



**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 LIBERIA

SUPPORT TO NEPAD–CAADP IMPLEMENTATION

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Volume II of IV

BANKABLE INVESTMENT PROJECT PROFILE

Project for Inland Swamp Rehabilitation and Development

September 2006

LIBERIA: Support to NEPAD–CAADP Implementation

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

Bankable Investment Project Profiles (BIPPs)

Volume II: Project for Inland Swamp Rehabilitation and Development

Volume III: Project for Sustainable Fisheries and Aquaculture Development

**Volume IV: Project for Market–oriented Agroforestry and Tree Crops
Production Systems**

NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

Country: Liberia

Sector of Activities: Agriculture

Proposed Project Name: **Project for Inland Swamp Rehabilitation and Development**

Project Location: Counties of Lofa, Grand Gedeh and River Gee

Duration of Project: 5 years (estimate)

Estimated Cost: **US\$ 7,000,000**

Suggested Financing:

<i>Source</i>	<i>US\$ million</i>	<i>% of total</i>
<i>Government</i>	0.2	3
<i>Financing institution(s)</i>	6.8	97
<i>Beneficiaries</i>	–	–
<i>Total</i>	<i>7.0</i>	<i>100</i>

LIBERIA

NEPAD–CAADP Bankable Investment Project Profile

“Project for Inland Swamp Rehabilitation and Development”

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Currency Equivalents

(September 2006)

Local Currency	=	Liberian dollar (L\$)
US\$1.00	=	L\$59.50
L\$100	=	US\$1.68

Abbreviations

ADA	African Development Aid
ADB	African development Bank
CAADP	Comprehensive Africa Agriculture Development Programme
CARI	Central Agricultural Research Institute
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GOL	Government of Liberia
IVS	Inland Valley Swamps
IWMI	International Water Management Institute
LCADP	Lofa County Agricultural Development Project
NEPAD	New Partnership for Africa’s Development
SHIDA	Smallholder Irrigation Development Authority
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WRC	Water Resources Center

I. PROJECT BACKGROUND

A. Project Origin

I.1. The Government of Liberia recognizes the importance of the agricultural sector, not only as a source of food for the population, but also as the nucleus of its development and socio-economic sustainability. The present “*Project for inland swamp rehabilitation and development*” was prioritized during the preparation of the National Medium-Term Investment Programme in Agriculture and Rural Development, under the auspices of NEPAD and the technical support of FAO. Prior to the onset of the civil war, some projects were implemented for swamp and aquaculture development, with support from various aid agencies.

I.2. To prepare this profile, a field trip was conducted by the team to collect field data in the specified counties, to review the existing data, and to talk to farmers and NGOs in the respective communities. The team identified needs, extracted lessons learnt and tested development approaches and techniques related to swamp management.

B. General Information

I.3. Liberia is a West African country with a total area of 111,370 km². The country holds a larger portion of West Africa’s natural rain forest area; however, the intensive and prolonged farming, as well as the exploitation of timber in the forest, is making the vegetation rapidly change into savanna woodland. The climate of Liberia is a monsoon type humid tropical with two distinct seasons: rainy season from May to October and a dry season from November to April. Most harvest is done in the dry season. The temperature of Liberia ranges from 14° to 33°C. The humidity is high throughout the year, easing the multiplication of pests and diseases of crops and animals. The climate of Liberia also favours the production of a wide range of tropical crops, which enhances the diversification of agricultural production as well as the development of export products.

I.4. It is estimated that the population of Liberia was about 3.5 million in 2005, including refugees. It is also estimated that the war displaced about 1,000,000 people internally and about 460,000 externally while total deaths were about 150,000. Recent reports indicate that significant numbers of displaced persons have returned to their abandoned homes, particularly in Bomi, Lofa, Cape Mount and Bong counties. Women, children, the disabled and the aged constitute the most vulnerable groups in the country. The need to empower women will help educate children for sustainable livelihoods in the future.

I.5. Liberia is facing a post-war period of serious political, financial, administrative and organizational problems that has led to multiple internal displacements of people; disrupted supply of food and increased the vulnerability of women and children to extreme poverty, hunger, disease and AIDS. Access to education is limited and an estimated 80 percent of schools, health service structures, water wells, and other facilities have been either destroyed or abandoned since 1998. There is no up-to-date water supply nor sanitation coverage, but those still functioning are in alarming and worrying conditions in almost all counties. As a result, mortality rates remain high and may deteriorate as population increases.

I.6. The Liberian economy consists essentially of a strong traditional agrarian sector comprising largely of subsistence farmers, mainly women with an average farm size of one and a half hectare. Rubber, timber and mining industries together accounted for only 7 percent of GDP but for 70 percent of public sector revenue and 60 percent of total external trade before the war. Presently, rubber is the

leading export commodity, since mining activities have ceased, accounting for 67 percent of total exports by volume. The Liberian economy has a rather narrow base as it depends on only a few commodities for growth at present.

I.7. The medium- and large-scale business or commercial sector of the economy, however, is almost exclusively in the hands of foreigners, partly because of the inability of the local entrepreneurs to raise capital to compete. The poor performance of the banks as well as the acute shortage of hard currency have exacerbated the situation, thus making it difficult for local businessmen who have no access to foreign exchange to invest in the sector.

I.8. One of the major resources of Liberia is water, which is seriously under-utilized, yet abundant throughout the country. Liberia is estimated to have more than 71,000 m³ per year of water resources per inhabitant, which is among the highest in African countries. However, its use is not effectively managed. The agriculture sector is estimated to use about 57 percent; the domestic sector about 28 percent and the rest (15 percent) by other indoor sector activities.

I.9. Liberia shares almost all of its important or major rivers with all the neighbouring countries. The abundance of surface water is mainly during the rainy season but there is a drastic decrease of surface water during the dry season when most of the rivers are completely dry. Such condition is unfavourable to irrigation; makes irrigation costly and labour intensive, therefore, water management becomes a major priority to sustain irrigation activities.

I.10. At present, or before the onset of the civil crisis in Liberia, only about 10,000 ha of a total of 600,000 ha of inland valleys had been developed to some extent, and used for agriculture. At present, less than 50% of the developed swamps are being cultivated. Inland swamps can be found in all areas of the country, making it possible for the diversification of such farming in every part of the country. Inland valley productivity potential is greater than that of the uplands due to higher organic matter content and a more favourable water regime for a longer period during the year. Under traditional farming practices, yields of rice, the country's staple food crop, present the average of about 1 ton/ha. However, under improved water management practices, rice yields in the range 3–4 tons/ha have been achieved.

I.11. The interest of inland swamp development continues to gain prominence, especially to refrain from expansion of agriculture into forests due to shifting cultivation methods. The inland swamps have a higher productivity potential than the upland because of the readily available water resource and the abundance of organic matter.

I.12. There are no irrigated food crop production in the country as of yet; however, there are market gardening activities being carried out, contributing to the socio-economic activity in Liberia. Local farmers manage to produce the common and basic crops for urban consumption throughout the year. These crops can be grown anywhere during the rainy season, but during the dry season, farmers move their crop gardening to mangrove swamps and river basins to enable them continue the supply of these crops to the urban dwellers. Crops that are commonly grown in this way include green leafy vegetables, cassava, sweet potato, cucumber, corn, pepper, okra and onion.

I.13. Market gardening is practiced more intensely during the dry season when water resources are generally scarce and the demand for horticulture crops is higher than during the rainy season. Farmers that cannot access water from wells are compelled to move to valley bottoms or swamps. Therefore, there is a need to identify and implement simple and appropriate technology for utilizing soil and water resources in order to extending crop production during the dry season.

II. PROJECT AREA

II.1. The proposed areas for project intervention are the counties of Lofa, Grand Gedeh and River Gee. Their selection is based on a notable potential for swamp development, past project experience and high rural development needs. River Gee County has a vast range of inland swamps that are drained by the same rivers of Grand Gedeh, since they share common border.

II.2. The counties of Lofa, Grand Gedeh and River Gee face urgent agricultural development support. Lofa was severely affected by war. Grand Degeh and River Gee are found at the bottom of the developmental ladder. The selected areas have a high concentration of inland valley swamps’ farmers who are actively engaged in intensive rice production. They have a history of being recipients of rice production support projects. The main agricultural features of each of these counties are next outlined.

II.3. **Lofa County** is located in the northwest of the country and has a population of about 276,000 inhabitants. The land is highly mountainous. Despite the many mountain ranges, it has one of the largest inland valley swamp area in the north of the country. Before the onset of the civil crisis, Lofa was part of the “bread basket” of Liberia because of its very fertile soils. Nowadays there is a need to strengthen its production in inland valleys, especially as Lofa County received the worst destruction during the war as compared to the other two selected counties. In addition, Lofa County has a past record of market gardeners, cooperatives and implementing major agricultural projects, such as the Lofa County Agricultural Development Project (LCADP). Before the civil war, Lofa County had farmer cooperatives and associations that engaged in rice production, as well as in tree crop production in each of the districts: e.g. Voinjama District Farmers Cooperative, Zorzor District Farmers Cooperative, Quadu Gbondi Farmers Cooperative, Foya District Farmers Cooperative and Gbandi Farmers cooperative. Each of these cooperatives had more than 50 farm households actively engaged in production and marketing through the cooperatives. There is accordingly a potential in rebuilding the cooperative spirit and dynamic.

II.4. **Grand Gedeh** is a county located in the southeastern region of Liberia, encompassing the second largest rainforest area of Liberia. It has a vast range of inland swamps, which are part of the Cavalla River watershed and other major watersheds of the country. The county was proportionately less affected by war in terms of infrastructure; however, it has limited roads, a dense forest and scattered villages.

II.5. **River Gee** is located in the southeastern region of the country with almost similar vegetation to that of Grand Gedeh County. Farming in River Gee County is not anymore intense in the postwar reality. Most farm families have shifted from crop production to mining, having advanced little in agricultural rehabilitation.

III. PROJECT RATIONALE

III.1. Liberia lies almost entirely within the tropical rain forest zone. The annual rainfall is very high, ranging from 1,600 mm inland to 4,600 mm on the coast. The country still has a considerable amount of West Africa’s rain forest that covers the mountains, hills and inland swamps, which are drained by the many rivers. Crop production mainly consists in shifting cultivation, which implies risks of degradation of the land resources. The development of inland swamps can reduce pressure on forest and land resources, improving food production and income in rural areas. Although there is adequate amount of water throughout most of the year, there are water shortages during some part of

the dry season. Water control and soil management measures are necessary for the sustainable and effective development of swamp areas.

III.2. Liberia has the potential of 600,000 ha of inland swamp development, of which only about 10,000 ha have been layout or developed. The country has experience in developing inland swamps for agricultural purposes. The three selected counties have a potential area for cost-effective development of inland swamps of around 31,000 ha, of which around 1,000 ha were rehabilitated in previous years (see Table 1).

Table 1: Rehabilitation of inland valley swamps (IVS) in targeted areas					
County	IVS area (ha)	Rehabilitated (ha)	Implementing organization	Funding agency	Years of operation
Lofa	10,382	441	ADA	UNDP USAID	2003–2006 2004–2006
Grand Gedeh	12,252	376	ECRRP	EU	1982–1999
River Gee	8,700	250	ECRRP	EU	1982–1999
Total	31,334	1,067			
Note: Swamps developed in southeast region of the country were long abandoned before the civil crisis. Most of the farmers have become miners.					

III.3. Prior attempts to develop inland swamps have often met with difficulties, especially when the aim was to completely develop the swamps without due regard of the biophysical characteristics. This approach resulted in the abandonment of some projects because some swamps became excessively drained, whereas the indiscriminate clearing of the adjacent upland areas led into accelerated soil erosion. This resulted in the clogging of peripheral canals and drains, which negatively affected the hydraulic behaviour of developed swamps and resulted in reduced crop yields. There is a need, therefore, to approach inland valley swamp development and/or rehabilitation from an integral perspective of the whole catchments, from the upland to the valley bottom.

III.4. Farming in swamps poses various health risks and, for that reason, carry out certain social stigma. In the past, reported cases of schistosomiasis, dracunculiasis, leach infestations and other parasites deterred people from farming in the swamps. Historically, farmers did not want to cultivate them. Now, however, farmers show an increasing interest for the agricultural potential of swamps, since rice production doubles and sometimes triples that of uplands. The use of adequate gear would significantly reduce the health risks and, hence, the social stigma.

III.5. Low crop production with swamp rice was due to lack of proper irrigation systems and water management technologies. A focus must be placed on the management of the water resources. The goal of rice production is not new to the Liberian farmers because they have been doing this for various decades, though on a very low scale level. Swampland development started in the 1950s in Liberia and farmers are aware of the country’s potential of inland swamp production. The rehabilitation of existing inland swamps and the development of new inland swamps will further exacerbate its highest potential for the contribution to food and economic national security.

III.6. The increasing economic and nutrition importance of small-scale market gardening, especially in view of growing urban populations, demands upgrading the capacity of the operators in this sector of agriculture. Women are a prominent actor in gardening agriculture. Gardening is usually done during the dry season when the availability of water is limited, so it becomes very time consuming and labour intensive. Small-scale irrigation technologies are highly valuable for this sector, which promises many benefits in economic, nutrition and gender equality terms.

III.7. In view of the potential of water-based agricultural development, Liberia needs institutional strengthening in this domain. In particular, there is need to improve the network of agro-climate stations and establish technical support for water management and small-scale irrigation.

IV. PROJECT OBJECTIVES

IV.1. The *overall objective* of the project is to increase food production and rural incomes through developing inland swamps.

IV.2. The *specific objectives* of the project are:

- to rehabilitate inland swamps and develop some new swamps for the production of mainly rice;
- to promote small-scale irrigation oriented to women-led market gardening; and
- to strengthen institutional capacity in water resources management for agriculture.

V. PROJECT DESCRIPTION

Component 1: Rehabilitation and development of inland swamps

V.1. *Overview.* This component will finance both the rehabilitation of previously-developed swamps and completing swamp development projects that were abandoned due to lack of funds, poor technical support or no political will. The project will also develop new inland swamps. In total, the component will bring about 3,850 ha of inland swamps into rice production. This may result in a production of up to 32,000 tons of paddy rice annually, at the average production rate of 4 tons per hectare per season (assuming 2 annual seasons). The aim is to raise rice production as quickly as possible in every project area as a contribution to the achievement of the national goal of food security. This target can be achieved within five years.

County	Rehabilitation of IVS		Development of IVS		Total	
	Area rehabilitated (ha)	Production (t)	Area developed (ha)	Production (t)	Area rehabil. & developed (ha)	Production (t)
Lofa	493.6	3,948.8	740.4	5,923.2	1,234	9,872.0
Grand Gedeh	580.8	4,646.4	871.2	6,969.6	1,452	11,616.0
River Gee	466.8	3,734.4	700.2	7,002.0	1,167	10,736.4
Total	1,541.2	12,329.6	2,311.8	19,894.8	3,853	32,224.4

Note: Production assuming 2 crop per year and average yield of 4 t/ha per crop.

V.2. *Inventorise, select and survey swamps.* Preliminary visits and surveys will be conducted in each district to identify the location of swamps that are to be rehabilitated as well as virgin swamps to be developed. Farmers’ groups with experience in swamp management will be identified too. Existing topographic maps, backed by additional surveys, will be raised for the determination of the actual magnitude of the rehabilitation and development work needed.

V.3. Depending on the type of swamp, detailed engineering and soil surveys will be necessary for designing appropriate water control facilities. For assessing the suitability of swamps for water control development, certain water availability indices are computed for agro-climatic stations, which need to be established, in the targeted districts. These parameters are then considered together with recognized categorizations of inland swamps in terms of their surface water regime and soil physical properties. Site-specific surveys and measurements of selected swamps will be carried out in order to obtain data that will be required for the design of each swamp.

V.4. After a complete characterization with studies and other field observations, selected inland swamps will be classified in terms of their amenability to water control development. The main types are as follows:

- *Swamps having surface water throughout the year.* These swamps are found in the eastern part of the country, where the moisture availability is higher. Swamps under this category will require little water storage for a second crop season, but provision must be made in the design for the control of flood water entering the swamp from the side and head catchments. Swamps in this category would be given top priority for development wherever they are located, provided also that the farming communities that are utilizing them are well organized and motivated to contribute to the project implementation.
- *Swamps having surface water till January/February.* These swamps are usually of lower moisture content as compared to the previous ones because of the shorter rainfall. Such swamps are mostly found in the northwestern part of the country, where the growing period is shorter (about 259 days). This type of inland valley swamp will require storage of water to expand the growing period through January and February.
- *Inland swamps receiving sand-laden runoff from the catchments and subject to excessive flooding.* These swamp type is commonly found in the Coastal Plains agro-climatic region of the country, and are characterized by coarse textured soils that are easily eroded by runoff waters. The basic requirements for the development are improved drainage and prevention of direct sand-laden runoff from the side catchments into the cultivated areas.

V.5. Detailed soils, topographic, and hydrological surveys, backed by discussions with farmers must be considered for the development of land and water management within the catchments.

V.6. ***Training of swamp construction facilitators.*** In the selected districts, there is personnel capable of jump-starting the preparation and construction of swamp sites. There is, however, a need to train these facilitators, and new ones, due to the effects of prolonged war. Tapping from the pool of existing trained and experienced facilitators, the project has an advantage for implementation, especially because the construction facilitators are familiar with the areas' climatic condition. Furthermore, the goal of sensitization regarding the exploitation of inland valley swamps is nothing new, but needs a new wave so to overcome the existing health and cultural barriers. The emphasis on proper working gear for protection must be a priority.

V.7. Construction facilitators will be selected according to location, swamp size and community. They will be identified in each district/area and given appropriate training and refreshment courses in the basic aspects of swamp rehabilitation and/or development, as well as on water management and improved farming methods. They will be trained to train farm facilitators and thus create a chain of swamp management specialists. A Farmer Field School scheme may be also established to enhance farmer capacities to manage the swamps and address present and future challenges related to swamp agriculture.

V.8. **Construction implementation and supervision.** Farmers will be involved since in the planning of construction because they are the ones to provide the bulk of the labour and the future users and managers of the farm swamps. The site selection and the plan of works will be done together with the farmers’ groups. The technical staff will determine quantity of earthwork required after the field layouts have been prepared, estimating realistic targets based on farmers’ ability and mobilization. Since the bulk of the labour will be provided by the farmers themselves, the project will make suitable arrangements for the farmers to access agricultural inputs and other support as needed in each district. Provision of proper gears for labour will be mandatory for the project.

V.9. **Support in farming and post-harvest activities.** The project will finance training, equipment and infrastructure to facilitate effective production and marketing of rice (and other crops) in the selected swamps. Provision of essential inputs, post-harvest facilities (e.g. storage) and training in cooperative management are examples of eligible actions for financing. Support to access loans will be also provided so that farmers and communities soon regain autonomy in using the swamps. An estimated set of equipment and minor support infrastructure that the project may finance is presented below in Table 3.

Table 3: Developed IVS areas and facilities to be provided under Component 1						
County	IVS area under rice production (ha)	Facilities to be provided (in numbers)				
		Power tillers	Rice threshers	Rice hullers	Multipurpose stores	Drying floors
Lofa	1,234	3	12	25	3	3
Grand Gedeh	1,452	3	14	29	3	3
River Gee	1,167	2	11	23	2	2
Total	3,853	8	37	77	8	8

Component 2: Promotion of small-scale community irrigation

V.10. This component will support small-scale irrigation, at community level, with a priority focus on women. The goal is to deploy new practices and technologies that are relevant to improve food security, nutrition, income sources and labour management, particularly among women. Small-scale irrigation is very useful for women interested and engaged in horticulture, and it is a good complement to swamp development. The dissemination of micro-irrigation technologies, introduction of water harvesting technology and the implementation of a pilot activity in the processing and marketing of food/cash crops, if successful, will enable the project to assess economic viability of the use of such technology. For instance, the introduction of the treadle pump to a few farmers in certain areas of the country will serve to test that the pump fits into current production activities and makes impact on crop irrigation as well as on expansion of cultivated acreages.

V.11. In essence, this component focuses in the modernization of current traditional methods of irrigated crop production by introducing simple, low-cost technologies that would help to remove the drudgery from labour while also expanding the cultivable area. Women are, as indicated above, the primary beneficiaries. In fact, most of the market gardeners in the project area are women.

V.12. The goal is to equip about 1,500 women gardeners in the targeted counties with 750 micro-irrigation sets in order to enable them to intensify the production of horticulture food/cash crops in existing lands.

V.13. The project will start by identifying and selecting women groups interested in horticulture. Irrigation technologies will be introduced and demonstrated. The technologies introduced will

comprise appropriate medium micro-irrigation systems with shallow tube wells and concrete and/or plastic reservoirs. This activity will be carried out in farmers’ community gardens in each county. The initial purpose is to raise awareness about the existence of such technologies and to make initial assessment of the requirements and feasibility for a potential upscaling. The demonstration will feature different modes of applying the irrigation pump for crop irrigation and, possibly, for other uses such as livestock watering. It will be carried out in fields having different layouts, topography and sources of water.

V.14. Shallow-tube wells will be implemented at strategic locations in each swamp site in such a way that one well-and-pump set could serve up to four farmers. This method is better than excavating many wells in a developed swamp. However, the most appropriate layout would be adopted based on the topography and layout of plots. Two farmers will be selected from each association/group farm to take part in a training course, which will focus on the correct installation, operation, care and minor routine maintenance of the irrigation systems; on crop agronomy (seed bed preparation, nursery care, compost making, the use of green manures, fertilizer application); and on irrigation water management. Training will be done during the dry season to coincide with the peak period of vegetable production. In addition to farmer facilitators, interested local artisans having the potential for providing major repair services to farmers will be trained in the repair of certain components of the irrigation technologies. Following the initial training, each graduate facilitator will be assigned to one group of gardeners in each district for training the other farmers. Project personnel will monitor the performance of the trainers and provide any assistance that may be required.

V.15. The component will also finance a pilot activity aiming at the dissemination of **new water harvesting technologies**. Five “tanks”/farm ponds will be developed in feasible swamp sites in Lofa County to serve as a pilot area, of 20 ha each. Lofa County is selected for this pilot activity because the hydrological characterization shows that this area has all water-regime types of inland swamps. This sub-component will be implemented in seasonal swamps sites that have a potential for supporting an extra crop of rice or other food crop by using runoff water stored in a “tank” or farm pond. The inland valleys constitute an appropriate ecology for impounding both direct precipitation and runoff during the period of declining rains. The impounded water can later be used for the irrigation of crops grown down stream in the valley bottom or it can be lifted using micro-irrigation pumps. The water can also be used for establishing fast-growing tree species on the crests, thus conserving this part of the landscape. Specific activities will include as follows: (i) identify and select suitable swamp sites; (ii) survey selected sites and design water harvesting facilities; (iii) mobilize and train beneficiary farmers in basic construction skills; (iv) undertake and supervise construction; (v) train farmers in the operation and maintenance of the facilities; (vi) empower farmers to undertake crop production activities; and (vii) monitor the use and performance of the systems.

V.16. The anticipated needs and outputs for this component are summarized in table 4.

County	Area cropped (ha)	Gardeners (beneficiaries)	Pumps	Wells	Reservoirs
Lofa	50	500	250	250	250
Grand Gedeh	50	500	250	250	250
River Gee	50	500	250	250	250
Total	150	1,500	750	750	750

V.17. The small-scale community irrigation component of the project is expected to benefit directly 1,500 small-scale market gardeners (or a total household’s population of about 9,000) in the targeted counties.

Component 3. Strengthening institutional capacity in water resources management

V.18. The goal of this component is to build the capacity of relevant local institutions for more effective planning and implementation of water resources management and development. There is a need to revitalize the country’s Central Agricultural Research Institute (CARI) as soon as possible, so it can support this project with the required amount of applied research and technology adaptation. For the capacity building in water resource management, the Ministry of Agriculture, in collaboration with the Ministry of Lands, Mines and Energy, will have to rehabilitate or establish agro–meteorological stations in other parts of the country.

V.19. Specific activities and outputs under this component comprise as follows:

- Establish a *Smallholder Irrigation Development Authority* – SHIDA (equipped with hydrological and land resources mapping facilities for implementing projects);
- Establish agro–meteorological stations in each targeted county (output: about 10 rehabilitated and re–equipped agro–met stations);
- Upgrade the skills of the Smallholder Irrigation Development Authority senior personnel and field technicians in agro–met data collection, recording, processing, packaging and dissemination (proposed output: 24 water/land technicians trained in hydro–met data collection and processing);
- Provide skilled training in water resources development (various specialized courses and training workshops to be held in Liberia);
- Establish hydrological equipment in key lowland agro–ecologies for continuous stream gauging and monitoring;
- Facilitate the establishment of a *Water Resources Center* (WRC) at the University of Liberia.

V.20. The above activities will be phased as shown in the table below:

Table 5: Phasing of the activities of Component 3 of the Project					
Activities	Year of implementation				
	1	2	3	4	5
1. Establish the Smallholder Irrigation Development Authority (SHIDA)	X	X			
2. Establish agro–meteorological stations in each targeted county	X	X			
3. Upgrade the skills of the SHIDA senior personnel and field technicians in agro–met data collection, recording, processing, packaging and dissemination	X	X	X		
4. Provide skilled training in water resources development		X	X	X	
5. Establish hydrological equipment in key lowland agro–ecologies for continuous stream gauging and monitoring			X	X	X
6. Facilitate the establishment of a Water Resources Center (WRC) at the University of Liberia		X	X		

V.21. The proposed Smallholder Irrigation Development Authority would be a semi–autonomous, parastatal organization mandated to plan and implement this project, as well as the engineering and socio–economic aspects of land and water development projects at the smallholder agricultural sector. It will have the authority to identify and source funding from donor/private organizations and have access to an agricultural development fund for its day–to–day activities.

V.22. Both SHIDA and the WRC will collaborate in planning and implementing the following activities:

- Provide the Project Management unit for this project;
- Train field technicians in data collection, recording and processing;
- Mount short-term training courses for agricultural extension personnel and farmers in relevant aspects of land and water management;
- Develop a comprehensive package for the development of the country’s surface and ground water resources;
- Undertake relevant Research and Development projects in water resources assessment, planning, development and monitoring (with focus on grasslands and IVS);
- Establish linkages with other organizations, such as the International Water Management Institute (IWMI), for collaborative activities in agricultural water management.

VI. ESTIMATED PROJECT COST

VI.1. Since there is lack of reliable unit cost data, a broad estimation of Project costs is presented, by component, in Table 6 below. It assumes that farmers will contribute with labour force, particularly in Component 1. In addition, it is estimated that 150 ha of small-scale irrigation, plus pilot water harvesting initiatives, together with technical, management and other training support to beneficiary women groups, all under Component 2, will cost around US\$800,000.

Component	Financing institution	GOL contribution	Total
1. Rehabilitation and development of inland swamps	4,500,000		4,500,000
2. Promotion of small-scale commercial irrigation	750,000	50,000	800,000
3. Strengthening institutional capacity	550,000	50,000	600,000
4. Project management (~ 12%)	700,000	100,000	800,000
Total baseline cost	6,500,000	200,000	6,700,000
Contingencies (~ 5%)	300,000		300,000
Total costs	6,800,000	200,000	7,000,000

VII. PROPOSED SOURCES OF FINANCING

VII.1. Due to civil war and the ban on timber and minerals, Liberia’s Government has a reduced budget, particularly for investing in development. Accordingly, this project would rely significantly on external funding, such as may be USAID, the European Union and the African Development Bank (ADB).

VIII. PROJECT BENEFITS

VIII.1. The main beneficiaries of this project would be:

- The vulnerable farm families in the rural areas, through increased availability of food;
- Women market gardeners: reduced drudgery, increased household income, potentially better nutrition and improved health status at household level;
- Youths in the rural areas who will benefit from increased employment opportunities;
- Enhanced technical capacity at the rural level in the areas of swamp construction, water management, equipment operation and maintenance;
- Improved management and conservation of the natural resources base.

VIII.2. The total number of farmers who will benefit directly from the swamp rehabilitation/development and small-scale community irrigation components of the project is estimated to be around 46,000 in all the targeted districts.

IX. IMPLEMENTATION ARRANGEMENTS

IX.1. The overall administrative management and technical execution of the project will be the responsibility of the Ministry of Agriculture, with collaborative contributions from the Ministry of Land, Mines and Energy. However, there is the need to form an authority outside of the ministry that will be responsible for irrigation purposes; along with its technical mandates. After many years of civil crisis, the Ministry of Agriculture may not be prepared to provide the requisite professionals from within, but may recruit from outside sectors, specifically for the irrigation of the project.

IX.2. A technical implementation team will be drawn from professionals in irrigation, water resources development, crop production, post-harvest mechanization and agricultural extension. The team will be responsible for planning and implementing all the technical aspects of the project, including the identification of the potential participating communities, the conduct of surveys, design and construction, mobilization and training of farmers, and the machinery operation and maintenance.

IX.3. The technical team will have the mandate to identify suitable local contractors or work teams from within the various communities in each district and make appropriate recommendations for their engagement on contractual terms.

IX.4. The main responsibility of the benefiting communities is the organization of their members for effective participation in the activities of the project in their respective locations. Beneficiaries will have to be members of the respective farmers’ groups. In order to ensure sustained commitment by the beneficiaries, their leaders (i.e. chiefdom/village farmers’ association executives and local government authorities) will be encouraged to be part of the planning team at local level. Beneficiaries will be required to pay some user fees for the irrigation facilities that would be developed in their locations, and hence contribute towards their maintenance.

IX.5. **Monitoring.** This project will not be successful without the constant monitoring of all aspects. There is a need to put in place a better instrument of monitoring the performance of all systems.

IX.6. **Micro-credit support.** The activities intended by this project (mainly swamp development and small-scale irrigation) need not only external capital to finance basic infrastructure and equipment, but also an accessible micro-financing system for farmers to maintain their initiatives viable. Liberian farmers, as many other African farmers, do not have readily available funds or sources of funding to enable them improve their economic activities. The need to provide a credit delivery mechanism to the farmers is paramount to the success of the farmers in their quest for improved and sustainable agriculture. Before the onset of the civil crisis in Liberia, there were financial institutions established for this purpose (for instance, the Agricultural Cooperative Development Bank), but they did not live to its mandate. The main problem was that the farmers did not have the requisite credit collateral to qualify for the credit; so they did not benefit from the credit mechanism that was established. The bank resulted into lending to non-farmers.

X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. The major Technical Assistance inputs that would be required, in the medium/long-term, for project management and implementation are as follows:

- **Overall Project Management:**
 - One agronomist;
 - One socio-economist;
 - One financial controller;
 - One agricultural engineer (expertise in small-scale irrigation and water management project).
- **Technical Implementation:**
 - One land and water resources development specialist;
 - One irrigation engineer;
 - One land use specialist;
 - One environmental specialist;
 - One agricultural engineer (mechanization/post-harvest).

X.2. In addition to the above requirements, an expert would be required to advise on, and assist in setting up a water resources authority, under Component 3 of the project, as well as to support water users' associations. This expert will be contracted for only a short-term assignment, i.e. 2–3 months.

XI. ISSUES AND PROPOSED ACTIONS

XI.1. **Environmental Concerns** This project will involve the rehabilitation and development of 3,853 ha of inland valley swamps in total. Therefore, it becomes a priority to consider the environmental concerns. There have been mistakes made during previous projects, especially in swamp selection, design and construction. That led to severe degradation of the land resources, due to the lack of understanding of the biophysical and socio-economic aspects associated with each swamp type and community. Due environmental management plans for swamp development will therefore be conducted. Furthermore, environmental monitoring in developed/rehabilitated swamps will become part of a routine activity.

XI.2. ***Introduction of New Micro-irrigation Technologies into the Farming System*** The use of micro-irrigation pumps and farm ponds is relatively new among farmers in Liberia, especially irrigation pumps. These new technologies are met to induce some changes in the socio-economic set up within farm families by increasing the incomes from the sale of the products obtained using this technology. Beneficiaries of such technologies for the first time will need some technical assistance during the first few months of installation through extension worker’s visits, information dissemination and other sensitization means.

XI.3. ***Sustainability of Technologies*** The useful life span of the micro-irrigation pumps is about five years, which coincides with the project’s life. There will be the need to ensure that these technologies persist over the years and that farmers do not allow developed swamps to relapse to “bush” after the project is phased out. Beneficiaries will be urged to contribute towards defraying part of the investment developing cost of the technologies so that, where appropriate, the accumulated funds can be used to procure additional technologies and to develop new ones locally. Emphasis will also be placed on the training of farmers in technology maintenance. Identified and interested artisans in the respective communities will be trained in the repair of the micro-irrigation pumps.

XI.4. ***Post-harvest Technologies*** to farmers in Liberia have always been a major issue of crop production; especially the machinery and the infrastructure. This project will make available a wide range of types of crop production and post-production machinery for use by beneficiary farmers. To ensure proper use and maintenance of the machinery, project management will facilitate the formation of viable teams of machinery operators and maintenance technicians in the various communities. These teams will be provided with adequate tools to enable them maintain the machinery. A suitable reward system will be agreed with the beneficiaries.

XII. POSSIBLE RISKS

XII.1. Failure on the part of the Government of Liberia to improve work conditions in the country, or to provide additional incentives to re-assigned staff, could affect project implementation adversely.

XII.2. The anticipated increases in crop production, especially of non-rice food crops, due to new irrigation technologies, could pose problems for marketing the surplus produce. The lack of adequate market outlets could disincentive farmers to take advantage of the new developments in water management.

XII.3. For developed swamps to achieve their expected output, farmers would need critical support, especially in terms of sustainable credit mechanism. The ability of the rural financial sector to meet the challenges constitutes a risk factor for this project.