



**New Partnership for  
Africa's Development (NEPAD)  
Comprehensive Africa Agriculture  
Development Programme (CAADP)**



**Food and Agriculture Organization  
of the United Nations  
Investment Centre Division**

## **GOVERNMENT OF THE REPUBLIC OF ANGOLA**

### **SUPPORT TO NEPAD–CAADP IMPLEMENTATION**

**TCP/ANG/2908 (I)  
(NEPAD Ref. 05/15 E)**

**Volume II of VI**

### **BANKABLE INVESTMENT PROJECT PROFILE**

**Irrigation Rehabilitation and  
Sustainable Water Resources Management**

*December 2005*



## **ANGOLA: Support to NEPAD–CAADP Implementation**

**Volume I: National Medium–Term Investment Programme (NMTIP)**

*Bankable Investment Project Profiles (BIPPs)*

**Volume II: Irrigation Rehabilitation and Sustainable Water Resources Management**

**Volume III: Rehabilitation of Rural Marketing and Agro–Processing Infrastructures**

**Volume IV: Agricultural Research and Extension**

**Volume V: Revitalization of Angola Forestry Sector**

**Volume VI: Integrated Support Centres for Artisanal Fisheries**



## NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

<b>Country:</b>	Angola
<b>Sector of Activities:</b>	Irrigation and Water Management
<b>Proposed Project Name:</b>	<b>Irrigation Rehabilitation and Sustainable Water Resources Management</b>
<b>Project Area:</b>	Northern, Central, Coastal, Eastern, and Southern Regions of Angola
<b>Duration of Project:</b>	5 years (2006–2010) – Pilot Phase
<b>Estimated Cost:</b>	<b>US\$315 million</b>
<b>Suggested Financing:</b>	

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	94.3	30
<i>Financing institution(s)</i>	157.3	50
<i>Private sector</i>	62.9	20
<i>Total</i>	<b>314.6</b>	<b>100</b>



**ANGOLA:**  
**NEPAD–CAADP Bankable Investment Project Profile**  
***“Irrigation Rehabilitation and Sustainable Water Resources Management”***

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### Abbreviations

ADB	African Development Bank
BADEA	<i>Banque arabe pour le développement économique en Afrique</i>
BCM	Billion cubic meter (or km <sup>3</sup> )
CAADP	Comprehensive Africa Agriculture Development Programme
DNA	National Directorate for Water
DNHER	National Directorate for Rural Hydraulics and Engineering
EDA	Agriculture Development Station
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDA	Agrarian Development Cabinet
GoA	Government of Angola
INE	National Institute of Statistics
MECANAGRO	National Enterprise for Agricultural Mechanisation
MINADER	Ministry of Agriculture and Rural Development
MINEA	Ministry of Energy and Water
MINSA	Ministry of Health
NEPAD	New Partnership for Africa’s Development
NGO	Non–Governmental Organization
NMTIP	National Medium–Term Investment Programme
OGE	General State Budget
UIM	Urban–Industry–Mining
UNACA	<i>União Nacional dos Camponeses Angolanos</i> (National Small Farmers Union)
USAID	United States Agency for International Development
WHO	World Health Organization of the United Nations
WUA	Water User Associations



## I. PROJECT BACKGROUND

### A. Project Origin

I.1. In the aftermath of the conflict, the Government of Angola (GoA) is facing a daunting effort of launching nation-wide rehabilitation programmes intended to bring all the nation-together, rebuild the basic social and economic infrastructures of the country, and promote the development of productive activities aimed at restoring a normal lifestyle of rural and urban populations after many years of starvation, suffering and despair. One of such programmes deals with the rehabilitation of existing irrigation systems whose infrastructures were neglected during wartime and the installation of new irrigation systems in the main river basins and floodplains. The share of State Budget (OGE) allocations devoted to the programme has increased since 2002 thus signalling the primarily financial commitment and priority attached to the development of irrigated agriculture as a basis to encourage private investment in the agriculture sector, reduce food shortfalls, create jobs among the impoverished rural population, and promote export crops.

I.2. The *Ministry of Agriculture and Rural Development* (MINADER) is coordinating donor and technical cooperation agencies such as EU, USAID and FAO among others towards the review of Angola's agriculture and rural development options. The rehabilitation of irrigation systems capabilities is expected to play a central role in the attainment of food security in the short- to medium-term. Preparatory steps were conducted by MINADER for the rehabilitation of large-scale irrigation canals in Matala (Huila) and Kikuxi (Luanda). The expansion of the programme is intended to include existing and new small, medium and large-scale systems in Bengo, Benguela, Cabinda, Kunene, Kuando Kubango, Huila, Huambo, Kwanza Norte, Kwanza Sul, Luanda, Lunda Sul, Malange, Moxico, Uige, and Bié among others.

I.3. The GoA has given top priority to the development of this irrigation programme, which amply falls under one of the pillars of the *Comprehensive Africa Agriculture Development Programme* (CAADP) i.e. sustainable land management and reliable water control systems. The proposed programme also fits with the highlighted priorities of the *Angola National Medium-Term Investment Programme* (NMTIP). The implementation of the programme is intended to support the development of small-scale irrigation in unison with large and medium-scale commercial farmers and agri-businesses. This decision is to be welcomed, as it will enhance agricultural development with less dependence on the rains.

I.4. The implementation of the programme under the NEPAD-CAADP initiative calls for a long-term and multi-stage approach within the scope of a medium-term rolling financial and programming framework whereby government funding can be supplemented by international concessionary and private funding. This programme would cover the first phase of the much larger government expansion programme above indicated.

### B. General Information

I.5. **Physical.** Angola is located in the north-western part of Southern Africa between latitudes 6°–18°S. Climatic conditions vary widely from humid tropical lowlands in the north and northeast, to desert in the south bordering with Namibia. The Central Highlands (Planalto Central) contains large areas with good rainfall (1,500 to 2,000 mm per year) and moderate temperatures but rather acid and unfertile soils, and have the highest rural population densities (around 100 inhabitants per km<sup>2</sup> against an average 10 inhabitants per km<sup>2</sup>). The southern areas are much drier, with rainfall ranging from 100 to 1,000 mm per year. With a total surface area of 124 million hectares, more than 40 percent of the

land area of Angola is covered with some form of woody vegetation (about 50 million ha), but only 18.5 percent of that area (about 23 million ha) is classed as natural forest. Angola’s agricultural potential is estimated at 35 million ha of arable land of which about 30 million ha is virgin land and the remaining 5 to 8 million ha is disposable arable land of which an estimated 2.5 million of ha are cultivated.

I.6. **Water Resources.** The Central High Plateau is a natural water table from where the major home rivers descend to either the Atlantic coast creating large floodplains, river valleys and basins (Mebridge, Dande, Bengo, Kwanza, Keve, Catumbela, Kunene, among others) or forming a highly dense river network (Kuando, Kubango, Kuito) in the southeast before draining their waters in to the Okavangu basin. The Zaire River and its tributaries in the north and northeast and Zambezi River and its tributaries in the east complete the country abundant hydrograph resources. The global renewable surface water availability in the country is estimated at almost 184 BCM (or km<sup>3</sup>/year), equivalent to around 17,200 m<sup>3</sup> per inhabitant per year. Currently much of the surface water drains into the Atlantic, which receives 41 percent of annual flows. However, the sharp decline and rapid transition between the Central Plateau and the low plains in the west coast provides a great number of potential sites to establish reservoirs and major diversions structures to regulate flows and to irrigate the extensive lower plains. On the other hand, the smooth transition of the Central Plateau to the swamps and lowlands in the east, presents a high potential for small river diversions structures and small storage tanks.

I.7. Renewable groundwater resources have been estimated at 72 BCM (or km<sup>3</sup>/year) with depths between 10–30 m in the Central Plateau, 5–30 m in the coastal zone and over 200 m in the semi-arid areas and low well yield of the south where around 70 percent of the country livestock is located.

I.8. **Water Use.** According to 1987 data, total water used was estimated at 480 km<sup>3</sup> per year of which agriculture accounted for 365 km<sup>3</sup> per year (76 percent), followed by urban communities with 67 km<sup>3</sup> per year (14 percent) and industry with 48 km<sup>3</sup> per year (10 percent). Due to the combined effect of war and lack of investments, production from irrigated agriculture has been severely depressed and expansion of water infrastructure for other uses reduced. The present level of urban–industry–mining (UIM) consumption is estimated at an equivalent to 74 litres per capita per day for a total urban population of 7.4 million. Actual per capita domestic consumption is much lower than this; for example, the weighted average domestic consumption for Luanda is less than 20 litres per capita per day, half of the minimum level specified by WHO. The situation is even worse in rural areas where population with access to potable water is estimated at 39.9 percent only. These figures gave rise to the investments in water sector that Angola should face during the forthcoming years.

I.9. The *Water Sector Development Strategy* dated November 2002 aims to increase urban consumption of water to 70 litres per capita per day, by increasing production to 90 litres per capita per day in all centres and reducing losses to 25 percent. If these targets were achieved, gross UIM consumption would reach about 0.36 km<sup>3</sup> per year by 2016, assuming a conservative urban population growth of 2.9 percent per annum to reach a total 11 million by 2016. The rural communities will utilise an additional 0.102 km<sup>3</sup> per year i.e. 40 litres per person per day on the basis of a rural population of 7 million by 2016, if the minimum level specified by WHO is made available to all inhabitants. If the irrigated areas by then are under full production, irrigation demand could reach 2.64 km<sup>3</sup> per year, giving a total ±3.00–3.50 km<sup>3</sup> per year. The total water use would thus increase from the 0.30 percent of global renewable water resources in 1987 to 1.75 percent, hardly cutting into the country’s global water resources.

I.10. According to data published in August 2003 by the *Ministry of Health* (MINSa) and the *National Institute of Statistics* (INE) corroborated by WHO, the water distribution pattern in Angola was as follows:

Table 1: Angola Water Supply Coverage			
<i>(figures in percent)</i>	Total	Piped Water	Non-Piped Water (well, borehole, fountain)
Nation-Wide	61.6	18.2	43.3
Rural	39.9	1.2	38.8
Urban	70.9	25.6	45.3

I.11. The rural communities had a very limited access to water only 39.9 percent of the population against 61.6 percent of the total population and this was heavily concentrated on access to water from wells, boreholes and public fountains. The East region covering the provinces of Lunda Norte, Lunda Sul and Moxico show the lowest rate of access to water, 39.7 percent, both piped and non-piped water. Region centre-south covering Huambo, Bié and Kuando Kubango with 70.1 percent and region north covering Zaire, Uíge and Malange with 66.7 percent show the highest concentration in the access to non-piped water. Additional data published by MINEA/DNA and WHO relative to the access to safe water by the population living the provincial capitals through the water supply system show the following lowest capitation rates per inhabitant: Zaire (14 litres), Kwanza Norte (14 litres), Kunene (18 litres), Kwanza Sul (21 litres), Huambo (22 litres), Moxico (31 litres), Uíge (32 litres), Bié (39 litres). (In Malange the system was out of order.)

I.12. **Irrigation Potential and Current Situation.** According to 2003 data overall potential area was estimated 6.7 million ha of which 3.7 million ha are potentially covered by small-scale irrigation schemes and lowlands irrigation; however total effectively irrigated land by 2004 was equivalent to 64,750 ha of which 39,750 ha with partly/fully operational equipped systems against a total of 425,000 ha in 1974 (only 75,000 was irrigated land covered with partly/fully equipped systems).

I.13. At present, there are three main types of irrigation systems co-existing in the country. These are:

- Large to medium scale irrigation systems fully or partly equipped with water control works. These occupy various river floodplains in humid and dry coastal zone and the southern temperate and arid zones. These systems are essentially the continuation of the colonial “fazendas” and/or state-run cash crops production plantations (banana, sugarcane, palm, fruits, etc.). During the 90s they have evolved towards green-belt farms located close to the major coastal urban areas and are operated by a combination of smallholder farmers and commercial ventures. Initial projects were set up in areas of Luanda, Bengo, Benguela, Namibe, Kwanza Sul and Huila but new projects have been initiated more recently in other areas of these same provinces and extended to additional provinces such as Kunene, Malange, and Moxico. Since 2000 Kikuxi (Luanda) and Matala (Huila) systems have benefited from major hydraulic works (river weirs, elevating/pumping stations, reservoirs, and long and often lined distribution canal systems). Presently they are absorbing the major part of the capital expenditure budget (PIP) of MINADER even though this is insufficient to meet the full rehabilitation costs of all these systems. The beneficiaries are large to medium farmers with the size of plots varying from 15 to 50 ha and small farmers holding plots around 3 to 4 ha. According to the data available, there would be around 100,000 ha of land irrigated by large to medium systems of which roughly 9,750 ha are reported to be operational in 2004. They are distributed as follows:

Area (Provinces)	Potential irrigated area (ha)	Operational irrigated area (ha)
Northern provinces: Kwanza Norte, Malange, Uíge, Cabinda	25,200	6,000
Coastal provinces: Benguela, Kwanza Sul, Luanda, Bengo, Zaire	35,550	26,850
Central Plateau provinces: Huambo, Bié	–	–
Eastern provinces: Moxico, Lunda Norte, Lunda Sul	1,000	–
Southern provinces: Huila, Kunene, Namibe and Kuando Kubango)	38,900	6,900
<b>Total</b>	<b>100,650</b>	<b>39,750</b>

- *Small-scale gravity or pumped systems.* Small-scale irrigation systems may represent an important part of the national irrigated area. They are generally to be found in the Central Plateau area covering Huambo and Bié and close to the existing larger green-belt type schemes in Bengo, Benguela, Huila, and Namibe. These systems are used to produce maize, vegetable, and fruits and are worked by smallholder commercial farmers. Historical data shows that as much as 320,000 ha were irrigated this way until 1974. Recent figures show a sharp decline to nearly 15,000–25,000 ha. Most of these schemes have been using small river diversion structures and springs, often combined with small storage ponds. Irrigation at plot level is mostly by gravity. In recent years small pump units (5 to 10 hp) have re-appeared around water ponds and small storage tanks. In some green belt areas, small pumps are being used to tap water from existing canals to irrigate additional areas outside the intended design command area. Usually the size of land varies around 1–2.5 ha. Locally dependent on groundwater conditions, shallow wells and small tube wells are also operated using small pumps.
- *Lowlands and depressions utilizing water conservation farming practices.* Lowland water systems exist in vast areas of central and east of Angola, where rains are sufficient but unequally distributed. Historical data indicates that potential area was around 850,000 ha until 1974. In these areas, each adult family member has at least two farming plots in community land areas: one (the “*lavra*”) for rain-fed agriculture usually located on the foot of mountains, which involves two cropping seasons, and another in lowland areas (“*nacas*”) usually located on river depressions used in the dry season. In the lowlands, simple rainwater harvesting and improved field water storage techniques are used. In the eastern areas, rainfed or upland rice was commonly produced using simple water deviation techniques in swampy plains. Extensive rice production systems are being implemented in Lunda Norte (2,859 ha in 2003) and Moxico (4,836 in 2003). Limited amounts of vegetable are produced in these areas even though superficial water tables can be tapped with small shallow wells.

I.14. The table below highlights the major crop production output in tonnage from both rain-fed and irrigated agriculture for the period 1998/99–2002/03. One of the major challenges faced by Angola’s traditional food crops sector is their over-reliance on rain-fed agriculture (“*sequeiro*”). Cassava, millet/sorghum, sweet potatoes and groundnuts are essentially produced by small subsistence farmers in rainfed areas; whereas maize, rice and beans though largely produced by the subsistence sector have a significant input from smallholder farmers that use irrigation methods. Horticulture and, in some extent, fruits are essentially based on irrigated agriculture and medium to large-scale farmers.

Food Crops ('000 mt)	1998/99	1999/00	2000/01	2001/02	2002/03
Cassava	3,130	4,433	5,394	6,628	15,373
Maize	428	395	429	557	1,032
Millet/Sorghum	102	105	148	152	248
Sweet potatoes	182	224	353	423	782
Beans	68	75	...	91	249
Groundnuts	11	13	...	31	87
Rice	7	6	...	5	70
Irish potatoes	19	13	...	179	472

Source: Ministry of Agriculture and Rural Development and Ministry of Commerce

I.15. **Livestock.** Cattle are largely produced in Angola on extensive systems by traditional farmers who possess 95 percent of total cattle stock for their own use as draught power, consumption and wealth. The stock from commercial farmers combine high-yield with autochthon races and are produced on confined areas with slightly improved water and pasture conditions. As a whole, livestock plays a critical role as it contributes to the self-consumption and food security of rural populations. The province of Huila, one of the least affected by the war, possesses one of the largest stock of cattle, pork, chicken and goats. The table below provides the distribution of livestock by region and animals.

Zone	Province	Cattle	Sheep	Goats	Pork	Chicken	Other
North	Luanda	6,689	5,937	12,688	1,500	-	-
	Kwanza Norte	500	2,500	11,500	14,500	25,000	-
	Malange	500	500	500	1,000	-	-
	Bengo	2,921	284	1,348	-	-	-
	Uige	33	731	12,982	2,257	25,452	-
	<b>Subtotal</b>	<b>10,643</b>	<b>9,952</b>	<b>39,018</b>	<b>19,257</b>	<b>50,452</b>	<b>-</b>
Centre-South	Kwanza Sul	76,273	34,867	69,387	27,723	27,537	127
	Benguela	20,704	6,349	21,782	5,812	37,270	-
	Huambo	6,652	365	824	-	-	1 963
	<b>Subtotal</b>	<b>103,629</b>	<b>41,581</b>	<b>91,993</b>	<b>33,535</b>	<b>64,807</b>	<b>2 090</b>
South	Namibe	363	120	467	3	9	3
	Huila	1,200,000	-	476,400	173,000	100,000	-
	Kunene	361,332	-	-	-	-	3 555
East	Ku. Kubango	25,000	5,250	56,000	15,500	-	1 800
	<b>Subtotal</b>	<b>1,586,695</b>	<b>5,370</b>	<b>532,867</b>	<b>188,503</b>	<b>100,009</b>	<b>5 358</b>
<b>Total</b>		<b>1,700,967</b>	<b>56,903</b>	<b>663,878</b>	<b>241,295</b>	<b>215,268</b>	<b>7,448</b>

Source: MINADER (March 2003).

I.16. Livestock activity is concentrated on the south region in an area of low rainfalls and scant population. The region central/south is specialized in the production of cattle, goat and sheep with large pastureland and remaining of crops made available for livestock. However, access to water and fresh pasture during the dry season on the arid areas of south region comprising Huila, Kunene and Namibe pose a permanent threat to individual farmers, who have to undertake the transhumance to areas where these can be found. In addition, water is also required to provide adequate sanitation and veterinary services. The north and central regions are specialized in the production of pork, sheep and goats.

I.17. **Current Rehabilitation and Expansion Programme.** During the years 2000–2002, 17 irrigation systems were earmarked for a total provisional budget of Kz37,972,225 (equivalent to US\$474,650). However, works effectively carried out amounted to less than 60 percent of the budget and comprised mainly emergency repairs and rehabilitation of piecemeal sections of these schemes. With the end of conflict in 2002, investments in irrigation have increased substantially. MINADER investment budget has made provisions in the tune of Kz230 trillion (US\$2.9m) for 10 schemes in 2003 and Kz775 trillion (US\$9.7m) for 15 schemes in 2004, most of which are schemes where initial works started in 2000–2002 and would continue during 2003–2004. An additional Kz197 trillion (US\$2.5m) was provisioned in 2004 for other hydraulic works for the livestock sector on four projects. Some provincial governments (Bengo, Benguela, Kuanza Sul and Kuando Kubango) have contributed with additional funds since 2003 towards eight additional schemes. In total they have mobilised Kz73.5 trillion (US\$0.9m) in 2003 and Kz210 trillion (US\$2.6m) in 2004.

I.18. These investments, even though they seem important, only represent an average investment per ha of Kz29,000 (US\$360). With exception of heavy hydraulic works conducted for Kikuxi (Luanda) and Matala (Huila) funded by the GoA through the line of credit Angola–Brazil, very few of these medium or large–scale schemes can therefore be considered as being effectively operational. In addition, Government investments in small irrigation and water conservation and development of lowlands have been almost inexistent since 2000. However, the government appears to be committed in providing adequate water irrigation infrastructure as a condition to attract private investments in the agriculture, livestock, and agro–processing and make arable land more productive as a means to reduce food insecurity and promote export crops.

I.19. **Management of Irrigation Schemes.** The management of medium and large–scale sector irrigation schemes is entrusted to public sector organizations called “*Gabinete de Desenvolvimento Agrário*” (GDA). At present, there are seven GDA irrigation stations formally established — Humpata and Matala (Huila), Manquete (Kunene), Kikuxi (Luanda), and Bom Jesus, Caxito and Quiminha (Bengo) whose investment and current budgets fall under the authority of MINADER. These are overseen by the provincial government authorities and backstopped by MINADER through the National Directorate of Rural Infrastructures and Irrigation. For the two other sectors, no formal management organization has been defined and maintenance depends entirely on user’s initiatives and customary practices. The GDAs face organizational, operational and maintenance problems as its present management model are set on a very centralized top–down manner. They lack input and/or participation from beneficiaries, farmer associations or producer groups on issues related to water use and control, water tariffs, land delimitation and titling, investment and maintenance cost recovery processes, access to credit, provision and price of inputs, and seeds quality among others. The existing GDAs are currently funded by MINADER’s annual recurrent and investment budget, they are far away from becoming self–financed, and there is no legal provision to allow the transfer of management to independent or private sector organization in the short to medium run.

I.20. **Institutional and Legal Framework.** According to Law No. 6/02 approved on June 21, 2002 the *Ministry of Energy and Water* (MINEA) is invested with the overall responsibility for the management of water resources including planning, coordinating, supervising and controlling activities related to the development of water resources and supply of drinking water. The *National Directorate for Water* (DNA) is the executive body in–charge of the implementation of the general water policy. However, this law does not address the specific issue of water irrigation and, as a result, it is unclear who will manage the various responsibilities linked with irrigation, how irrigation management will link in with the various bodies created under the ministry’s rule and how inter–

I.21. Ministerial coordination will be pursued with other governmental institutions. MINEA is short of qualified and experience personnel and much of MINEA resources are directed on water supply rather than on water resources management.

I.22. Irrigation falls under the authority of MINADER and the *National Directorate for Rural Hydraulics and Engineering* (DNHER) established in 1991. DNHER is in charge of: (i) the overall strategies and policy framework; (ii) the project study, design and construction supervision; (iii) the management and follow up of existing schemes; and (iv) the overall coordination of rural infrastructure. DNHER mandate covers, among others: irrigation infrastructure and agricultural–rural hydrology planning; overall planning, inventory, monitoring and management of hydro–agricultural infrastructures and schemes. DNHER operates at field level through four regional brigades. However, the articulation of DNHER with the various Departments of MINEA is not clearly set as the Law No. 6/02 still remains to be regulated. In addition DNHER is severely short of qualified and experienced personnel and is not equipped with the basic means to compile and process hydrological data and information on rural areas and undertake water quality surveys such as salinization (a common problem affecting underground water in coastal zone’s floodplains), fertiliser and agro–chemical tail–waters, among others.

I.23. Notwithstanding the *Land Law* and *Water Law*, no specific policy, law or regulation has been recently issued or drafted in the field of irrigation. As a result, the country does not have a national irrigation policy and strategy, and various other documents with a direct impact on the development of irrigation are still to be created. This includes; (i) various executive regulations stemming from the Land Law; (ii) the legal framework pertaining to *Water User Associations* (WUA) and their implication in the management and management of irrigation systems; (iii) the law on cooperatives and associations of producers; (iv) various technical regulations relating to the construction of irrigation structures including small earth dams, security and maintenance of reservoirs, quality and supervision of construction works, among others; (vi) regulations relating to energy (industrial, and/or agricultural electricity pricing, fuel, lubricants and agriculture inputs pricing, import tariffs, among others).

## II. PROJECT AREA

II.1. The overall MINADER irrigation systems development programme calls for: (i) the rehabilitation and entry into production of simple lowlands water conservation systems with the potential to irrigate around 850,000 ha of land; (ii) the rehabilitation and entry into production of small and medium to large scale systems with the potential to irrigate 162,000 ha of land; and (iii) the implementation of new small and medium to large scale systems with the potential to irrigate around 52,000 ha of land. These systems are intended to promote agriculture and livestock produce among individual family and smallholder farmers, and commercial farmers. The key priorities of the programme consider investments in 17 perimeters of 9 provinces identified below as follows.

### A. Province of Cabinda

II.2. *Yabi valley: total area 6,000 ha.* New irrigation scheme for production of horticulture and fruits, livestock (pork, cattle and chicken). Intended beneficiaries are small and medium farmers. Installation of food processing units to be considered. Finance not yet secured.

## B. Province of Luanda

II.3. Kikuxi irrigated perimeter: total area 5,000 ha. Phase I covering 480 ha irrigated land funded by OGE resources completed. Located on the Luanda plateau in the outskirts of Viana; headwater from the Kwanza river from where the water flows through a 22-km Cassaqui canal towards the Kapiápiá pumping station. Actually, Kikuxi is a primary source of UIM water to Luanda and its satellite town, Viana, supplemented by Kifangondo system in Funda. Production of horticulture, fruits, and beans. Phase II, still un-funded, would allow expansion of irrigated land to 5,000 ha. Intended beneficiaries are small and medium commercial farmers. Expansion study concluded.

## C. Province of Bengo

II.4. Caxito irrigated perimeter: total area 4,000 ha. Located on the former sugarcane estates the area was reconverted for the production of horticulture, roots and tubers, and beans. Headwater on the Dande river from where the water flows through a dike that regulates the water stream through the canal ditches throughout the year. Intended beneficiaries are small and medium commercial farmers. Rehabilitation study still to be completed. ADB expressed interest in funding the rehabilitation.

II.5. Bom Jesus irrigated perimeter: total area 6,000 ha. Phase I covering 1,350 ha irrigated land fully funded by OGE resources completed. Located on the former sugarcane estates on river Kwanza right shore, the area was reconverted for the production of horticulture, roots and tubers, cereals, and focus on bananas. Headwater from the Kwanza river. Intended beneficiaries are small and medium commercial farmers. Emergency repairs needed in pumping station, water ditches and protection dike. Completion of expansion study by FAO. Possible ADB finance. Study for the modernization of the irrigation system possibly funded by BADEA.

## D. Province of Malange

II.6. Kapanda hydro-agriculture perimeter: total area 300,000 ha. Phase I covering 13,500 ha to be implemented. Construction of headwater from river Kwanza. Production of industrial crops on non-irrigated land and production of food crops such as cereals, roots and tubers, beans, horticulture and fruits on irrigated area. Intended beneficiaries are small, medium and large commercial farmers. Installation of agro-processing units to be considered. Finance not yet secured.

## E. Province of Kwanza Sul

II.7. Cela valley: total area 6,000 ha. Phase I to include rehabilitation of Matumbo headwater on Keve/Cossi river and canal. Production of cattle and milk cow, and cereals, roots, tubers, beans, horticulture and fruits. Intended beneficiaries are small and medium commercial farmers. Works would include epidemiology tracking system, creation of pastures, artificial insemination center. Finance not yet secured. Studies available. French finance under review.

II.8. Aldeia Nova (New Village): Social re-settlement of ex-soldiers into productive activities. Installation of 15 set of housing compounds. Production of cereals, roots and tubers, beans, horticulture, and fruits. Intended beneficiaries are ex-soldiers. Installation of agro-livestock processing units to be considered. Studies available. Israel finance under review.

## F. Province of Benguela

II.9. Cavaco irrigated perimeter: total area 5,000 ha. Phase I to include construction of Dungo earth dam purportedly to regulate stream of water of Cavaco river (seasonal). Located on the outskirts of Benguela city on Cavaco river right shore; headwater from the river Cavaco. Production of cereals, beans, horticulture and fruits. Intended beneficiaries are small, medium and large commercial farmers. Installation of agro-processing units to be considered. No studies available. Finance not yet secured.

II.10. Catumbela irrigated perimeter: total area 3,000 ha. Located in the former sugarcane estates on river Catumbela shores in the outskirts of Catumbela town; headwater from the Catumbela river. Production of cereals (wheat), horticulture and fruits. Intended beneficiaries are small and medium commercial farmers. No study available. Finance not yet secured.

## G. Province of Namibe

II.11. Bero valley: total area 1,000 ha. Located on Bero floodplain in the outskirts of Namibe city. Headwater from river Bero. Production of fruits, horticulture and small-scale vineyards. Intended beneficiaries are small and medium commercial farmers. No study available. Finance not yet secured.

II.12. Giraul valley: total area 800 ha. Located on the shores of Giraul floodplain. Headwater from river Giraul. Production of fruits, horticulture and small-scale vineyards. Intended beneficiaries are small and medium commercial farmers. No study available. Finance not yet secured.

## H. Province of Huila

II.13. Matala irrigated perimeter: total area 6,000 ha. Phase I covering 800 ha irrigated land funded by OGE budgetary resources completed. Located on the middle course of Kunene river eastern of Lubango city. Headwater on Kunene river from where the water flows through a newly rehabilitated concrete-paved 42 km canal. Production of cereals, horticulture, fruits, beans, and livestock. Phase II, still unfunded, would allow expansion to 5,000 ha irrigated plots. Intended beneficiaries are small, medium and large commercial farmers. Rehabilitation of agro-processing units and feeder roads to be considered. New model of perimeter management to be approved by the Government. Expansion study concluded.

II.14. Neves irrigated perimeter: total area 870 ha. Located on the municipality of Humpata; headwater from the river Neves. Production of cereals (wheat), horticulture, moderate climate fruits, and livestock. Intended beneficiary's small and medium commercial farmers. Phase II study in preparation. Electrification of perimeter and installation of agro-processing unities to be considered. Finance not yet secured.

II.15. Gandjelas irrigated perimeter: total area 1,991 ha. Located on the municipality of Chibia; headwater from the Gandjelas earth dam on river Tchimpumpunime. Production of cereals (wheat), horticulture, and citrus. Intended beneficiary's small and medium commercial farmers. Studies to reconvert the perimeter including the completion of earth dam and irrigation canals concluded. Finance not yet secured.

## I. Province of Kunene

II.16. Manquete hydro-agriculture perimeter: total area 1,500 ha. Located on the Manquete village in the commune of Mucope on the right shore of Kunene river. Headwater from river Kunene.

Production of cereals (millet/sorghum), tropical fruits, and livestock. Intended beneficiaries’ small and medium commercial farmers. Preliminary studies completed. Finance not yet secured.

II.17. *Kalueque irrigated perimeter: total area 7,000 ha.* Installation of a new perimeter in areas close to the Kalueque Dam on Kunene river. Production of cereals, tropical fruits, horticulture and livestock. Intended beneficiaries’ small and medium commercial farmers, and ex–army soldiers. Studies in preparation. Finance not yet secured.

II.18. *Huila–Namibe–Kunene hydro–pastoral system: total area 1,990 ha.* Construction of ponds (“chimpanças”) and perforation of boreholes for agri–livestock intended for individual families and small and medium farmers, and supply of water to rural populations.

II.19. In addition to the rehabilitation of existing irrigation systems, MINADER has also prioritised the installation of new irrigation systems as indicated in the table below, some of which would be considered for implementation under this same Phase I of the programme.

Provinces	Rehabilitation & Expansion of Existing Irrigation Systems	New Irrigation Systems
Cabinda	Yabi (6,000)	
Zaire	<i>(not foreseen)</i>	
Uige		Quitexe Negage
Bengo	Bom Jesus (6,000), Caxito (4,000)	Quiminha (30,000)
Luanda	Kikuxi (5,000)	Santiago (54), Funda (300)
Kwanza Norte		Mucosso (400), Lucala (280), Luinga (5,000)
Kwanza Sul	Cela (6,000), Aldeia Nova	PD Porto Amboim, Vale do Keve, Vale do Longa
Malange		Kapanda (13,500), Kissol (700), Gangasol
Lunda Norte	<i>(not foreseen)</i>	
Lunda Sul		Pelengue
Benguela	Cavaco (5,000), Catumbela (3,000)	Canjala (3,000)
Huambo		Gove, Kalima
Bié		Cambandua (3,500), Sande (2,500)
Moxico		Lwena (1,000), Luxia (5,000)
Kuando Kubango		Missombo (600)
Huila	Matala (6,000), Humpata–Neves (870), Chibia–Gandjelas (2,000)	Quipungo–Malipe (200), Sendi (1,500), Chicungo (300)
Namibe	Bero (1,000), Giraul (800)	Caraujamba (500)
Kunene	Manquete (1,500), Kalueque (7,000)	Kakuluvar (16,000)
<b>Total Number of Schemes</b>	<b>15 (54,170 ha)</b>	<b>29 (approx. 110,000 ha)</b>
Source: MINADER Memorandum, April 2004 & MINADER/NEPAD technical team. Note: Irrigation area (ha) in brackets		

II.20. The component of water for livestock plays a central role in the following irrigation systems and water development projects: Kakuluvar (Kunene Province); Quipungo–Malipe; Chicungo; and Sendi (all in Huila Province); Lucala (Kwanza Norte); Yabe (Cabinda); Bero; Giraul; and Caraujamba (in Namibe Province).

### III. PROJECT RATIONALE

III.1. Water resources management play a fundamental and multifaceted role in the process of rehabilitation and reconstruction of Angola in the post-war era. As opposed to mineral resources, the country has failed to develop and modernise its agriculture and livestock sectors, which are rather dependent on rainfall. The huge water potential for irrigated agriculture lays largely unexploited due to the lack of investments in adequate irrigation infrastructure. The country is embarking upon on developing its basic infrastructures on the various sectors of the economy. Small, medium and large-scale irrigation have been considered vital for the country to attract private investment into the sector and, through an effective use of its agriculture and livestock resources, promote sustained increases of traditional food crops from the rural family sector as a means to reduce famine and poverty.

III.2. The water resources management programme fits within the CAADP Pillar 1 (*Sustainable land management and water control*) and Pillar 3 (*Increasing food supply and reducing hunger*). The use and management of water comes on top of the government’s priorities given Angola’s natural endowment of water resources and their importance for agriculture, livestock and local communities. The government is funding with its own budgetary resources the rehabilitation of existing irrigation systems and intends to expand the availability of irrigated water to large, medium and small farmers including the traditional peasant sector. This is considered of vital importance to reduce the level of food insecurity and thereby improve livelihoods of rural and urban population.

III.3. The programme takes an integrated approach to the use and management of water resources on the basis of its importance to agriculture, livestock and rural communities. The starting point is that investments to be made in the water sector in rural areas should be designed to give answer to the needs of those who need water for irrigated agriculture, livestock and local communities living and working in the vicinity. Stemming from this approach, the programme is structured in *three components* as follows:

- ***Lowland Water Conservation and Irrigation Perimeters for Large, Medium and Smallholder Farmers:*** Effectively operational irrigation is in excess of 39,000 ha out of nearly 110,000 ha and covers large and medium scale irrigation perimeters; however, the government intends to undertake the rehabilitation of existing small, medium and large scale systems and installation of new irrigation systems covering additional 52,000 ha thus increasing the irrigation capabilities to around 162,000 ha of land, out of 850,000 ha potentially maintained with lowland water conservation techniques.
- ***Increasing Availability of Water for Livestock:*** Pasture land is estimated at 40 million ha and current livestock is in excess of 2.5 million, most of which owned by traditional cattle growers in arid regions of the southern provinces (Kunene and Huila) and coastal provinces (Namibe and Benguela), which are cyclically affected by the drought.
- ***Increasing Availability of Water for Human Consumption in Neighbourhood Communities:*** In rural areas, population with access to potable water is estimated at 39.9 percent and the GoA is seeking to increase this level up to 47.9 percent in 2005/06, 57.9 percent by 2010 and 70 percent by 2015.

#### IV. PROJECT OBJECTIVES

IV.1. The programme *ultimate objective* is to achieve an increase in the crop yields in the efficiency on the utilization, preparation and conservation of water and land resources and infrastructures, in the management and operational efficiency of the technical and support services, and the increase in the economic returns of small subsistence farmers and small, medium and large scale farmers through the introduction of diversified irrigation systems.

IV.2. The *operational objectives* of the programme are related to:

- The rehabilitation of irrigation, water conservation and drainage systems of the irrigation perimeters with a view to increasing availability of water for agriculture, livestock and human consumption in rural areas;
- The support to the establishment and strengthening of farmer and producer associations and cooperatives through the development of appropriate management, technological, environmental and productive skills to enable them maximizing the use of the irrigation and production systems;
- The support to the establishment and organization of water user associations (WUA) to allow them making an effective use, control and management of water resources especially the maintenance and operation services;
- The promotion of a smooth and staged transition of the management responsibility of the irrigation perimeters from the existing public pattern under the GDAs to public–private operations in the short–run and entirely private operations in the medium –to long–term; through profit and non–profit partnerships with view to bring efficiency to the use and management of water.

#### V. PROJECT DESCRIPTION

V.1. This proposal of programme is part of the GoA’s NEPAD–CAADP *National Medium–Term Investment Programme* that aims to increase agricultural production, promote the rehabilitation of rural infrastructures, rural trade and processing of agriculture product, minimise rural poverty and food insecurity, and manage natural resources on a sustainable manner with to a view to minimising the causes of conflict over natural resources. Therefore, this programme proposal fits into NEPAD–CAADP Pillar 1 and would be implemented during the first 5–year period (2004–2008).

V.2. The underlined programme’s concept is to support the organization of small producers and farmers associations and cooperatives as well as water user associations within the scope of the three types of irrigations systems identified with special focus on (i) small–scale gravity or pumped systems, (ii) lowlands and depressions utilizing water conservation farming practices. This concept is intended to promote the rehabilitation cum development of existing and new low–cost irrigation systems e.g. in terms of hydraulic works and irrigation equipment requirements, among others with proved potential to contribute to food security and poverty alleviation, and promote the use of participatory methods.

V.3. The approach to be pursued by the programme calls for the integrated management in the use of water resources taking into account their importance to rural development as a whole including the agriculture and livestock sectors and local communities in rural areas. To turn this approach operational, the use and management of water should be seen as a factor of social development and not

only to promote economic activities in the agriculture and livestock sectors. The needs of rural families in water will have to be considered at an earlier stage in project designing so as to ensure that they will not be excluded from and will benefit of access to water for their day-to-day live.

V.4. Therefore, the programme will concentrate on and finance the following three components:

**Component 1: Lowlands Water Conservation and Irrigation Perimeters for Large, Medium and Smallholder Farmers**

V.5. Irrigation effectively operational is calculated in excess of 39,000 ha out of nearly 110,000 ha and covers mainly large and medium scale irrigation perimeters. The programme aims to rehabilitate existing small, medium and large scale systems and install new irrigation systems covering additional 52,000 ha thus increasing the irrigation capabilities to around 162,000 ha of land. River weirs, water ditches, dredging and siltation works, soils conservation and protection along rivers course; and, elevating pumping stations, reservoirs, low-lifting irrigation pumps, central pivots and drip irrigation equipment would be provided, whenever required. The growth of irrigation area would be achieved on a staged and incremental basis and reach 10,000 ha/year.

V.6. The rehabilitation of lowland systems aims to improve the management of rainfall water by the use of simple, diversified, low cost and participatory methods. Simple rainwater harvesting and improved field water storage and deviation techniques would be used. The programme aims to re-established lowland water conservation in excess of 60,000 ha out of 850,000 ha. The works would be implemented on a staged and incremental basis and reach some 15,000 ha/year thus the total command area of 850,000 ha anticipated by MINADER’s global target would fall beyond Phase I and will roll over to Phase II (2009–2013) and subsequent phases of the programme.

V.7. This programme component aims at achieving steady increases in basic staple food; horticulture and fruits produce thus making a significant contribution to the combat against poverty and the attainment of food security across the country. This will be reflected in the following crops:

V.8. **Maize.** The maize is a basic staple food of local populations. It is cultivated throughout the countryside, on a total estimated area of 985,000 ha by individual farmers (90–95 percent) and commercial farmers (5–7 percent). The average crop grain yield varies between 25–700 in the individual farmers and 1,500–2,500 kg/ha. The traditional areas of maize are:

- ***Lowland maize:*** low tropics encompass the agro-ecological zones characterized by altitudes between 0 to 1 000 meters above sea-level, annual average rainfalls in the tune of 0 to 500 mm, and average temperatures between 27° to 30°C. This corresponds to the coastal and southern regions.
- ***Highland maize:*** high tropics encompass agro-ecological zones characterized by altitudes between 1,000 to 1,500 meters above sea level, annual average rainfalls in the tune of 600 to 1,500 mm, and average temperatures between 17° to 24°C. This corresponds to the Central Plateau, and north and east regions.

V.9. Maize crop is predominantly farmed in the central provinces (69 percent) with remaining areas evenly distributed by the northern provinces (Uige, Malange, Kwanza Norte, Luanda, Lunda Norte, Zaire, Lunda Sul, Bengo and Cabinda), and southern provinces (Huila, Kuando Kubango, Namibe, and Kunene). 74 percent of total farmland is concentrated on four provinces: Huambo, Huila, Benguela and Bié.

V.10. **Cassava.** Cassava is a typical crop of the northern provinces of the country although it is currently cultivated in all provinces excepting Namibe and Kunene in the south and covers a total estimated area of 644,000 ha. The Northern provinces account for 79 percent of total farmland area (Uige, Malange, Kwanza Norte, Zaire, Lunda Norte, Lunda Sul, Bengo, Cabinda and Luanda). Central provinces of Huambo, Bié, Benguela, Kwanza Sul and Moxico account for 16 percent and the southern provinces 5 percent only. 66 percent of total farmland is concentrated on five provinces: Uige, Malange, Kwanza Norte, Zaire and Lunda Norte.

V.11. **Millet/sorghum.** Millet and sorghum are mainly cultivated in the provinces of southern region (Kunene, Huila and Kuando Kubango), and centre region (Huambo, Benguela, Bié); however, they have been in rapid expansion in the provinces of Namibe, Moxico and Kwanza Sul. Total cultivated area is estimated at 339,000 ha. Four provinces account for 92 percent of total farmland: Huila, Kunene, Huambo and Benguela. Despite its natural disadvantage in relation to maize, the importance of millet/sorghum is growing, as they represent an important substitute in terms of food security.

V.12. **Beans.** Beans farmland covers a total area of 240,000 ha throughout the countryside. Beans are predominantly farmed in Central provinces of Huambo, Bié, Benguela, Kwanza Sul and Moxico (54 percent). The Northern Province (Uige, Malange, Kwanza Norte, Zaire, Lunda Norte, Cabinda, Lunda Sul and Bengo) account for 32 percent of farmland; and, the southern provinces account for the remaining 14 percent. 70 percent of total farmland is concentrated on six provinces: Huambo, Bié, Uige, Huila, Malange and Kwanza Sul.

V.13. **Sweet Potatoes.** Total area cultivated with sweet potatoes is about 110,000 ha of which 52,000 ha in the Northern provinces, 45,000 ha in the central provinces and 12,000 ha in the southern provinces. Uige, Huambo, Benguela, Malange and Huila account for 56 percent of total cultivated area.

V.14. **Groundnuts.** Groundnut total cultivated area is estimated at 86,000 ha with 55,000 ha in the Northern provinces and 27,000 ha in the central provinces. Uige, Malange, Kwanza Norte, Kwanza Sul, Bié and Benguela account for 67 percent of farmland area.

V.15. **Rice.** Rice total cultivated area is estimated at 5,700 ha covering the provinces of Bié, Moxico, Lunda Norte and Lunda Sul. The Central Plateau as well as the south and east of Angola have favoured conditions to grow wheat and rice; however, the provinces of Uige, Malange and Benguela also deserve special consideration.

V.16. **Irish Potatoes and Horticulture.** This includes Irish potatoes, tomatoes, pepper, aubergine, paprika, cabbage, onion and garlic, among others. The bulk of production comes from individual smallholders and medium to large commercial farmers using irrigation methods. Irish potatoes total farm area covers 42,000 ha mainly distributed by the provinces of Huambo, Bié, Huila, Uige, Kwanza Sul, Malange which in total represent around 95 percent of total farmland area. Traditional production areas of remaining horticulture produce also comprise the coastal provinces of Luanda, Benguela, Kwanza Sul, Bengo, and Namibe.

V.17. **Fruits.** The variety of tropical fruits includes: mango, banana, citrus, pineapple, avocado, papaya, guava, passion fruit; and, moderate fruits such as apples, pears and grapes. Tropical fruits grow throughout the country whereas moderate fruits are farmed in the highlands of Huila, Huambo and Bié and grapes in the lowlands of Namibe and Benguela with Mediterranean-type climate.

## **Component 2: Increasing Availability of Water for Livestock**

V.18. Pastureland is estimated at 40 million ha and current livestock is in excess of 2.5 million, most of which owned by traditional cattle growers in arid regions of the southern provinces (Huila, Kunene and Huila) and coastal provinces (Namibe and Benguela). These areas are among the most cyclically affected by drought and access to water and fresh pasture during the dry season pose a continuous threat to individual farmers, who have to undertake the transhumance of cattle to areas where these can be found. The north and central regions are specialized in the production of pork, sheep and mutton.

V.19. Therefore, water for livestock plays also an important role in other perimeters considered under this programme. In addition, water is also required to provide adequate sanitation and veterinary services. Based on the perimeters identified, the programme would support the development of springs for water conservation and the construction of earth dams for livestock water and the general improvement in the access to water supplies for livestock use through the construction of ponds (“*chimpacas*”) in earth or concrete and other water reservoir structures.

V.20. This component of the programme aims at achieving steady increases in livestock produce thus making a significant contribution to the combat against poverty and the attainment of food security across the country. Specifically, the programme will focus on the following:

V.21. **Livestock.** Livestock activity is concentrated on the south region in an area of low rainfalls and scant population. The region central/south is specialized in the production of cattle, goat and sheep with large pastureland and remaining of crops made available for livestock. The north and central regions are specialized in the production of pork, sheep and mutton.

V.22. As a whole, livestock plays a critical role as it contributes to the self-consumption and food security of rural populations. The province of Huila, one of the least affected by the war, possesses one of the largest stock of cattle, pork, chicken and sheep.

V.23. **Cattle Milk/Beef.** The milk production was formerly based on three milk basins, mainly Cela/Catofe (Kwanza Sul), Huambo and Matala/Capelongo (Huila). At present, annual consumption is estimated at 200 million litres/year and the production of milk available in the market is basically from Huila and Namibe as small cattle growers in the south of Huila, Kunene and Namibe produce milk for their own consumption. According to MINADER/FAO out of 1.5 million cattle stock of the region Huila/Namibe and Kunene only 150,000 (10 percent) are marketed thus putting the demand of cattle for slaughtering at 350,000 animals/year.

V.24. **Sheep/Goats.** With a combined stock of 720,000 animals of which goats represent 92 percent, sheep are basically produced in Kwanza Sul, Benguela and Kuando Kubango; and, goats in Huila, Kwanza Sul, Kuando Kubango. However, most of meat goes for self-consumption not to the market and, therefore, goat milk is not consumed by local population as it could be.

V.25. **Pork.** Pork production is concentrated on the maize-producing regions of central and southern provinces, which concentrate 85 percent of total stock, and around the main urban centres. Out of 24,000 animals, 188,000 are produced in the south region, mainly in Huila (92 percent). However, only 11,200 tonnes/year of pork meat are slaughtered for human consumption.

V.26. **Chicken.** The stock of chicken is estimated at 215,000 units; however, the consumption of chicken meat and eggs is very low. The country would need to produce around 49,000 tonnes of eggs and 29,000 tonnes of chicken meat to be aligned with the standards of other developing countries. The

boost in the production of chicken would need to be concentrated on and around the grain-producing regions and the urban centres.

### **Component 3: Increasing Availability of Water for Human Use**

V.27. In rural areas, population with access to potable water is estimated at 39.9 percent and the GoA is seeking to increase this level up to 47.9 percent in 2005/06, 57.9 percent by 2010 and 70 percent by 2015. Though that the primary objective of the programme is to increase the availability of water for agriculture, it is recognized that this objective would fall short if the rural communities do not share the benefits of an increased availability of water, and this is not reflected in major improvements in their day-to-day existence. Therefore, based on the perimeters identified, the programme would support the improvement of water supplies for human use through the construction of boreholes, wells and fountains mainly for domestic use supplies. This will target the rural communities in the neighbourhood of the irrigation perimeters that will be rehabilitated or installed as Greenfield projects under this programme.

## **VI. INDICATIVE COSTS**

VI.1. The annualized investment costs shown in Table 6 below cover Phase I of the programme over the initial five-year period (2004/08) and funds earmarked for Phase II (2009/13). They have been budgeted on the basis of standardized unit costs (see Appendix), and more detailed costing would need to be supported by the financial assessment of technical works required by each individual project.

VI.2. It is assumed that: (i) the financial execution would begin in month 8 of year 2004; (ii) the irrigation projects would be implemented at a pace of 10,000 ha/year for small-medium scale systems and 15,000 ha/year for lowland water conservation systems; (iii) Phase I would cover a total area of 71,000 ha in existing irrigation systems to be rehabilitated and 52,000 ha in new irrigation systems to be created; (iv) the annual budgets have been apportioned by the three components as follows: component 1, 70 percent; component 2, 20 percent; and component 3, 10 percent of total budget requirements. These have been projected into the investment budget presented below.

**Table 6: Cost Summary per Component**

Component	2006	2007	2008	2009	2010	Phase I Total
1. Lowland Water Conservation & Irrigation Perimeters	15,050,000	33,950,000	49,000,000	49,000,000	49,000,000	196,000,000
2. Water for Livestock	4,300,000	9,700,000	14,000,000	14,000,000	14,000,000	56,000,000
3. Water for Human Use	2,150,000	4,850,000	7,000,000	7,000,000	7,000,000	28,000,000
<b>Total Component Costs</b>	<b>21,500,000</b>	<b>48,500,000</b>	<b>70,000,000</b>	<b>70,000,000</b>	<b>70,000,000</b>	<b>280,000,000</b>
Programme coordination (5%)	1,075,000	2,425,000	3,500,000	3,500,000	3,500,000	14,000,000
<b>Total Baseline Costs</b>	<b>22,575,000</b>	<b>50,925,000</b>	<b>73,500,000</b>	<b>73,500,000</b>	<b>73,500,000</b>	<b>294,000,000</b>
Contingencies (7%)	1,580,250	3,564,750	5,145,000	5,145,000	5,145,000	20,580,000
<b>Total Project Costs</b>	<b>24,155,250</b>	<b>54,489,750</b>	<b>78,645,000</b>	<b>78,645,000</b>	<b>78,645,000</b>	<b>314,580,000</b>

## **VII. PROPOSED SOURCES OF FINANCING**

VII.1. This is a high-profile bankable programme with full Government support. Thus the GoA is the fundamental source of funding with the supporting donors. Some EDA extension staff and GDA irrigation workers will be seconded to the project. The GoA will further contribute with office and housing accommodation for the staff, whenever possible. It can also be anticipated that some in-kind and financial contributions might come from international and local private companies supporting local farms within the areas of the irrigation schemes as a means to replace their imports and support local economies.

VII.2. The beneficiaries who are the community, including smallholder and commercial farmers, will contribute in kind by offering their labour on some civil works as well as materials. The ADB has expressed interest in funding Bom Jesus irrigation perimeter; however, it is anticipated that other donor may be willing to consider supporting the initiative once the programme is formulated and concrete project proposals become available. The Angolan Government will present this proposal to donors in the framework of NEPAD for possible financial support.

## **VIII. PROJECT BENEFITS**

VIII.1. In the immediate term, the main benefits would be accrued directly and indirectly to the individual projects beneficiaries. The direct beneficiary smallholder farmers whose farmlands would be cultivated using draught power and mechanized tillage systems, re-oriented and demarcated to suit irrigation under centre pivot and drip irrigation systems as well as small-scale gravity and pumped systems and small river diversion structures and springs alongside with small storage ponds would be most immediate participants. More regular and increased water availability at farm level from reservoir and pond structures will also help farmers provide water to their livestock thus avoiding to undertake long journeys for the transhumance of the cattle during the dry season. The rural communities in the neighbourhood of the GDA irrigation systems would have a more wide access to potable water which would provide them with healthier conditions to grow and protect their livelihoods. Ultimate, long-term benefits will include, among others, the following:

- An increase in income of smallholder farmers, and commercial farmers adopting irrigation since the same piece of land would be cropped twice per year;
- Growing cereals in rotation with beans would potentially accrue net incremental benefits per farmer in one season. Cumulatively, this would accrue net-income per year at project level;
- There would be rural employment creation for farm labour and processing/packaging activities in the marketing chain;
- There would be an improvement in the lifestyle of the rural community through having more food staples available, better nutrition and health than before;
- A reduction in absolute poverty would reduce thefts from commercial farms around the projects areas thus improving the safety conditions in the farmland;
- Commercial farmers could benefit from having an opportunity to offer contracted services such as mechanized land preparation, aerial spraying, combine harvesting and operation and maintenance of irrigation equipment (centre pivots/pumps);

- Commercial and smallholder farmers would have an opportunity to participate in strategic marketing of cereal crops such as maize, rice, wheat millet/sorghum and beans through warehouse receipt system;
- The irrigation projects would accord the smallholder farmers and commercial farmers who have well developed marketing strategies, have joint bargaining strength in the marketplace;
- There would be built-in capacity for the smallholder farmers to operate an irrigated farming system in an efficient manner;
- Successful implementation of the project would open a wide-ranging opportunities for development as this would be replicated over a larger area within the irrigable farming sites;
- Crop diversification and multiple cropping for a growing local market are possible with irrigation.

## IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The Government through the MINADER will play a central facilitator role in the implementation of programme activities; however, the operational implementation of the programme and projects would be at the province level. Specifically, the MINADER along with local unions of UNACA and local farmers associations, and through the EDA extension stations and GDA irrigation stations will carry out community and stakeholder mobilization and sensitisation meetings about this *Irrigation and Water Resources Management Programme*. To support this effort, the programme includes a programme coordination budget to assist in establishing an implementation and coordination mechanism. This will enable the communities in association with existing informal farmer groups and water user groups participate in the planning and implementation stages of the various components of the programme in different project locations. The communities will thus feel a sense of ownership of the projects. Some of the roles might include one or more of the following:

- Consulting and keeping the community informed of activities;
- Disseminating technical messages and resolving any problem that might arise concerning farming including water and land use rights, land ownership titles, land re-demarcation issues, users’ organization and maintenance;
- Translating the community’s dreams/visions/wishes into practice;
- Taking appropriate action for work not being done or not being done properly;
- Ensuring the community has enough resources to carry out activities;
- Protecting the community’s interests;
- Ensuring proper use of all resources;
- Work towards achieving community’s vision;
- Proposing activities to the community for approval;

- Receiving proposals from the community for implementation;
- Undertaking fund-raising activities for the community/cooperative or association;
- Making community/group action plans;
- Monitor/evaluate group activities.

IX.2. **Decision-making.** It will be very critical to avoid previous mistakes where Government planned and designed projects without consulting the stakeholders except at implementation stage. This type of top-down decision has resulted in failure of many irrigation schemes. It is therefore imperative that smallholders and rural communities in the neighbourhood of the projects establish their own associations and participatory dialogue mechanism within the framework of the formally established GDA irrigation stations aimed at ensuring the principles of economic and social cohesion, self-sustaining and profit-making operations. These associations who would be based at the different project sites will have board members including representatives from the smallholder farmers and small subsistence farmer families, local community-based groups, NGO and agri-business companies with special interests in the envisaged project activities. The board shall have responsibilities of hiring key-personnel to be in-charge or running the affairs of the farmers associations on commercial basis.

IX.3. All contracted services such as development works, irrigation equipment installation, plot demarcation and allocation; mechanized land preparation and levelling, spraying services and marketing shall be procured and facilitated by the GDA irrigation station in close consultation with the farmers associations, NGO and community-based groups. Prevention shall be made for use of inadequate fertilizers, un-tested seeds and individual spraying that may result in selling contaminated or inferior-grade produce as this would result in serious loss of business and confidence from the markets. The model of operation would ensure that quality and quantity of produce is assured. The management concept is community driven in the sense that all decisions on the success and sustainable running of the scheme will be vested in the community; however it will integrate and disseminate the farming practices and crop yields methods of the best smallholder farmers.

IX.4. The farmer beneficiaries will be pivotal elements in deciding the day to day operations as they would be consulted at every decision making stage. Of particular importance will be their participation in planning, designing and operation of the scheme so as to bring about a sense of full ownership of the scheme.

IX.5. In order to maximize on utilization of earth moving and land development equipment available in the area either pertaining to large commercial farms, agri-business companies or leased to MECANAGRO regional stations, the smallholder farmers associations shall hire the services of such equipment for all development works on a most competitive basis. This is a sustainable way to do business rather than depend on Government works departments that might derail the progress of development works. Beneficiary farmers will receive training in irrigation agronomy, water management, pest and disease control, harvesting and marketing in order to ensure that farmers do small and non-specialized operations.

## X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. Although not specifically identified at this stage, it would appear that *short-term technical assistance* would be required in the following areas:

X.2. **Land and water policy and institutional specialist:** This international expert will assist the MINADER in preparing irrigation policy and strategy advice and institutional advice to enable MINADER develop a comprehensive regulatory framework for the water and management issues affecting the irrigations sector and assist in the transition from a centralized management of national irrigation systems to a more decentralized, participatory and self-sustainable management.

X.3. **Training specialist:** This international specialist would be responsible for overseeing all specialist capacity building programmes with respect to technical training. The major areas of training will include cooperative leadership, irrigation agronomy and irrigation water management, crop quality control, packaging/storage and marketing.

X.4. **Post-harvest and storage specialist:** For high-value crops meant for international and region export, there is need to adhere to export regulations and standards. In this regard an international expert in crop quality control, packaging/storage and marketing will be necessary. The expert should have qualifications in post-harvest technology and marketing.

X.5. **Monitoring and evaluation specialist:** To keep track of programme objectives and intended goals and benefits (outputs), a monitoring and evaluation specialist would be required. The specialist will keep track of all progress of the various projects in preparation and going on and help guide its success by recommending timely remedial measures. This will be a national specialist position.

X.6. Only two *long-term technical assistance* would be required covering the following areas:

X.7. **Programme manager:** This specialist (with qualifications in socio-economics) will provide both technical and social advice and coordinate overall programme/project activities throughout the lifespan of the national programme. This will require the services of an international expert.

X.8. **Irrigation and drainage engineer:** An international qualified oversight irrigation and drainage engineer will be required to oversee all engineering works and ensure that there is full adherence by the subcontractors to the project design and this will have participation from the community and stakeholders.

## XI. ISSUES AND PROPOSED ACTIONS

XI.1. The success of the national programme will depend on proper and systematic approach towards planning, design and implementation stages. The following issues will help ensure maximum success:

XI.2. **Community awareness raising:** It is necessary at the inception stage to contract a local or international NGO with experience in agriculture sector to work with the community-based organizations particularly in bringing awareness of the proposed programme/project activities and its benefits and the importance of their maximum participation in planning, designing and implementation. Critical issues will include the decision by the community on what their contribution will be in the implementation of the various projects. It would be the duty of this NGO with the extensionists and irrigation workers from MINADER and associations/cooperatives to ensure that

provincial steering committees overseeing the implementation works in the areas of implementation of the irrigation programme are established and play its role.

XI.3. **Operation of irrigation equipment and mechanized services:** Smallholder irrigation using centre pivot and drip irrigation system will involve a non-traditional system that is sophisticated but much more efficient and easy to invoke smallholders’ organization. For this reason, it might be required to have contract services for operation and maintenance of the equipment. Other services that would be contracted on an entire project-scale basis would include earth levelling, draught power and mechanized land tillage, combine machine harvesting, collective aerial spraying, and bulk marketing. It will be very important that common costs for such services are well understood by the farmers and cost-shared in order to reduce conflicts arising from misunderstanding. All agronomic and cultural practices as well as marketing arrangements will be vested in the farmers.

XI.4. **Cropping pattern:** This is a critical factor with regard to transforming smallholder agriculture, which essentially produced without a market in mind. There is needed to keep in mind that production will be market driven. Considering that highly perishable vegetables require specialized handling and quality standards to find a market in fresh-stores, it would be prudent to establish group-farmer dealings with marketing companies to provide counselling and training. Because of high risks in vegetables business, it would be advisable to engage more in market-linked cereals like maize, rice, wheat and beans. Other potential crops that can be considered are; fruits, paprika, tomatoes, Irish potatoes, and cut flowers (“*rosa de porcelana*”). However, the farmers themselves will decide the cropping pattern.

XI.5. **Project scale:** Despite the entire programme area potentially covering some 162,000 ha as a whole, it is prudent to start on a small project scale in Phase I of the national programme in order to minimize the failure rate. When successful during the initial stage of a defined project, it will be sensible to advance the same project to another stage and/or replicate the experiences learned within the same irrigation system on a multi-stage implementation approach.

XI.6. **Financing:** Although the GoA may be one source of funding, there would be other sources like the ADB, among others, who may consider entering into funding arrangements in support to the implementation of the national programme. The likelihood of achieving a high level of funding of the irrigation programme as a whole would remain on the way how local farmers and communities in the different areas and project locations will respond to the initiative and how the different forms of partnerships would lead to profitable and self sustainable operations. This is crucial as it determines the viability of the national programme.

## XII. POSSIBLE RISKS

XII.1. There are some risks that may abound the project and these are foreseen in the following areas:

XII.2. **Implementation delays:** Funds disbursement if tied to government system will cause unnecessary delays and diversion of funds as it has happened before on some projects. Whilst some of the delays may still be attributed to the unstable economic situation, many are bound to be merely bureaucratic and might similarly jeopardize the implementation schedule of the proposed projects. The programme proposes a more autonomous and decentralized decision-making and management structure should help to reduce such risks.

XII.3. **Farmer interest in irrigation and involvement:** Past experiences to be drawn are dated back prior to independence in 1974 and, to some extent may not be applicable anymore. However, lessons from neighbouring countries indicate that poor performance on small-scale irrigation development has been caused by the farmers themselves who were not interested in using irrigation. To mitigate against this risk, the projects will rely on the involvement of potential participants, extensionists and NGO to interest farmers on crops to be grown and how they will be organized right up from the beginning. This would be done through local association leadership and other stakeholders.

XII.4. **Markets:** The potential for replicating the irrigation scheme would largely fall in the farmers’ ability to market their crops and generate income. The marketing strategy should be developed from the onset and all cost recovery activities should be mapped up on the onset and explained to the farmers.

XII.5. **Land demarcation:** The possibility of farmers not cooperating to have their land re-demarcated and re-allocated to suit the proposed irrigation systems for fear of losing their plots either by size or comparative fertility status has to be considered. This will be mitigated through sensitisation meetings that will outline overall individual farmer benefits and trade offs with the participation of local traditional authorities (“*sobas*”), whenever possible.

XII.6. **Participatory approach:** Top-down approaches to the community might result in poor community participation in the implementation of activities. To counter this problem, the community groups and traditional authorities would be involved in the entire cycle of the project from planning to implementation stages.

XII.7. **Canal siltation/environmental protection.** Run-off and erosion hazard from the catchments area might result in siltation of the main canal in the long run. To mitigate this potential problem, the project will put up a regular maintenance programme for the main canal. For environmental protection in the watershed/catchments area, a community based forestry/afforestation management programme will be put in place.

### Appendix: Standard Costs of Investments in Irrigation Infrastructure

Description	Unit cost (US\$)	Source
1. Centre pivot (75 ha capacity)	1,000/ha	Brazil supplier
2. Drip irrigation (75 ha capacity)	1,000/ha	Brazil supplier
3. Low-lift Irrigation pumps	3,990	CLUSA monthly newsletter April 2004 (Novagro)
4. Canal excavation cum fill	250/m <sup>3</sup>	FAO TCP/ANG/2907
5. Feeder roads:		
• maintenance	2,500/km	MECANAGRO
• new earth roads	5,000/km	MECANAGRO
6. Land preparation (tillage)	80/ha	MECANAGRO
7. Pumping costs (fuel, lubricants, operation)	46.68/1,000m <sup>3</sup>	CLUSA monthly newsletter April 2004
8. Water distribution (pipes, fittings, works)	31.03/1,000m <sup>3</sup>	CLUSA monthly newsletter April 2004