



# EXECUTIVE SUMMARY

## ■ INTRODUCTION

The principle objective of this Feasibility Study Report is to provide the background of the requirements including technical, financial and socio-economical analysis for the Angola Agriculture Modernization Project (hereinafter called as the “Project”), which shall be promoted and executed by the Ministry of Agriculture (hereinafter called as “MINAGRI”) in order to establish the irrigation system to the cotton field of 3,200ha in Kwanza Sul Province in Republic of Angola.

This Project is planned to be implemented in two steps. First step of the project (hereinafter called as “Phase I Work”) is to build an irrigation infrastructure system. Second step of the project (hereinafter called as “Phase II Work”) consists of farming infrastructure improvement and farming support program. Phase I Work is currently progressing well due to support from the EDCF loan, but due to lack of Angolan government's financial fund, progress has been held up for Phase II Work.

The reasons for the lack of funds is due to budget being allocated to other projects such as custom tax & other expense, electricity substation work and additional work of farm road. The Angola government has experienced financial strain because the oil price, Angola's main source of income, dropped dramatically in the end of 2008.

Thus this F/S report will analyze the requirements for Phase II work including its financial aids and it will complement the current work scope by supplying new works items including background items for each Phase II work in order to increase cotton productivity and satisfy the original project goal.





## ■ CURRENT SITUATION OF PHASE I

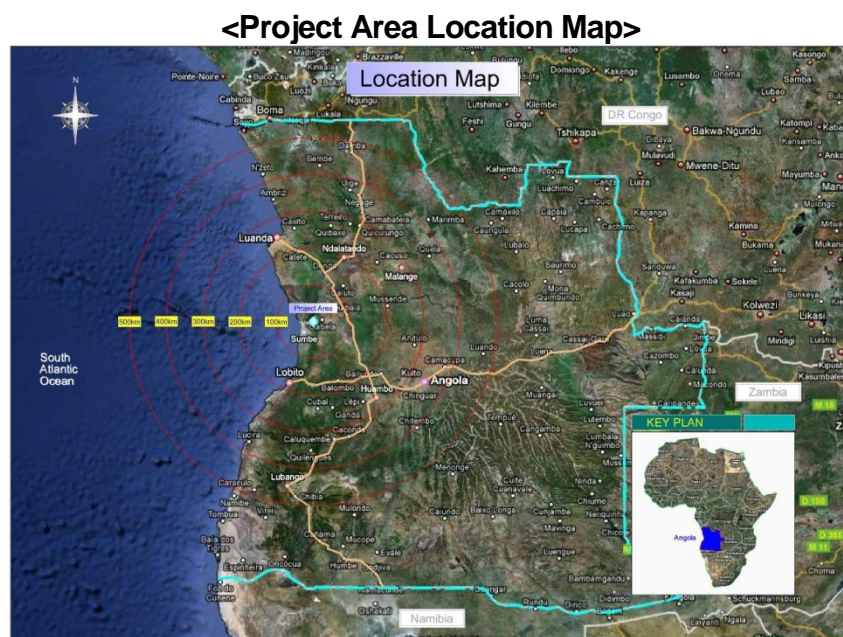
### 1) Background and object

Angola government has a high interest in the construction of modern irrigation system to supply water to farms for the modernization of Angola agriculture.

Their goals are not only to construct irrigation system for supplying adequate quantity of water to cotton fields in a timely fashion, but also to train agriculture specialist and farmers for proper operation, maintenance, and management of the irrigation system and farming cotton fields with modernized agriculture technology.

### 2) Project Area

This project area is located next to Sumbe city, Kwanza sul province, in the Republic of Angola and 325km south of Angola's capital Luanda and about 20km north-east of Sumbe city. Total project area is 5,000ha. The Irrigation area for cotton cultivation will be 3,200ha and exclude mountain, steep area, and road.





### 3) Main Schemes

Procedure	Details
1. Pump Stations	600mmx1,050kwx4, 400,350mmx650, 375kwx2
2. Reservoirs	1st - 29,000 m <sup>3</sup> , 2nd- 10,310 m <sup>3</sup> , 3rd- 15,360 m <sup>3</sup>
3. Conveyance Pipeline	L= 18.6 km, Steel Pipe & Ductile Iron Pipe
4. Distribution Pipe Line	L=105.9 km, D=500mm~700mm
5. Road	L=66. 5km - Main : L=11 km W=6m - Subsidiary: L=55 km W=5m
6. Hydrants	320 hydrants(1 Hydrant/10 ha)

### 4) Current Situation

Procedure	Situation
1. Construction Progress	90.8% completed at the end of July in 2009
2. Design	In the MINAGRI meeting held on March, 2009 The detail design was determined
3. Manpower	63 people consisting of Korean and Chinese
4. Procurement	Pipes and pump sets, principal materials arrived at project site at the end of July in 2009
5. Test	To guarantee the quality of the project, material tests are performed by official research laboratory in Korea before shipping and many kinds of inspections are conducted during construction
6. Project Amount	Up to now project Budget paid total 27,629,318.66USD. This budget included advance payment 30% and maintenance 5% retention money is excluded total paid budget is 27,247,969.75USD (84% of Total amount)





## ■ CURRENT ISSUES

### 1) Additional Hydrants and Pipelines

As per contract the hydrant was designed based on a hydrant per 50ha. But, hydrants per 50ha were not enough to full-fill the requirement for providing water to every cotton field. Hydrants per 10 ha are necessary to provide full water coverage.

### 2) Tax and Custom expense exceeded

As per contract Employer should cover all tax required in Angola. However, local fund of this project was used for tax, and total tax amounted to 4,266,000USD. This amount was more than the estimated budget.

### 3) Additional substation installation

As per contract generator should be installed for power supply. But it was discovered that the generator would consume too much oil. Therefore, both parties agreed that national electricity will be supplied to the pump station. Preparation of the electricity line and substation will be responsible by the Angola government. The cost is estimated around 6,000,000 USD.

## ■ FARMING INFRASTRUCTURE IMPROVEMENT (PHASE II -1)

### 1) Summary

Large parts of the irrigation area are uncultivated with trees and grass. Even when Phase I work, irrigation infrastructure improvement, is complete, start of farming is difficult without farming infrastructure improvement such as drainage improvement, farmland preparation, and irrigation channel. Thus, Phase II work is required.





## **2) Improvement of drainage**

As project district is not equipped with drainage system yet, it is impossible for maintenance of irrigation area and farm road from heavy rain. So, an overall drainage system is required. The improvement of drainage system consists of improvement of the drainage channel, temporary water storage pond, and drainage culvert to pass water under the road.

## **3) Farmland Preparation**

Out of the total irrigation area, 1,701ha is uncultivated under natural conditions, which is equivalent to 55% of the total irrigation area. Farmland preparation is to remove trees and bush, and to make the uneven ground smooth level for flood irrigation.

## **4) Installation of Irrigation Channel**

After completion of the works, farmland is planned to be distributed to every farmer with a scale of 1~2ha. It is necessary to make the irrigation system to provide water to every farmer's land. Considering the uneven ground and sand soil condition, pipeline system is rather than an open channel to maximize the efficiency of irrigation.

## **5) Installation of additional Hydrants and Pipelines**

It is necessary to install additional Hydrants from 64ea (1ea/50ha) to 320ea (1ea/10ha) and additional pipelines of 31.4km.

## **6) Installation of the Electricity Substation**

The Electricity Transformer Sub-station is going to be installed near the pump station No.1 to supply electricity to both pump station No1 and No2.



## **7) Design & Engineering and Consulting Service**

First of all, fast and accurate measurement and design work should be conducted for earlier implementation of Phase II work. Construction supervision and consulting services are required during construction.

## **■ FARMING SUPPORT PROGRAM (PHASE II-2)**

### **1) Summary**

After completion of farming infrastructure improvement works, Phase II-1, It is necessary to prepare farmer & farming support program for successful settlement of the project and to increase productivity.

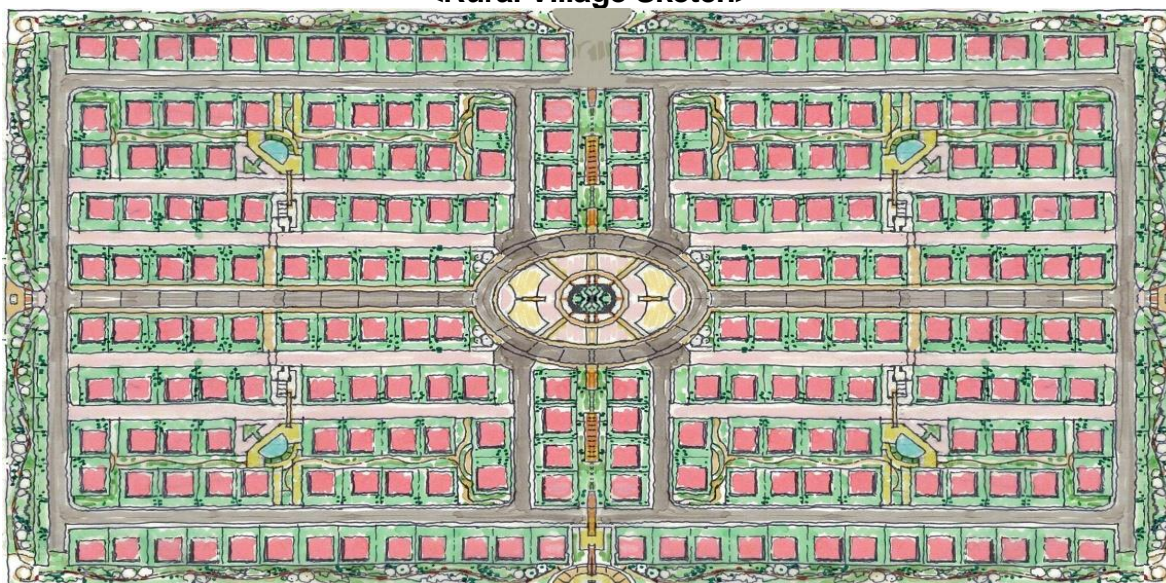
### **2) Rural Village**

In time of full-scale farming, more than 1,000 farmers should be engaged in farming. Currently there are 6 villages near project area and a total of 328 houses. Due to lack of enough labor in the project area, an influx of farmers can be expected. In preparation for the influx of these additional farmers, it is necessary to build a new rural village infrastructure such as residential development, roads, electricity, and water-based facilities.





&lt;Rural Village Sketch&gt;



### 3) PMU Office Building

For the maintenance of irrigation system and the support of farmers, it is necessary to install project management unit office and residential facilities.

### 4) Warehouse for Agriculture Production

It is necessary to build ware house for agriculture production to control good price and quality by selling the harvest at a proper time.

### 5) Farmer Training Center

To transfer agriculture technique and execute a program to promote the agriculture industry, a Farmer Training Center needs to be set up. The anticipated participants are about 1,000 farmers. The scale of the center is designed to accommodate 25people at a time.

### 6) Maintenance Building

For supporting and maintaining the cotton project, it is necessary to build an agriculture machinery maintenance center.





## ■ COST AND FINANCIAL INFORMATION

The estimated budget for Phase II Work is 30,756,000USD. Out of this amount EDCF loan is 18,500,000USD (60.15%) and Angolan Local budget is 12,256,000USD (39.85%).

### 1) Cost for Phase II Works

Procedure	Q'TY	Amount (USD)		
		SUM (100%)	EDCF (60.15%)	LOCAL (39.85%)
<b>A. Farming Infrastructure</b>		<b>22,838,000</b>	<b>15,179,000</b>	<b>7,659,000</b>
1. Drainage Improvement	22km	2,793,000	2,793,000	-
2. Farmland Preparation	1,701ha	1,674,000	-	1,674,000
3. Irrigation Facilities	196km	4,895,000	4,895,000	-
4. Additional Hydrants, Pipeline	256ea	4,491,000	4,491,000	-
5. Electricity Substation	6.6KV	5,985,000	-	5,985,000
6. Design & Engineering	5mon.	500,000	500,000	
7. Consulting Service	29mon.	2,500,000	2,500,000	-
<b>B. Farming Support Program</b>		<b>6,442,000</b>	<b>2,446,000</b>	<b>3,996,000</b>
1. Rural Village	1Village	1,624,000	497,000	1,127,000
2. Offices Site	-	4,818,000	1,949,000	2,869,000
2-1. Infrastructure	-	642,000	642,000	-
2-2. Architecture	1ea	4,176,000	1,307,000	2,869,000
1) PMU Office	1ea	1,307,000	1,307,000	-
2) Ware House	1ea	1,045,000	-	1,045,000
3) Training Center	1ea	1,344,000	-	1,344,000
4) Maintenance Building	1ea	480,000	-	480,000
<b>Sub Total(A+B)</b>		<b>29,280,000</b>	<b>17,625,000</b>	<b>11,655,000</b>
<b>C. Contingency</b>		<b>1,458,000</b>	<b>875,000</b>	<b>583,000</b>
<b>D. Financing Cost</b>		<b>18,000</b>	<b>-</b>	<b>18,000</b>
<b>Total</b>		<b>30,756,000</b>	<b>18,500,000</b>	<b>12,256,000</b>





## 2) EDCF Loan Supply Conditions

- Foreign Exchange: US dollar
- Maturity: 40 years including 15 years of grace period
- Interest: 0.01% per annum
- EDCF Loan Ratio: 60.15% of total project cost
- Loan Service Charge: 0.1% of loan amount procured

## ■ ECONOMIC ANALYSIS

This analysis is to determine the Financial Net Present Value (FNPV), Financial Internal Rate of Return (FIRR), Profitability-Index (P/I), Economic Net Present Value (ENPV), Economic Rate of Return (EIRR), Benefits/Cost Ratio (B/C).

The ENPV has a plus value at US\$ 105,745,420, B/C Ratio 1.32 is higher than 1.0 and the EIRR value, 10.8% is also much higher than the WACC 3.39%. Therefore the proposed project is economically viable.

### <Summary of Economic Analysis Results>

(Unit: USD)

Particulars	Amount	Remarks
<b>1. Cost</b>	<b>691,135,372</b>	
- Construction Cost	65,212,775	
- Operational Cost	625,922,597	
PV of Cost	325,878,589	
<b>2. Benefit</b>	<b>991,469,280</b>	
PV of Benefit	431,624,009	
<b>3. Net Benefits(2-1)</b>	<b>300,333,908</b>	
<b>4. ENPV</b>	<b>105,745,420</b>	
<b>5. EIRR</b>	<b>10.8%</b>	
<b>6. B/C Ratio</b>	<b>1.32</b>	





## ■ PROJECT IMPACT

The Project is expected to be a cornerstone of future agriculture development in Angola. Although mining, including oil and diamonds, constitutes the largest share of GDP, agriculture is still a significant sector of the Angolan economy, representing approximately 20 percent of GDP.

### 1) Why cotton?

Cotton is expecting new investments in relation with textile industry that currently is entirely dependent on imports. The first goal is to restart cotton cultivation to substitute imports and to boost the dormant textile industry and increase employments. After achieving the first goal, Angola also can provide surplus cotton to its neighboring countries.

### 2) Economic Impact

Through this project, Angola aims to settle down displaced people of urban areas into country and make them to cultivate commercial crops and self-feed crops without governmental subsidy.

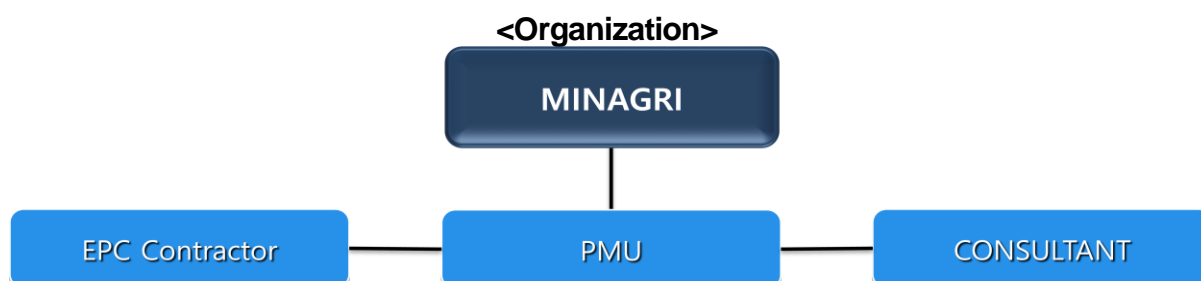
It is guaranteed to supply enough and superior electric power to the pump which carry the water from the river to the storage.

The water supply system including pump operation should lead to the success of the irrigation project and increase the productivity based on the water supply rate.



## ■ PROJECT IMPLEMENTATION PROGRAM

### 1) Organization



### 2) Project Implementation Method

MINAGRI is considering this project as a good model for irrigation system in ANGOLA. This project's case will be the foundation of national irrigation system project. For this purpose, MINAGRI is enabling its entire organization to support this Project. The PMU was organized in the construction site to sustain close cooperation between the consultant and contractor.

Once the results of the study for the clustered textile industry that will be conducted in the end of 2009 become available, the farming support program can be adjusted.

### 3) Project Implementation Schedule

Phase I work is planned to be completed in December of 2009. But the final functional test of the works will be done in 2010 with supply of electricity power provided by the Angola government.

In the Phase II work, design engineering work will begin for earlier construction. Additional hydrant and pipeline work and electricity substation work that was started in 2009 continues until completion of design work in 2010. Drainage improvement and farmland preparation, and irrigation channel work will be done based on the detail design for Phase II-1 work. It will take



12 months for Phase II -1 Work.

Consulting services will be conducted throughout the whole Phase II work for the supervision of design engineering and construction and taking part in farmer and farming support program.

Project Management Unit building and training center will be completed in 2010 and the other works for Phase II -2 will begin in 2011.

### < Project Implementation Schedule >

TASK	2009						2010												2011												2012		Remarks
	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2-12	
1.Stage1(Irrigation Infra)																																	
- Construction																																	
- Test & Commission																																	
2.Stage 2(Farming Infra)																																	
- Design & Engineering																																	
- Farmland Preparation																																	
- Drainage Improvement																																	
- Irrigation Channel																																	
- Additional Hydrant, Pipeline																																	
- Electricity Supply Work																																	
- Consulting Service																																	
3.Stage 2(Farmer Support)																																	
- Rural Village																																	
- PMU Building																																	
- Ware Housing																																	
- Training Center																																	
- Maintenance Building																																	