,604	609	9,463	8,854
99	593	11,473	10,880	681	9,751	9,070
2000	872	11,825	10,953	1,002	10,051	9,049
01	382	12,218	11,836	439	10,385	9,946
02	769	12,672	11,903	884	10,771	9,887
03	530	13,157	12,627	609	11,183	10,574
04	593	13,668	13,075	681	11,617	10,936
05	872	14,201	13,329	1,002	12,070	11,068
06	382	14,758	14,376	439	12,544	12,105
07	769	15,340	14,571	884	13,038	12,154
08	530	15,945	15,415	609	13,553	12,944
09	593	15,585	14,992	681	13,247	12,566
2010	768	11,299	10,531	882	9,604	8,722
11	237	9,876	9,639	272	8,394	8,122
12	142	6,909	6,767	163	5,872	5,709
13	142	1,638	1,496	163	1,392	1,229
14	142	1,638	1,496	163	1,392	1,229
15	142	1,638	1,496	163	1,392	1,229

Case I	Case II
NPV at 15%: 12,047	NPV at 15%: 2,202
12%: 24,294	12%: 10,668
18%: 6,244	18%: -2,925
IRR (%) : 22	IRR (%) : 16

Assumptions for All Sensitivity Analyses

Case I: Base Estimates

Case II: Pessimistic Estimates
Benefits are lower than base estimates by 15%

Costs are higher than base estimates by 15%

III. Feeder Roads

A. Project Area Selection

This project has evolved through different stages from conceptualization to the actual design. Early during the preparation of the PID, two major studies were carefully reviewed: Norconsult, Master Plan of Feeder Roads and UNDP, Western Sudan Transport Study. The Norconsult Study evaluated possible alignment alternatives in the project area through what it called "screening process". The main parameters of the screening process were as follows:

- Zone of influence area,
- Population estimate of the zone,
- Estimated agricultural production (existing and anticipated),
- Estimated per capita income, and
- Traffic growth estimates.

Having subjected each potential road alignment to these criteria, Norconsult established threshold traffic levels below which the construction of a feeder road would not be economically justified. Based on the results of this study, the PID and PP design teams were able to identify the different sections of the loop. The reviews of the reports were then supplemented with field trips to the project area and extensive discussions with Kordofan's Ministries of Agriculture and Finance. In the final design stage Consultants from Wilbur Smith and Associate update Norconsult's technical and economic data and reappraised the project. The Wilbur Smith Study forms the basis of this PP.

B. Agricultural Benefits of Feeder Road Improvements

Increased crop production and other agricultural benefits are associated with reduced transport costs for agricultural outputs or inputs such as fertilizers and improved seeds. We can assess these benefits through either increased producer surplus or generated traffic estimates. Of the two, the producer surplus method is conceptually preferable because it explicitly links increased agricultural production to project activities. The generated traffic approach only incorporates agricultural benefits implicitly through increased vehicle counts but is easier to quantify. In practical terms, the key issue is how to isolate agricultural benefits attributable solely to road improvements. Based on this consideration and limitations on rural production data, we opted for the generated traffic approach rather than make questionable estimates in producer surplus increases.

That is not to say that road improvements will not have explicit agricultural benefits. Improved production incentives are the centerpiece of the project. However, the mechanisms linking roads to production can best be qualitatively described rather than quantified. This section explicitly discusses these linkages in order to complement the quantitative estimates of traffic generation.

There are at least four potential means for roads to generate agricultural benefits:

(1) Reduced Transport Costs. To the extent that the transport sector is competitive, savings in vehicle operating costs will be passed on to producers and other transport users in the form of lower tariffs and more frequent and reliable service. As a result, production costs will decrease and thus increase the net farmgate price. Depending on responsiveness to price incentives, as determined by risk prefernces and other constraints, farmers may expand cash crop production.

(2) Migration. Improved and cheaper access to an area with available agricultural land may encourage inward migration to zones alongside the road, either from areas with poorer access or from areas suffering from relative over-population and land shortage. In practice, migration may represent simply a geographical transfer of economic activity, and it is important to deduct the value of production foregone elsewhere from the increase in production resulting from migration to the road zone.

(3) Reduced Technical and Marketing Constraints. On the production side, year-round access to farm areas may allow more timely availability of farm inputs and more effective supervision of farming operations, leading in both cases to higher yields. Increased market access may permit commercial sales of wetseason fruits, vegetables and similar products which otherwise would not be produced or whose production would be limited to local demand.

(4) Social and Information Effects. The reduced costs of personal travel and improved communications following road development may have a beneficial impact on literacy and education, health and nutrition, and communication between communities. Further, it should facilitate access to commercial, institutional and administrative facilities and improve the rate of disseminating knowledge of new farm techniques, as well as allowing more effective use of farm extension and advisory services. All these developments should increase farm productivity in the long term, although the impact is indirect and difficult to quantify.

The relative impact of these four factors depends on population size and farming methods (traditional vs. mechanized) in the project area. Mechanized farming schemes depend on some purchased inputs (particularly fuel) and regulation of farm size or cropping pattern. The traditional sector is almost free of formal regulation and has a limited dependence on purchased inputs. Out of the four development benefits outlined above, it is believed that reduced transport costs (type 1) will be the major mechanism to benefit the traditional sector, amplified by access to wetseason markets (type 3) and general benefits (type 4) that are difficult to quantify. In the modern sector, reduced transport costs (type 1) and provision of wetseason access (type 3) are expected to be the main sources of development benefits.

Evidence already exists that farmers in the traditional sector respond to changes in crop prices. The development of commercial groundnut production in western Sudan following the extension of the railroad to Nyala and the expansion of sesame production in southern Kordofan are two cases in point. The agricultural impact of road improvements, in practice, will depend on: (a) the percentage of transport cost savings transferred into higher farmgate prices; (b) farmer ability to respond to market incentives; and (c) additional investments or costs associated with expansion.

All three factors are related to the agricultural marketing system in Kordofan. The transport sector, as previously discussed, is extremely competitive; we should expect savings on vehicle operating costs to be passed to the village level. Within the village, the sheil system and merchant monopsony power will limit the spread of benefits. Currently farmers either sell to one village merchant who can set a price, or they mortgage their crops even before they are planted. In either case, flexibility to respond to market signals is limited.

The storage and credit components of the project, which will stimulate competition with merchants at the village level, are critical to assuring that transport savings translate into agricultural benefits. Given the financial flexibility to respond to the market, farmers have demonstrated their interest in expanding production. Increased access to villages promises to complement financial flexibility by giving farmers options among buyers. Initially, the principal technical constraint will be labor. Once cultivation expansion reaches a limit under current farming techniques, cultural practices and technology must change for the flow of benefits to continue. Technology change is exogenous to this project, but is being addressed through the Western Sudan Agricultural Research Project.

In the mechanized sector, land expansion is formally limited by Mechanized Farming Corporation leases on units of 1,500 or 1,500 feddans. In practice, mechanized farming has expanded to undemarcated areas and would likely continue with production and marketing incentives. Unchecked expansion, however, should be controlled due to negative environmental effects from land clearing and poor farming techniques.

The desired impact on mechanized farming is an improvement of yields through removal of wetseason access constraints. In the short run, more timely provision of fuel and other inputs will mitigate the declining trend in yields. Delays in fuel supplies have meant that sowing has often taken place well after the optimum time or that the area sown has been smaller than intended. Theoretically, capable management might have the foresight to ensure that adequate supplies of inputs are stocked at the farm level before the rains begin. The private sector has possibly been more successful here than the public, but often at the expense of high costs in time and transport. Nor is it practical to plan for every eventuality; many instances were quoted of farmers undertaking tractor journeys lasting several days to obtain vital spares in the wet season, thus tying up both skilled manpower and machinery at a critical time for cultivation activities. Declining yield trends will begin to reverse with improved technologies and cultural practices. Improved road access will obviously contribute to their extension.

C. Traffic Analysis

1. Normal Traffic

Average annual daily traffic (AADT) was calculated from estimates of freight and passengers for the base year, which was fiscal year 1978/79. In order to reduce the volume of calculations, annual growth rates for different types of cargo were averaged, and applied to the base year totals. These rates were reasonable. All freight growth rates are under 5 percent, and passenger growth was 6 percent or less. The composition of traffic was also assumed to change over time, with a trend towards a lower proportion of medium trucks, with more large trucks, buses, light vehicles and passenger cars. This trend is in line with current experience.

In estimating the number of vehicles by type which would be required daily to handle the tonnage projected for a particular year, the following equation was used:

$$AADT = \frac{T \cdot x \cdot P}{L} \text{ divided by } 365$$

where

AADT= average annual daily traffic, for type vehicle
T = Total annual forecasting tonnage
P = percent of total allocated to that type vehicle and period
L = Average loading of type vehicle, that period, in tons
365 = number of days per year.

The number of vehicles for passengers is computed in the same way, assuming that average passenger loads assigned to vehicles were: medium trucks (20), buses (30), light vehicles (3), and passenger cars (7). Where a vehicle was dual purpose for carrying both people and cargo, requirements were calculated separately and then netted, with only the higher figure then used. This procedure effectively eliminated possible double counting of freight and passenger requirements for such vehicles.

2. Diverted Traffic

Diverted traffic on the northern end of project roads is considered to be tied to traffic on the planed Kosti-El Obeid road, with diverted traffic varying inversely with the distance from the Kosti-El Obeid road. Accordingly, it was assumed that the net diversion effect could result in the addition of the equivalent of 4 percent of the Kosti-Umm Ruwaba AADT during the critical years to road sections connecting Balahat, Barid, El Abbasiya, Rashad and Abu Gubeiha. For Kologi-Abu Gubeiha section (4A), this rate is reduced to 3 percent, and for Shagrabeth-Kologi Section (4B), 2 percent is used. These diversion estimates are considered very conservative. From Shagrabeth west, diversion traffic was assumed to be oriented towatd the Kadugli-El Obeid road, the diverted traffic for Talodi-Shagrabeth section (4C) being estimated at 5 percent of normal traffic.

3. Generated Traffic

The new road should generate both passenger and freight traffic. The Norconsult Study projects a 20 percent increase, which is considered too

high. A figure of 10 percent of normal traffic is assumed, for combined passenger and freight generation, to ensure that the results are sufficiently conservative.

4. Vehicle Operating Cost Savings

As mentioned earlier, VOC benefits are realized on normal, diverted and generated vehicle traffic. The difference in VOC on the existing road versus that on the improved road is the basis for these benefits, which are calculated on an annual basis. The basic VOC data, taken from the Berger Study, are made for a 6-ton truck, a Bedford or Austin. Based on this data, three levels of VOC were computed, depending upon the severity of the surface conditions and vehicle types. In order to ensure a conservative result, the lowest cost section (El Obeid-Umm Ruwaba) was selected as the basis for conversion to clay surface costs. The converted costs include escalation (at 37.5%) to account for inflation between mid 1983 and January 1985. In calculating VOC benefits, the consumers' surplus approach was used.

5. Time Savings

In determining a reasonable cost for a passenger's time, interviews were conducted. Based on the results, unskilled labor was priced at LS 3.50 per day or LS 0.50 per hour for a 7 hour day. Skilled labor was priced at LS 8.00 per day and administrative/other labor at LS 16.00 per day. In calculating passenger time benefits, the number of passengers in normal traffic was calculated, using growth rates discussed earlier. The number of passengers on diverted vehicles was then estimated, using the loading rates which were noted previously. Finally, the number of passengers in generated traffic was calculated, at 10 percent of normal passenger traffic. The total is then disaggregated into unskilled, skilled and administrative/other categories, using respective shares of 0.75, 0.15 and 0.10. Each category was then multiplied by the appropriate wage rate and the travel time saved by the improved road over the existing one. In estimating time saved, comparative speeds of 52 kph for a gravel road and 30 kph for a track were used.

D. Cost/Benefit Tables: Feeder Roads

1. Annual Road Segment Costs

Table 6B-2

ROAD SEGMENT

Year	1A (1)	1B	1C	2C	3A	4D	Total
			(LS 000)				
1986	0	0	0	0	0	0	0
87	0	0	0	0	0	2553	2553
88	379	0	790	0		3830	4999
89	569 (2)	1620	1185	0	0	75	3449
90	10	2430	19	1682	1435	75	5651
91	10 (3)	41	19	2523	2153	75	4821
92	10	41	19	49	46	462	627
93	61	41	116	49	46	75	388
94	10 (4)	252	19	49	46	75	451
95	10	41	19	303	282	75	730
96	10	41	19	49	46	75	240
97	10	41	19	49	46	462	627
98	61	41	116	49	46	75	388
99	10	252	19	49	46	75	451
2000	10	41	19	303	282	75	730
01	10	41	19	49	46	75	240
02	10	41	19	49	46	462	627
03	61	41	116	49	46	75	388
04	10	252	19	49	46	75	451
05	10	41	19	303	282	75	730
06	10	41	19	49	46	75	240
07	10	41	19	49	46	462	627
08	61	41	116	49	46	75	388
09	10	252	19	49	46	75	451
2010		41		303	282		626
11				49	46		95
12							0

(1) Segment designations: 1A = Sherkeila-Balahat
1B = Barid-Sherkeila
1C = El Abbasiya-Bardi
2C = Rashad-El Abbasiya
3A = Abu Gubeiha-Rashad
4D = Kadugli-Talodi

(2) First two years are construction costs.

(3) Routine Maintenance.

(4) Periodic Maintenance.

2. Annual Road Segment Benefits

Table 6B-3

ROAD SEGMENT

Year	1A (1)	1B	1C	2C	3A	4D	Total
			(L.S 000)				
1986	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0
89	0	0	0	0	0	2854	2854
90	407	0	549	0	0	2947	3903
91	424 (2)	1233	570	0	0	3043	5270
92	442	1305	592	1037	936	3142	7454
93	461	1382	615	1097	998	3244	7797
94	481	1462	639	1161	1065	3350	8158
95	502	1548	656	1228	1136	3559	8630
96	526	1576	674	1299	1211	3572	8858
97	550	1604	692	1358	1278	3688	9170
98	575	1633	710	1421	1348	3809	9496
99	602	1662	729	1486	1423	3933	9835
2000	629	1692	749	1554	1502	4061	10187
01	662	1722	794	1625	1584	4193	10580
02	696	1795	842	1699	1672	4330	11034
03	732	1871	892	1790	1763	4471	11519
04	771	1951	946	1886	1860	4616	12030
05	811	2033	1003	1987	1962	4767	12563
06	853	2119	1063	2094	2069	4922	13120
07	897	2209	1127	2206	2181	5082	13702
08	944	2303	1194	2324	2301	5241	14307
09	993	2401	1266	2448	2427	4412	13947
2010	687 (2)	2501	1335	2579	2559		9661
11		2820		2718	2700		8238
12				2802	2469		5271

(1) Segment designations: 1A = Sherkeila-Balahat
1B = Barid-Sherkeila
1C = El Abbasiya-Barid
2C = Rashad-El Abbasiya
3A = Abu Gubeiha-Rashad
4D = Kadugli-Talodi

(2) First figure is opening year benefit. Next to last figure is final year benefit. Last figure is salvage value of right-of-way and structures.

3. Economic Returns of Improved Feeder Roads

Table 6B-4

CASE I: BASE ESTIMATES

(Cash flow in LS 000)

No.	Segment	Net Present Values 15%	12%	10%	IRR(%)
1A	Sherkeila-Balahat	1300	1915	854	40
1B	Barid-Sherkeila	2551	4172	1536	30
1C	El Abbasiya-Barid	1152	1915	666	27
2C	Rashad-El Abbasiya	1707	3079	894	26
3A	Abu Gubeiha-Rashad	1799	3150	995	28
4D	Kadugli-Talodi	9273	13457	6450	40
	Total	17782	27688	11395	34

Table 6B-5

CASE II: PESSIMISTIC ESTIMATES

No.	Segment	Net Present Values 15%	12%	18%	IRR(%)
1A	Sherkeila-Balahat	889	1410	554	31
1B	Barid-Sherkeila	1456	2724	683	23
1C	El Abbasiya-Barid	581	1181	209	21
2C	Rashad-El Abbasiya	798	1841	204	20
3A	Abu Gubeiha-Rashad	965	2007	368	21
4D	Kadugli-Talodi	6374	9781	4097	31
	Total	11064	18944	6115	27
	less: unallocated engineering costs	-9147	-10084	-8335	.
	Grand Total	1917	8860	2220	16

IV. Economic Returns of Improved Storage

A. Summary Table

Table 6B-6

Sensitivity Analysis

(Cash Flow in LS 000)

	CASE I			Case II		
Period	Costs	Benefits	Net Ben.	Costs	Benefit	Net Ben.
1	1021	0	-1021	1174	0	-1174
2	2837	0	-2837	3263	0	-3263
3	1903	1059	-844	2188	900	-1288
4	174	1638	1464	200	1392	1192
5	142	1638	1496	163	1392	1229
6	142	1638	1496	163	1392	1229
7	142	1638	1496	163	1392	1229
8	142	1638	1496	163	1392	1229
9	142	1638	1496	163	1392	1229
10	142	1638	1496	163	1392	1229
11	142	1638	1496	163	1392	1229
12	142	1638	1496	163	1392	1229
13	142	1638	1496	163	1392	1229
14	142	1638	1496	163	1392	1229
15	142	1638	1496	163	1392	1229
16	142	1638	1496	163	1392	1229

NPV at 15%: 2801
12%: 4663
18%: 1567
IRR (%): 25%

NPV at 15%: 908
12%: 2,359
18%: 0
IRR(%): 18%

186

V. Financial Analysis: Storage and Credit

A. Financial Analysis of Storage and Inventory Loans.

The following tables compare financial returns to farmers under the current ABS storage program and under the proposed program with improved storage and handling. Table 6B-11 shows that even with increased storage fees farmers can increase their returns per crop due to improved storage and handling (see column G in both tables).

1. Net Gains under Current ABS Storage/Loan Program

Table 6B-7

	A	B	C	D	E	F	G	H	I
	Price at Harvest (LS/bag)	Increase in Market Price (%)	Total Increase Due to Storage (LS/bag)	Total Storage Costs (LS/bag)	Storage losses (LS/bag)	Net Additional Revenue Due to storage (C-D-E)	Net Gain (%) (F/A)	Amount of loan (0.7*A)	Net Cash in flow at sale (A+F-H)
Sorghum	30.0	54	16.2	1.78	4.39	10.03	33	21.0	19.03
Sesame	72.0	19	13.7	2.80	7.59	3.31	5	50.4	24.91
Groundnuts	32.4	32	10.4	1.50	3.75	5.15	16	22.7	14.85

Note: The table is prepared based on the following data reported in Storage and Inventory Loan Component, Kordofan Rainfed Agriculture Project, Sudan, Kansas State University, August, 1984.

1. Average storage time (months): Sorghum (5), Sesame and groundnuts (4).

2. Current average storage costs per bag at ABS facilities: 10.1 piasters/month for storage; 1.0 piasters/month for insurance; 14 percent of interest on loan of 70% of harvest value.

3. Storage losses: Sorghum (9.5%), Sesame (8.75%), Groundnuts (8.75%)

4. Loans equal 70 percent of the value of crops based on harvest prices.

2. Net Gains Under New Storage/Loan Program

Table 6B-8

	A	B	C	D	E	F	G	H	I
	Price at Harvest (LS/bag)	Increase in Market Price (%)	Total Increase Due to Storage (LS/bag)	Total Storage Costs (LS/bag)	Storage losses (LS/bag)	Net Additional Revenue Due to storage (C-D-E)	Net Gain (%) (F/A)	Amount of loan (0.7*A)	Net Cash in flow at sale (A+F-H)
Sorghum	30.0	54	16.2	2.43	0.69	13.08	44	21.0	22.08
Sesame	72.0	19	13.7	3.31	1.30	9.09	13	50.4	30.69
Groundnuts	32.4	32	10.4	2.02	0.64	7.74	24	22.7	17.44

Note: The Table is prepared on the following data; reported in Storage and Inventory Loan Component, Kordofan Rainfed Agriculture Project, Sudan, Kansas State University, August, 1984.

1. Average Storage time (months): Sorghum (5), sesame and groundnuts (4).

2. Storage costs per bag: 23 piasters/month for storage; 1.0 piasters/month for insurance; 14 percent of interest on loan of 70% harvest value.

3. Storage losses: 1.5 percent for all grains (0.5% of weight loss and 1.0% of damaged kernel loss.

4. Loans equal 70% of the value of crops on harvest prices.

Detailed Cost Analysis

I. Feeder Road Component

A. Introduction

Detailed construction cost estimates used in the Wilbur Smith study are based upon unit price values and equipment and vehicle hauling operating costs developed by Norconsult for the 1980 Feeder Road Study and the Kosti-El Obeid Road, the Berger update study of the Kosti-Umm Ruwaba Road, and the 1974 Road Maintenance Program prepared by Berger. All costs were escalated to January 1985 using rates from the IBRD Third Highway Project Paper. For the purpose of this PP the January 1985 costs per kilometer were escalated to the mid-construction point, Mid 1989.

Item	Unit	Jan 1985 Unit Price (Sudanese Pounds)
1. Clearing and Grubbing	m^2	0.18
2. Embankment in Place	m^3	3.00
3. Select Mat'l. in Place	m^3	4.00
4. Excavation of Ditches	m^3	2.[illegible]
5. Pit-run Gravel Surfacing, 1 km Haul	m^3	8.00
6. Haulage	m^3/km	0.50
7. Concrete, Plain	m^3	150.00
8. Concrete, Reinforced	m^3	190.00
9. Reinforcing Steel	kg	2.40
10. Stone Masonry	m^3	65.00
11. Rip Rap	m^2	8.00
12. Rock Excavation	m^3	20.00
13. Foundation Excavation	m^3	11.50
14. CMP Culvert, 1000 mm	m	110.00

B. Estimated Construction Costs Per Kilometer

To develop construction cost estimates for each road section, the Wilbur Smith study estimated per kilometer costs for earthworks, minor drainage and gravel surfacing. Costs for box culverts, open-bottom culverts and stream fords were developed on an estimated incidence basis.

1. Earthworks

The road is designed with a gravel surface 6.0 M wide and 150 MM thick, 2:1 side slope which results in a subgrade formation width of 6.6 M built up to an average formation height of 0.50 M.

Formation volume = 0.50 M [2(6.6 M) + 4 (0.50 M)](1000 M)1/2=3880 M^3/km; an average haul distance of 10 km was assumed. Ditch excavation was estimated to be 1.44 M^3/M and clearing and grubbing for 15 M on each side of the centerline.

ESTIMATED EARTHWORKS COSTS PER KILOMETER
(Sudanese Pounds)

Item	Cost
Formation: 3,880 m^3 X LS 3.00/m^3	11,640
Side Ditches: 1,440 m^3 X LS 2.50/m^3	3,600
Overhaul: 3,880 m^3 X 10 km X LS 0.50/m^3km	19,400
Clearing & Grubbing: 30 m X 1000 m X LS 0.18/m^2	5,400
Erosion Control and Other Misc. Earthworks	2,600
Total	42,640

2. Foundation for Formation in Black Cotton Soil Areas and Gravel Surface

In areas of black cotton soil, a layer of rocky material 150 mm thick will be layed between the black cotton soil and the formation. In addition to the foundation in black cotton soil areas, the entire roadway will be surfaced with a 150 mm layer of gravel. A unit cost of LS 5 per m^3 plus 10 km haulage of LS 10 per m^3 gives an estimated cost per km of LS 13,800.

Gravel Surfacing 150 mm Thick

Volume	= 0.15 m [2(6.0 m) + 4(0.15 m)] (1000 m)1/2	= 945 m^3/km
Gravel Cost	= 945 m^3/km X LS 8.00/m^3	= LS 7,560/km
Haulage	= 945 m^3/km X (15)km X LS 0.50/m^3km	= LS 7,087/km
	TOTAL GRAVEL COST	LS 15,592/km
	USE	LS 15,600/km

3. Concrete 600 mm Pipe Culverts

From field observation it is estimated that an average of two concrete 600 mm concrete pipe culverts per km will be required with every third installation being a double pipe. The cost per single pipe culvert is LS 800 giving an average per km cost of LS 2,100 for pipe culverts.

4. Open-Bottom Masonry Abutment Culverts

All well defined water courses were noted. Depending on the runoff, they will require a single or double 4.6 m span culvert.

ESTIMATED QUANTITIES AND COSTS
TYPICAL SINGLE 4.6 M SPAN OPEN-BOTTOM CULVERT

Work Item	Unit	Quantity	Unit Price LS	Amount LS
Stone Masonry	m^3	93	65.00	6,045
Reinforced Concrete	m^3	16.5	190.00	3,135
Plain Concrete	m^3	18.2	150.00	2,730
Reinforced Steel	kg	2112	2.40	5,069
Str. Excavation	m^3	270	11.50	3,105
Railing, Back Filling, Etc.	-	-	-	2,605
				LS22,690

The cost of a double 4.6 span open-box culvert is not 2 times the cost of a single because the piers and abutments are increased by only the cost of a single pier and a three span structure is increased by the cost of two piers. The total estimated cost of a typical double and triple span is LS 37,000 and LS 51,000, respectively. Since the drainage areas of the well defined water courses have not been determined, the exact size of the structure will not be known until final design. For estimating purposes an average cost of LS 37,000 was used for each defined water course.

5. Concrete Box Culverts

Some drainage areas will be too large for a pipe culvert and too small for an open-bottom culvert. It is estimated that on the average one 2 X 1 m and one 3 X 1 m box culvert will be required every 3 km. This estimate includes those water courses where open-bottom culverts must be subtracted from the estimated number of box culverts. Using an estimated cost of LS 760 per m^2 of culvert and a culvert length of 7.0 M times the total span of box culverts, gives the estimated cost of box culverts. For example, a 60 km long road with 12 open bottom culverts would have 60 divided by 3 less 12 or 8 box culverts. The estimated cost for 1 km would be LS 760 X 7.0 X 8 (2+3)1/2 = LS 106,400).

6. Fords for Water Courses

Stream channels will be crossed by fords rather than bridges. Fords will be 4.0 m wide, with concrete cutoff walls and a concrete surface overlaying hand-placed rock and gravel between the cutoff walls, gabions on each side. Approaches will extend on a maximum grade of 1:6. Estimated cost of a ford is LS 600 per meter of length.

SUMMARY OF ESTIMATED 1985 FINANCIAL CONSTRUCTION COSTS
ROAD BETTERMENT FOR KORDOFAN RAINFED AGRICULTURE PROJECT
(Thousand Sudanese Pounds)

Road Section	Improved Length (km)	Black Cotton (km)	Earth-works	Gravel Surface	Pipe Cul.s	Box Cul.s	Open Box Cul.s	Fords	Sub-Total	Misc. +10%	Total Cost	Cost Per km
1. Kadugli-Talodi	91.6	18.3	4,165	1,334	192	920	-	297	6,908	691	7,599	82.9
2. Abu Gubeiha-Rashad	56	28	2,288	815	118	293	238	131	3,883	388	4,271	75.3
3. Rashad-El Abbasiya	60	6	2,644	874	126	-	745	163	4,552	455	5,007	83.5
4. El Abbasiya-Barid	23	23	1,307	335	48	133	179	135	2,137	214	2,351	102.2
5. Barid-Sherkeila	50	45	2,770	728	105	452	238	90	4,383	438	4,821	96.4
6. Sherkeila-Balahat	12	4	571	175	25	187	-	68	1026	103	1,129	94.0
Totals	292.6	124.3	13,745	4,261	614	1,985	1,400	884	22,889	2,289	25,178	86.0
Percent of Totals	100	42	55	17	2	8	6	4	91	9	100	-

192 198

C. Estimated Total Construction Cost of Phase I

1. 1985 Costs

As stated previously, the Wilbur Smith study started with basic unit costs, escalated to 1985. From observations of the route that the roads will follow and from the existing detailed design of the Kadugli-Talodi route, they estimated the volume of the earthwork and gravel that would be needed, the haulage distance and the number of pipe, open-bottom and box culverts that would be needed in addition to fords for defined water courses. By multiplying the distance times the incident of each of the factors they arrived at a total cost for each section of the road and an average for all sections of LS 86,000 in 1985 prices for a total construction cost of LS 25,163,600 for 292.6 km (see summary table, previous page).

Following the above described methodology for costing the road, Wilbur Smith rationalized that since earthworks and gravel surface combined account for 72 percent of the estimated construction cost and that their estimated quantities for earthwork are accurate within a range of ± 15 percent and gravel surfacing ± 5 percent. A combined error of 25 percent in the cost estimate for the remaining work items would result in an error of approximately 7 percent in the overall estimate. WSA considered their estimate to be within the range of plus or minus 5 percent of actual overall costs. Based on their confidence intervals, however, we believe 16 percent is correct.

To ensure that for the purpose of the project paper the cost estimates are conservative, it was decided to increase the Wilbur Smith 1985 average cost per kilometer by 15 percent as contingency cost.

86,000 X 1.15 X 292.6 km = LS 28,938,140 or LS 29.0 million

Wilbur Smith also estimated the quantities of fuel that would be needed to construct the road: 2,090,000 imperial gallons of diesel fuel and 209,000 of gasoline. At a cost of $1.10 for diesel and $1.50 for gasoline, the total fuel cost is $2,612,500 in 1985 prices. Since the cost of fuel is included in the unit cost, and foreign exchange is escalated at 7% per year and local currency at 18% a year, the cost of fuel is removed from the total construction cost and escalated separately.

Total 1985 construction cost including fuel cost =	LS 28,938,140
Fuel cost $2,612,500 -	LS 5,486,250*
Construction local currency cost	LS 23,451,890

2. Costs Escalated to Mid-Construction Period: Mid 1989

			Use
LS 23,451,891 at 18% per/yr	=	LS 49,560,120	LS 50 million
$2,612,500 at 7% per/yr	=	$ 3,544,310	$3.5 million

---

* Exchange rate of $1.00 = LS 2.10 which was used for the WSA study.

D. U.S. Engineering and Construction Services Cost

All technical assistance is budgeted for the full design and construction period. However, the A&E contract for expatriate assistance will be for a four year period on the assumption that the Sudanese A&E and construction firm will be able to carry on without expatriate assistance. An evaluation will be made in 1989 to determine if additional expatriate assistance is required. If not, the total person months of assistance required under the project would be reduced by 60.

1. Engineering Assistance

The engineering assistance will consist of a team leader/resident engineer and an assistant resident engineer. The team leader/resident engineer will be required for a period of 73 person months, and the assistant resident engineer for a period 42 person months for a total of 115 person months. To estimate the engineering services cost, a basic monthly average salary of $4000 is used and a family status of two children.

a. Field Services

Basic salary	$ 4,000 month
Post differential	1,000 month
Fee (15%)	750 month
Overhead (150%)	7,500 month
	$ 13,250 month
Education allowance	20,000
Travel 4 X 2 X 3000	12,000
Shipment HH goods	5,500
Storage, consumables, unaccomp. baggage	8,000
	51,500
Total	$211,000 per year per person

194 201

Escalated at 7% per year	'85	'86	'87	'88	'89	'90	'91
Team leader/Resident Eng.	211	226	242	258	277	300	317
Assist. Resident Engineer	....	....	242	258	277	300	...
Totals (ooo's)	$211	226	484	516	554	600	317
Accumulation	$	437	921	1437	1991	2591	2908

b. Home office Support

Salary - 3 pm per year @ $12,000 for 6 years	$216,000
Overhead 150%	324,000
Travel 8 round trips	24,000
Misc.	25,000
	$589,000

c. Total Cost Engineering Services (000's)

Field Services	,908
Home Office	589
Contingencies (15%)	425
	$3,922
USE	$3,900

2. Design Services

The design services consist of a highway engineer for 18 pm, a soils engineer and drainage engineer for 9 pm each for a total of 36 person months. All design services will be on a short-term basis.

Salary @ $12,000 for 36 pm	$ 432,000
Overhead 150%	648,000
Travel - 8 round trips	24,000
Misc.	25,000
	$1,129,000
USE	1,130,000

3. Construction Services

The construction services consist of one construction engineer/superintendent for each of the construction segments or for each two contracts for a total person months of 90 person months. An average basic salary of $3300 per month is used and a family status of children.

a. Field Services

Basic Salary	$ 3,300 month
Post Differential	825 month
Fee (15%)	619 month
Overhead (110%)	4,538 month
	$ 9,282 month

Allowances (same as in 1.A. above)
51,500

$163,000 per year per person

Escalated at 7% per year	'85	'86	'87	'88	'89	'90	'91
#1		175	187	200	214	229	245
#2	...	...	187	200	214	...	
Totals (ooo's)	$	175	374	400	428	229	245
Accumulation	$	175	549	949	1377	1606	1851

b. Home Office Support

Salary 2 person months per year @ $12,000 for 5 years	$120,000
Overhead (110%)	132,000
Fee (15%)	18,000
Travel - 5 round trips	15,000
Misc.	25,000
	$310,000

c. Total Cost Construction Services (000's)

Field Services	1,851
Home Office	310
Contingencies (15%)	324
	$ 2,485
USE	$ 2,500

4. Totals for Engineering & Construction Services (000's)

		FX	LS*
A.	Engineering Services	3,900	1,463
B.	Design Services	1,130	424
C.	Construction Services	2,500	938
D.	Field Office/Quarters $30,000 X 4	120	45
		$7,650 **	$2,870

E. Cost Analysis of Sudanese Engineering Services Cost

		PM	LS Cost Per/PM	Total (000's)	Logistics
1.	Design Services				
	Highway Engineer	24	4000	96	
	Location Engineer	24	3000	72	
	Drainage Engineer	24	3000	72	
	Soils Engineer	24	2500	60	
	Surveyors (2)	48	2000	96	
	Equipment & Logistics	-	-	-	700
		Subtotal		LS 396	700
2.	Construction Services				
	Senior Engineer	105	4500	473	
	Engineers	180	3000	540	
	Materials/Lab Engr.	180	3000	540	
	Chief Insp.	180	2000	360	
	Inspectors	360	1500	540	
	Surveyors (2)	360	2000	720	
	Senior Clerks	120	2000	720	
	Clerks	240	1500	360	
	Typists	96	1000	96	
	Equipment and Logistics	-	-	-	5,000
		Subtotal		4,349	4,000
3.	Overall Subtotals			4,745	4,700
4.	Contingencies 15%			712	70
5.	Overhead & Fees (50% of Salaries)			2,373	
6.	Total			LS 7,830	4,770

* Local currency cost estimated at 15% of dollar cost.

** If the expatriate TA services are limited to 4 years, the total cost is reduced by approximately $2 million.

F. Total Costs Feeder Road Component (000's)

	Item	LS	FX
1.	Design		
	Expatriate TA	424	1,130
	Sudanese TA*	653	-
	Incountry Logistics	700	-
	Subtotal	1,777	1,130
2.	Construction Supervision		
	Expatriate TA	1,463	3,900
	Sudanese TA*	7,176	-
	Incountry Logistics	4,000	-
	Field Office/Quarters	45	120
	Subtotal	12,684	4,020
3.	Construction Assistance		
	Expatriate TA	938	2,500
4.	Construction Cost	50,000	3,500
5.	Maintenance Study	-	75
6.	Routine Maintenance	1,220	-
7.	Project Vehicles (12)	-	240
	Total	LS 66,619	$11,465
	USE	LS67,000	$11,500

* Including salaries, 15% contingency, overhead and fees.

198 205

II. Storage Component Cost

A. Estimated Imported Materials and Cost

Each warehouse is designed for 1600 m^2 of floor area. The following estimate is based on the use of I-section steel stanchins, portal rafters, gable posts, galvanized iron roof, galvanized side-wall sheets, steel doors, Z-section steel purlins and rails. Estimated tonnage of the imported material is given below:

1.	A maximum of 22 I-section steel stanchions with approximate dimensions 305 mm X 165 mm X 40 mm, 1.5 tons each	33 tons
2.	A maximum of 22 I-section steel portal rafters with approximate dimensions 203 mm X 133 mm X 30 mm, 1.2 tons each	27 tons
3.	A maximum of 6 I-section steel cable posts with approximate dimensions 254 mm X 146 mm X 31 mm, 1.0 ton each	6 tons
4.	Galvanized iron roof (corrugated)	15 tons
5.	Galvanized side-wall sheets (corrugated)	8 tons
6.	Z-section steel purlins and rails	3 tons
7.	A maximum of 12 sliding doors and fittings, 500 lb each	3 tons
8.	Miscellaneous parts, fittings, nuts, bolts, washers, braces, brackets	2 tons
	Total	97 tons

Approximately 100 tons of imported material will be required for each warehouse. It should be realized, however, that the actual tonnage of materials will depend on the detailed structural and civil engineering design. In any case, the above estimate is expected to be close to the actual requirement.

According to the ABS engineer, the imported steel requirement will be approximately $70 per m^2 of floor area, or $112,000. However, this estimate is based on the lowest recent bid received by the ABS. For budget purposes, the estimated C&F Port Sudan price of these imported materials is $150,000.

B. Estimated Local Currency Cost

The actual cost figures will depend on the final design and engineering. This estimate is prepared on the basis of construction experience of the ABS.

Item	Unit	Quantity	Price per Unit (LS)	Total Cost (LS)
Excavation for foundation	m^3	180	13	2,340
Excavation for external platform	m^3	100	13	1,300
Hard-core filling under floors and platform	m^3	1,700	32	54,400
Sand filling under floors and platform	m^3	300	16	4,800
Lean concrete under foundation	m^3	10	230	2,300
Lean concrete under grade beam	m^3	15	230	3,450
Lean concrete foundation to platform wall	m^3	45	230	10,350
Reinforced concrete without steel in foundation	m^3	40	300	12,000
Reinforced concrete without steel in short columns	m^3	72	350	25,200
Reinforced concrete without steel to grade beams	m^3	80	350	28,000
Brickwork in cement mortar to floor level	m^3	675	40	27,000
Cement plastering	m^3	675	12	8,700
Brickwork retaining wall to platform	m^3	325	40	13,000
Plain concrete in floors, platform and ramps	m^3	425	250	106,250
Plain concrete final surface of storage area slab	m^3	60	250	15,000
Holes in columns for holding down bolts	m^3	92	5	460
Cement grouting to hold down bolts	m^3	92	5	460
Joint sealer between wall and floors	m^3	200	5	1,000
		Total		315,410
M.S. bars in column	kg	3,400	1.8	6,120
M.S. bars in short column	kg	3,400	1.8	6,120
M.S. bars in grade beams	kg	6,750	1.8	12,150
Materials for 5 X 5 X 3 m office	job	-	-	19,000
Materials for construction for security post 3 X 3 m	job	-	-	2,500
Materials and construction for latrines and showers (possible sites)	job	-	-	12,000

Materials and erection of fencing	m	360	45	16,200
Materials and fixing of steel gate	no	1	2,500	2,500
Transport and erection of steel structures	job	-	-	50,000
Painting steel structures	job	-	-	2,500
Lighting fixtures inside warehouse	no	40	100	4,000
Electrical outlets	no	10	50	500
Power distribution panel	no	1	500	500
Weatherproof external light	no	15	100	1,500
Lighting fixtures in office and lavatory	job	-	-	300
Ceiling fan in office	no	1	200	200
Customs duty on import				
			Total	451,500

C. Private Sector Pilot Project: Grain Cleaners

Each of the three storage facilities will have a grain cleaner included in equipment. These grain cleanders are to be imported from the U.S. The specifications are given below.

All metal seed and grain cleaner (scalping and cleaning grain).
Capacity: Not less than 200 bu/hr of sorghum.
Charging hopper about 2 bu capacity and elevator required.
3 sets of two screens (one top and one bottom) for sorghum.
3 sets of two screens (one top and one bottom for sesame.
Elevator-bagger complete with power attachment and two-way bag holder.
Complete with 1 HP motor single phase 220V 50 cycle motor. Motor must withstand ambient temperature of up to 120° F.
Caster mounting.
Spare Parts: 1 motor belt, brush, and bearings used in the cleaner.
Each cleaner unit costs $12,000. The total cost for three cleanders is $36,000.

D. Summary of Warehouse Construction Cost

	$ (000's)	LS
1. 3,000 MT Warehouse (6)	900	2,709
2. 6,000 MT Warehouse (1)	300	903
3. Grain Cleaners (3)	36	25
4. Maintenance Materials	10	-
5. Subtotal	$1,200	LS3,637
Contingency 20%	240	728
Total	1,440	4,365
USE:	$1,450	LS4,400

E. Estimated Sudanese Technical Assistance Cost

1. Design and Supervision of Construction

		$	(000's)	LS
(a)	Design (5% of D.S.)			300
(b)	Supervision of Construction (2-1/2% D.S.			150
2.	Estimated Expatriate Technical Assistance Cost			
(a)	8 PM Construction assistance			
	Salary at 12,000	96		
	8 round trips	27		
	In-country logistics			100
(b)	3 PM Design			
	Salary at 12,000	36		
	3 round trips	10		
	In-country logistics			50
(c)	2 PM Agriculture Economist			
	Salary at 12,000	24		-
	1 round trip	3		-
	In-country logistics	-		30
(d)	8 PM training			
	Salary at 12,000	96		
	5 round trips	17		
	Training Mat. + 2 PM In U.S.	34		
	In-country logistics			00
(e)	2 PM Pilot Project			
	Salary at 12,000	24		
	4 round trips	14		
	Commercial Support Fund	200		-
	In-country logistics			25
	Totals	581		55
	Contingency 20%	116		51
		$696		906

F. Total Storage Cost - 1985

		$	(000's)	LS
(a)	Construction Costs	1,450		4,400
(b)	Technical Assistance Costs	696		906
		2,146		5,306

G. 1985 Cost Escalated to September 1987 (Mid-Construction point)

FX $2,146 at 7% = $2,586 USE 2,600

LS 5,300 at 18% = LS 8,265 USE 8,300

III. Credit Component Estimated Cost

A. Technical Assistance	$	LS
1. Short Term		
a. Financial Advisor (6 PM)		
Salary* ($4,800/mo x 6)	28,800	
Per diem ($168 x 180 days)	30,240	
1 round trip	3,000	
In-country logistics	-	60,000
b. Coop Advisors (6 PM)		
Salary* ($4,800/ x 6)	28,800	
Per diem ($168 x 180 days)	30,240	
1 round trip	3,000	
In-country logistics	-	60,000
c. Other Consultancies (6 PM)		
Salary* ($4,800/mo x 6)	28,800	
Per diem ($168 x 180 days)	30,240	
6 round trips	18,000	
In-country logistics	-	60,000
d. Sub total (1-3)	201,120	180,000
Contingency 20%	40,225	36,000
	241,345	216,000
USE	$240,000	LS215,000

2. Long Term Advisors (Three dependents)		
a. El Obeid/Dilling (36 PM)		
Salary at $40,000	120,000	-
Differential (25%) + (5%)	36,000	-
Overhead (40%)	63,000	-
Travel (3 round trips x 3 depend.)	36,000	-
Shipment and Storage	30,000	-
Education allowance 2 @ 12,500	75,000	-
In-country Expenses - 15%		135.000
Subtotal	$360,000	LS 135.000

* Short-term salaries include all benefits, applicable differentials and overhead.

b.	Abu Gubeiha (24 PM)		
	Salary at $40,000	80,000	-
	Differential (25%)+ (5%)	24,000	-
	Overhead (40%)	42,000	-
	Travel (2 round trips x 3 depend.)	24,000	-
	Ship't and storage	30,000	-
	Education Allowance	50,000	-
	In-Country Expenses-	-	94,000
	Subtotal	$250,000	LS94,000
c.	Talodi (36 PM)		
	Salary at $40,000	120,000	45
	Differential (25%) + (5%)	36,000	-
	Overhead(40%)	63,000	-
	Travel (3 round trips x 3 depend.)	36,000	-
	Ship't and storage	30,000	-
	Education allowance	75,000	-
	In-Country Expenses		135,000
	Subtotal	$360,000	LS135,000
d.	Subtotal (1-3)	$970,000	LS364,000
	Contingency 20%	194,000	73,000
	Total long-term	1,164,000	437,000
	USE	$1,200,000	LS480,000

3. 1985 Total Estimated Credit Assistance Cost

a.	Short term Advisors	240,000	215,000
b.	Long term advisors	1,200,000	450,000
c.	Vehicles (3)	60,000	10,000
		$1,500,000	LS675,000

4. Estimated 1985 Cost Escalated to Mid-Point of Assignment

a.	Financial Advisor (Jan-June '86)	66,700	75,000
b.	Coop Advisor (Jan-June '86)	66,700	75,000
c.	Other Consultancies (Jan '87 - Jan '89)	92,400	105,800
d.	El Obeid Advisor (July '86-July'89)	432,000	237,000
e.	Abu Gubeiha Advisor (Jan'88-Jan'90)	322,000	164,000
f.	Talodi Advisor (Jan'88-Jan'91)	481,000	234,000
g.	Vehicles	60,000	10,000
	Contingency	200,000	-
	Total	$1,720,000	LS900,000

B. Capital Requirements

Total capital requirements are based on the feasible storage volumes for the El Obeid, Abu Gubeiha and Talodi facilities estimated by Kansas State University. KSU valued stored commodities at LS 46/sack sorghum, LS 87/sack sesame and LS 43/sack groundnuts. All prices for rainfed crops are extremely volatile due to drought conditions, so we have added a 25 percent factor to the value of stored crop volume. The total loan fund equals 70 percent of the value of stored crops. Based on INTSORMIL's farm research in north Kordofan, we have divided the loan fund between 30 percent for production loans and 40 percent for inventory loans. The production loans will finance approximately half of total inputs. Lastly a 10 percent contingency is added to cover defaults due to drought. Each year's capital requirement is considered an illustrative planning figure. It should be reviewed and revised annually to compensate for price variations, changes in production techniques, yield improvements, and other factors that could affect farmer revenue.

	Year (LS 000)						
	86	87	88	89	90	91	92
1. El Obeid							
a. Production Loans	120	142	165	198	232	276	324
b. Inventory Loans	159	188	221	263	308	367	432
c. Subtotal	279	330	387	461	540	643	756
2. Abu Gubeiha							
a. Production Loans	-	-	102	183	269	361	464
b. Inventory Loans	-	-	135	244	357	480	615
c. Subtotal	-	-	237	427	626	841	1,078
3. Talodi							
a. Production Loans	-	-	102	183	269	361	464
b. Inventory Loans	-	-	135	244	357	480	618
c. Subtotal	-	-	237	427	626	841	1,082
4. Total Production Loans	120	142	369	564	770	998	1,252
5. Total Inventory Loans	159	188	491	751	1,022	1,327	1,665
6. Subtotal Loan Fund	279	330	860	1,315	1,792	2,325	2,912
7. 10% Drought Factor	28	33	86	131	179	233	292
8. Total Loan Fund (Annual)	307	363	946	1,446	1,971	2,558	3,209
9. Incremental Requirements	307	56	583	501	525	587	651

C. Total Credit Component Estimated Cost

	$	(000's)	LS
1. Technical Assistance	1,720		900
2. Capital Requirements	-		3,209
Total	$1,720		LS4,109
USE	$1,720		LS4,100

IV. Total KORAG Project Cost

	$	(000's)	LS
A. Feeder Road Component	11,500		67,000
B. Storage Component	2,200		8,300
C. Credit Component	1,720		4,100
D. Participant Training	260		-
E. Project Management	420		400
F. Audit and Evaluations	100		100
Total	16,600		LS79,900
In $'s	$16,600	LS in $ 31,960	
USE	$16,600	LS in $ 32,000	

Social Soundness Analysis

This social analysis is based on extensive field reconnaissance done by the Sudanese Consultations Bureau and summarized in their February 1985 report, "Private Sector Review of Western Sudan." The intent of the analysis is to identify the major social conditions, economic activities and organizational units in southern Kordofan. Of the three project components, feeder roads will have the most extensive impact throughout the region. The socio-economic background presented in this analysis is indicative of potential beneficiaries from the roads' areas of influence, including principal crops and economic activities likely to be affected. A specific discussion of social changes that may be stimulated by the project is provided in the Social Analysis, Section VI-C in the text.

1. General Features

Kordofan Region in western Sudan has a land area of 383,607 square kilometers. It accounts for 16% of the total area of the country and its population, according to the 1983 Census, was 3,240,070 which is about 15% of Sudan's total population. 44% of the total population of the region lives in the southern part. Population by districts and rural councils in the road areas of influence in southern Kordofan are shown below.

District	Town and Rural Councils	Population
Rashad	(District Head)	444,818
	Abbasiya Rural	71,189
	Abbasiya Town	8,118
	Rashad Rural	68,753
	Rashad Town	3,832
	Abu Gubeiha Rural	43,154
	Abu Gubeiha Town	14,491
	Abu Kershola Town	6,974
	Talodi Rural	191,096
	Talodi Town	8,770
Kadugli	(District Head)	330,965
	Heiban Rural	82,696
	Buram Rural	84,059
	Umm Durin Rural	62,600
	Kadugli Rural	55,912
	Kadugli Town	45,698
Dilling	(District head)	222,877
	Dilling Town	24,681
	Salara Rural	59,825
	Kurgul Rural	29,272
	Delami Rural	23,126
	Habila Rural	40,573
	Hamadi Rural	15,861
	Dubeibat Rural	29,519

The Region can be divided into four broad climatic zones comprising desert, semi-desert, low savannah rainfall and high savannah rainfall. These four climatic zones dictate the prevalent pressure, temperature and rainfall and hence the vegetation and land use types. Rainfall is by far the most important factor with an average ranging from 100mm in the desert areas in the north to 800mm in the high savannah rainfall to the south. Thus, the 400mm isohyte runs approximately in the middle of the region. In very generalized terms, soil type can be divided into sandy in the north and heavy clays in the southern part. The local people usually categorize soil into "qoz", "gardud" and "teen". With its relatively superior soil type and abundant rainfall, southern Kordofan stands as a potentially rich but greatly underutilized region in many areas of production.

2. Agricultural Production

Kordofan Region in general and the southern parts in particular are potentially quite wealthy in at least four areas of agricultural production: grain and oilseed production, horticultural production, livestock production and forestry. Main crops produced are sorghum, millet, groundnuts, sesame, cotton and karkadeh. Table 1 on the following page shows the region's relative importance to the national economy of some key products. The southern part of the region possesses a significant comparative advantage in the production of many of these products. Tables 2A and 2B show average annual production of four crops for nothern and southern Kordofan consecutively. As can be readily seen, the southern region is characterized by higher productivity for all crops indicated. The productivity of dura in particular is more than double that of northern Kordofan, a fact, under the present drought conditions, that requires more than a passing emphasis.

Despite existing potential, increased production is constrained by the prevalence of traditional and outmoded methods and techniques of production. The use of inferior inputs and primitive tools which require laborious human effort hardly allows for high yields. Except for the mechanized sector in Habila, Al Baida and Um Lobia areas, the majority of the land is still under the traditional sector, with well over two million small farmers engaged in production. Small plots of land are the dominant feature and the family still forms the main source of agricultural labor. Of the total area of 31,049,480 feddans of Southern Kordofan, 17,760,540 feddans are high potential land suitable for mechanized rainfed agriculture of which just over one million feddans are actually being put to mechanized farming. 7,047,180 feddans are categorized as moderate to low potential lands that can be put to mechanized farming but are more suitable for traditional farming, forestry and pastures. The remaining 6,311,760 feddans are generally regarded as uncultivable.

Of the individuals in mechanized farming, retired army officers, high-ranking officials and civil servants, merchants and school teachers are the dominant owners of the schemes. Cooperatives (mainly agricultural production cooperatives) have recently started to play a more important role both in mechanized and traditional sub-sectors, while farmers unions and producer associations figure less prominently. Nonetheless, farmer unions were found to support some limited activities of agricultural extension, distribution of improved seeds and the arrangement of agricultural guidance. However, because of their perceived political nature, they have not gained the confidence of the farmers.