



**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 MAURITIUS**

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

**TCP/MAR/2904 (I)  
(NEPAD Ref. 05/16 E)**

**Volume IV of VII**

### **BANKABLE INVESTMENT PROJECT PROFILE**

**Sustainable Land and Water Management**

*February 2005*



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

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

*Bankable Investment Project Profiles (BIPPs)*

**Volume II: Agricultural Diversification (Integrated Processing and Marketing)**

**Volume III: Mauritius Agricultural Information System (MAIS)**

**Volume IV: Sustainable Land and Water Management**

**Volume V: Community Development and Poverty Alleviation Project**

**Volume VI: Mauritius Agricultural Biotechnology Institute (MABI)**

**Volume VII: Strengthening the Agro–Processing Capacity of Rodrigues**



## NEPAD–CAADP BANKABLE INVESTMENT PROJECT PROFILE

**Country:** Mauritius

**Sector of Activities:** Irrigation

**Proposed Project Name:** **Sustainable Land and Water Management**

**Project Location:** Uplands and Victoria

**Duration of Project:** Between 1 to 5 years, depending on project components

**Estimated Cost:** **Rs141,200,000**

**Suggested Financing:**

<i>Source</i>	<i>US\$ million<sup>1</sup></i>	<i>Rs million</i>	<i>% of total</i>
<i>Government</i>	0.12	3.5 <sup>2</sup>	2.5
<i>Financing institution(s)</i>	4.65	137.7	97.5
<i>Beneficiaries</i>	–	–	–
<i>Private sector</i>	–	–	–
<b><i>Total</i></b>	<b><i>4.79</i></b>	<b><i>141.2</i></b>	<b><i>100.0</i></b>

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<sup>1</sup> Exchange rate:  
 Currency: Mauritius Rupee (Rs)  
 US\$1 =Rs29.5  
 Rs1 = US\$0.0339

<sup>2</sup> As per budgetary allocations (2004/05).



**MAURITIUS:**  
**NEPAD–CAADP Bankable Investment Project Profile**  
*“Sustainable Land and Water Management”*

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### Abbreviations

AMSP	Agricultural Management and Services Project
AREU	Agricultural Research and Extension Unit
BIPP	Bankable Investment Project Profile
BMU	Block Management Unit
CAADP	Comprehensive Africa Agriculture Development Programme
DARE	Directorate of Agricultural Research and Extension
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FSC	Farmers Service Corporation
IFAD	International Fund for Agricultural Development
IMT	Irrigation Management Transfer
IPU	Irrigation Planning Unit
LAMU	Land Area Management Unit
MAFTNR	Ministry of Agriculture, Food Technology and Natural Resources
MIS	Market Information System
NEPAD	New Partnership for Africa’s Development
NMTIP	National Medium–Term Investment Programme
NPIP	Northern Plains Irrigation Project
NSSSP	Non–Sugar Sector Strategic Plan (2003–2007)
PIM	Participatory Irrigation Management
RDP	Rural Diversification Programme
SPMPC	Sugar Planters Mechanical Pool Corporation
UFW	Unaccounted for Water
WRU	Water Resources Unit
WUCS/WUA	Water Users Cooperative Societies / Water Users Association



## I. PROJECT BACKGROUND

### A. Origin and Summary Description

I.1. The project comprises several components which provide an integrated support to irrigation developments in Mauritius, particularly in the Victoria region. The project provides for investments in new irrigation structures, capacity building of the beneficiaries as well as support to the existing irrigation facilities in the North (*Northern Plains Irrigation Project*, NPIP) through the reforestation of the main catchments region in Mauritius.

I.2. All the project components (outlined below) fall under the pillar of the *Comprehensive Africa Agriculture Development Programme* (CAADP) of sustainable land management and reliable water control systems. The project is in line with the priorities identified in the *National Medium-Term Investment Programme* (NMTIP) for Mauritius and in the strategic plan for the agricultural sector, which promotes the judicious utilization of water resources in agriculture. In the *Sugar Sector Strategic Plan*, the target has been set to increase the area under irrigation to some 32,000 hectares by 2010, in the context of water efficient systems. The government has committed significant investment to the extension of irrigation facilities in the financial budget 2004/05 with a provision of Rs127 million, destined primarily for small scale irrigation projects.

#### Component 1: Irrigation Infrastructure

I.3. **Subcomponent 1.1: Victoria Small Scale Irrigation Scheme.** It is a demand-driven small-scale irrigation scheme in the Victoria region at an estimated cost of Rs90m. The scheme would cover the construction of irrigation infrastructure and the installation of irrigation equipment on some 116 ha of land belonging to about 140 small farmers, regrouped under the *Petite Victoria Water Users Cooperative Society*. The request was made by the small planters in the Victoria Region back in 1996. The *Irrigation Authority* started feasibility works in the same year and in March 2000, the Supreme Court Order granted them the Water Rights. Permission was obtained to draw 250 litres of water per second for a continuous 13 h per weekday and Saturday from Deep River at Pont Lardier. However in August 2000, Deep River Beau Champ Ltd (Sugar Estate) challenged these Water Rights because water availability from Deep River is variable and is not sufficient, especially during the dry months of August to December. The scheme had received financing from the IFAD through their *Rural Diversification Programme* (RDP) with a loan of Rs60 million. It was however stalled because of the problem of Water Rights but this issue has now been resolved in Court. The funding originally earmarked for this scheme was used to finance other irrigation schemes, namely the Block 8A of the NPIP II

I.4. **Subcomponent 1.2: Small Scale Irrigation Scheme Using Boreholes.** In view of the increasing demand for irrigation from planters whose fields are located far from any over ground water sources, the *Irrigation Authority* has presented a small-scale irrigation scheme which will exploit the water resources of boreholes. The scheme would run for 3 years and would cost around Rs30 million. Provision has been made for around 9 boreholes to be drilled and irrigation infrastructure to be set up, over the project duration on a demand-driven basis.

#### Component 2: Capacity Building of Petite Victoria WUCS

I.5. Mauritius has adopted a participatory distribution technology for irrigation water and has thus formed a number of *Water Users Cooperative Societies* (WUCS) / *Water Users Associations* (WUAs). Responsibility for the management and maintenance of the irrigation structures is transferred

to the WUCS and this is where effective *irrigation management transfer* (IMT) becomes crucial for the sustainable performance of the irrigation systems. However, in Mauritius, few of the WUCS are active and working well and the Government of Mauritius in collaboration with IFAD have thus been working on transforming them into effectively operational WUCS. Under the IFAD *Rural Diversification Programme*, a successful training programme was developed and implemented for both trainers and beneficiaries of irrigation facilities. The project was initiated in July 2003 and some 8 WUAs have benefited from the training. It is now proposed that the successful training programme be replicated to the Petite Victoria WUCS to ensure the viability of the irrigation system which will be put in place.

### ***Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes***

I.6. This project component aims at providing support to existing irrigation schemes by up keeping the main catchments areas which provide water for irrigation purposes. Under this component, it is proposed to reforest some 100 ha of catchments forest areas in the uplands, around the Midlands Dam, the Mare aux Vacoas reservoir and Grand Basin. The Midlands Dam provides an important support to irrigation facilities in the Northern part of the island whereby the additional volume of water available captured by the Dam helps to:

- Improve crop water requirements of the existing NPIP Stage 1, Solitude I & II drip projects (2,000 ha)
- Extend irrigation facilities to an additional area of about 3,200 ha in the upper north in the regions of Vale, Petit Raffray, Fond du Sac, Rouillard and Belle Vue.

I.7. It has been estimated that about 55 percent of the water capture of the Midlands Dam is channelled to agricultural purposes.

## **B. General Information**

I.8. ***Watershed Management.*** In Mauritius, all naturally occurring freshwater comes from precipitation of which 23 percent is exploited for domestic, industrial, commercial and agricultural uses. Because of the island’s geomorphology, a high percentage of rainfall results in surface and groundwater run-off to the sea. In the centre of the island is a large plateau, varying in elevation from 270 to 730 metres above sea level, that gently slopes down to the coastal regions surrounding the island. Mauritius receives up to 70 percent of its total annual rainfall in the summer season, November to April, and during this season, the island is vulnerable to cyclone visits which can bring up to 400 mm of rain over a 24 h period. Annual average rainfall varies from 4,000 mm on the Central Plateau to 900 mm along the western coasts.

I.9. The island has been divided into 25 main river basins and 22 minor river basins and the catchments areas vary from 3 to 164 km<sup>2</sup>. Only 2 rivers namely the Grand River North West and the Grand River South East have catchments areas exceeding 100 km<sup>2</sup>. Mauritius has a dense network of rivers, most of which have their sources in the highly elevated regions. Drainage is essentially radial from the Central Plateau towards the sea. Of the total water mobilisation from surface water resources, an average of 514 Mm<sup>3</sup> comes from river-run off takes. The remaining resources are captured by the 10 man-made reservoirs which have a combined storage capacity of 67.36 Mm<sup>3</sup> and an annual yield of about 230 Mm<sup>3</sup>. The annual groundwater recharge has been estimated at 390 Mm<sup>3</sup> but only 145 Mm<sup>3</sup> is currently being mobilised from boreholes.

I.10. **Forests.** By virtue of their strategic locations, the upland forests play a vital role in soil and water conservation. They are the main water catchments areas and they help regulate run-off and prevent floods. Our native forests are the habitat of a few species of very rare and endangered flora and avifauna. The environmental and protective functions of forests indirectly support other economic sectors such as agriculture and tourism and provide direct and indirect employment to people in different sub sectors such as plantation forestry, wildlife conservation, deer-ranching and eco-tourism among others. The two main institutions responsible for the implementation of field activities on state owned forests are the *Forestry Service* and the *National Park and Conservation Service*.

I.11. **Institutional Capacity in the Forestry Sector.** The *Forestry Service* and the *National Park and Conservation Service* both operate under the aegis of the *Ministry of Agriculture, Food Technology and Natural Resources* (MAFTNR). Their main responsibilities include the protection of the upland forests for soil and water conservation and the protection of the rare native flora and fauna. The *Forestry Service* is responsible for all state and forest plantations and a considerable area of native forests while the *National Park and Conservation Service* is responsible for the management of the National Park and the islets around Mauritius. The reforestation programme of the *Forestry Service* is limited by the availability of funds and by the shortage of skilled labour force. Its annual reforestation budget of around Rs1m is barely enough to meet the needs of reforestation of clear felled forest plantations. Consequently, it cannot undertake reforestation projects similar to those proposed in this document. The Service is increasingly relying on mechanisation and on the contracting out of some of its labour intensive forest operations.

I.12. **Water Utilisation.** Of the total water harnessed, both surface water and ground water, 48 percent is used for irrigation purposes, about 31 percent goes to hydropower generation and the remaining 21 percent is used by households, industries and the commercial sector. About 99 percent of the population in Mauritius have access to piped potable water with only a minority of around 2,500 people receiving a maximum of four hours of water supply per day. The efficiency of the water supply network ranges between 45 percent and 55 percent with around 50 percent of *Unaccounted for Water* (UFW), comprising of water used in tanker service, illegal pilferage, leakage and fire fighting.

I.13. The present annual water utilisation is around 982 Mm<sup>3</sup>, with 837 Mm<sup>3</sup> coming from surface water and 145 Mm<sup>3</sup> from groundwater. The amount of available fresh water resources is around 1,180 m<sup>3</sup> per person per year but there is the risk that demand will outstrip supply within 50 years, hence the ‘*Integrated Plan for Harnessing Additional Water Resources – Vision 2040*’ prepared by the *Water Resources Unit* (WRU). The plan makes provision for the construction of five surface reservoirs and additional river-run diversion schemes. Under this plan, the Midlands Dam project was initiated three years ago and was completed in March 2003. It is currently the biggest reservoir in Mauritius with a capacity of 42 Mm<sup>3</sup> and it meets the various water needs of the Northern part of the country. With the coming into operation of the Midlands Dam, an additional 3,200 ha in the North will be irrigated to complement the current 22,000 ha of land under irrigation. The construction of an additional dam at Bagatelle is currently in the pipeline and will cater partly for the needs of the Port Louis and Plaines Wilhems region, especially Rose-Hill and Quatre Bornes.

I.14. **Institutional Capacity in the Water Resource Sector.** There are several institutions that operate in the water resources sector. The *Central Water Authority* operates under the aegis of the *Ministry of Public Utilities* and is responsible for the treatment and distribution of water to domestic, industrial and commercial consumers. The *Water Resources Unit* is a unit of the *Ministry of Public Utilities* and looks after the assessment, development, management and conservation of water resources in Mauritius.

I.15. **Irrigation.** Of the total cultivable area of 86,000 ha, 33,000 ha are irrigable and 22,000 ha are currently under irrigation. Most of the irrigated lands are located along the coastal regions where rainfall is not sufficient and erratic: in the North 6,671 ha, the South 5,243 ha, the East 3,173 ha and the West 5,358 ha and the Centre of the island 777 ha. In the agricultural sector, the Government of Mauritius has established policies to support all diversification efforts into non-sugar crops, through the formulation of a *Non-Sugar Sector Strategic Plan* (NSSSP). One of the objectives of this plan is to increase the presently 22,000 ha of land under irrigation to 32,000 by the year 2010. Irrigation is a high priority for the government which has been giving financial and technical support to the development of irrigation schemes and has been encouraging the capacity building of WUAs which will be entrusted with the responsibility of effectively harnessing the water resources put at their disposal.

I.16. **Institutional Capacity in the Irrigation Sector.** Most of the irrigation developments are done through the *Irrigation Authority*. It is a para-statal organisation set up under the *Irrigation Authority Act* and functions under the aegis of the MAFTNR. The organisation is run by a board composed of representatives of Ministries, planters and other institutions working directly with the *Irrigation Authority*. The latter provides assistance in identifying, investigating, planning, designing and implementing irrigation projects. The *Irrigation Authority* also undertakes research into the optimum use of water made available by the *Central Water Authority*. As a result of the increasing load of the *Irrigation Authority*, the World Bank under the *Agricultural Management and Services Project* (AMSP) recommended a restructurisation programme in order to strengthen the capability of the organisation. Consequently, in 1992/93, the *Irrigation Authority* was reorganised with the creation of the *Irrigation Planning Unit* (IPU) and improvements were brought to the well-defined functional structure of its departments.

I.17. The Government of Mauritius through the *Irrigation Authority* is giving support to small farmers to increase their land productivity and hence their income generated by irrigation. Presently the *Irrigation Authority* has 17 such projects scattered all over the island covering 4,588 ha owned by some 3,927 small farmers. The proposed *Victoria Small Scale Irrigation Project* located in the East of the island and grouping some 140 small farmers is one of the short-term projects of the *Irrigation Authority*.

## II. PROJECT AREA

II.1. **Component 1: Irrigation Infrastructure – Subcomponent 1.1: Victoria Small Scale Irrigation Scheme.** Located in the eastern part of the island in the district of Flacq (see Maps in Appendix 1), the *Victoria Small Scale Irrigation Scheme* identified shall cover some 140 small farmers owning a total of 116 ha as contiguous plots. The land is relatively flat to undulating with a rock content which is greater than 80 percent over a maximum vertical depth of 40 cm and changing to hummocky lava bedrock for a further depth. The general slope of the terrain is about 1.3 percent with its highest point being at a reduced level of 40 m and its lowest point at a reduced level of 10 m. These 116 ha of land in the Victoria region have good soil types (P3 type) but is found in the poorly watered regions of the country with an average annual rainfall of 1,200 mm. The soil is of a highly weathered layer, granular in texture and sometimes carnevous at a shallow depth below earth’s surface. The climate in the Victoria Region is classified as sub humid mega thermal. The limited supply of water for agricultural purposes is an important hindrance for the development of agricultural production and diversification. As shown in the annexed plan, presently about 41 percent of the 116 ha are sugar cane planted and 13 percent are under diversified crops and the remaining 46 percent of lands are bare lands due to unavailability of water for agriculture.

II.2. **Component 1: Irrigation Infrastructure – Subcomponent 1.2: Small Scale Irrigation Scheme using Boreholes.** This scheme will involve drilling and exploiting boreholes in the fields of small planters all over the island. Based on the yields of respective boreholes, the areas to be put under irrigation will be defined accordingly.

II.3. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The reforestation of 100 ha of catchments forest areas in the uplands concerns specifically the degraded forests around the Midlands Dam, the Mare aux Vacoas reservoir and Grand Basin. The upland forests are strategically located and form the catchments areas of the major river systems. The proposed project areas are found in two regions. The Midlands Dam region comprises area around the dam (28 ha) and the Mare aux Vacoas region comprises areas around the reservoir and Grand Basin (72 ha). These areas are mostly covered with planted forests. However, they have suffered substantial degradation owing to natural calamities such that their stocking capacity is now less than 50 percent of their full potential. With an annual rainfall of up to 4000mm characterized by heavy downpour during the summer months of December to March, there is a serious risk of soil erosion and siltation of the reservoirs in these regions.

### III. PROJECT RATIONALE

III.1. Annual average rainfall in Mauritius varies from 4,000 mm on the Central Plateau to 900 mm along the western coasts. Particular areas of Mauritius suffer from very dry seasons, hence making irrigation indispensable for cultivation. The Government of Mauritius, with the financial and technical support of donor agencies/countries, has invested heavily in the development of irrigation facilities in the country, in particular in the North under the NPIP. The government has been providing finance to several irrigation schemes especially in support of the small planters who lack the financial means to invest in irrigation infrastructures. The government, through the MAFTNR, has been promoting the effective transfer of the running and maintenance responsibilities from the *Irrigation Authority* to the WUAs. Several transfers have been undertaken in the past and the smooth and successful shifting of responsibilities for 8 particular WUAs has been ensured by the capacity building programme of WUAs, financed under the IFAD RDP.

III.2. **Component 1: Irrigation Infrastructure – Subcomponent 1.1: Victoria Small Scale Irrigation Scheme.** The area identified for the irrigation development has good soil types but availability of water has been a major hindrance to intensive agricultural development. The area is located in the Eastern region where the average annual rainfall is only around 1,200 mm. Back in 1996 when the request for an irrigation scheme was made, water was being pumped from Glassie Borehole which had a high capacity of salinity water. This saline water caused much damage to the crops and to the existing irrigation equipment and irrigation using this borehole was stopped. Since then, some of the farmers have been having recourse to water lorries to irrigate their plots, spending around Rs800–1,000 for a lorry with a water capacity of 5,000 litres. For some planters, the water bill represents almost 30–40 percent of their budget. Bringing irrigation to the poorly rained areas will stop the abandon of lands by small farmers (around 46 percent of the total 116 ha) and will ensure diversification of agricultural production. Some of the crops currently cultivated are tomato, brinjal and chilli but with irrigation, the *Agricultural Research and Extension Unit* (AREU) has identified other crops that would be suitable for cultivation such as cabbage, lettuce and watermelon. With the implementation of the irrigation facilities, the present rained yield of 15–20 tons of sugarcane per acre will double. The Victoria scheme would also support other irrigation projects in the region. The design of its the delivery main has made provision for an additional flow of 55 l/s for the *Trou d’Eau Douce*

*Irrigation Project*, representing the total water requirements of this project. The latter covers 34 acres of land with some 82 beneficiaries.

III.3. **Component 1: Irrigation Infrastructure – Subcomponent 1.2: Small Scale Irrigation Scheme using Boreholes.** The drilling of boreholes will be mostly for planters whose lands are far from existing irrigation networks and surface water resources. The provision of irrigation facilities to these small planters will stop the abandon of lands and will encourage agricultural diversification. The provision of irrigation facilities usually brings about a doubling of the existing yield, with minor variations depending on climate, soil and crops cultivated amongst others.

III.4. **Component 2: Capacity Building of Petite Victoria WUCS.** Farmers grouped under the WUA or the WUCS will be important as they will be involved right from the project planning up to project construction and completion. Participatory programs have helped to improve water distribution and system maintenance and improve irrigation performance and farmer welfare overall (*Participatory Irrigation Management, PIM*). As highlighted in a conference held by the FAO on the theme of IMT, there is a strong correlation between the productivity and profitability of irrigated agriculture and the viability of the water users association and the ability of the farmers to pay for the irrigation dues. Their commitment will have direct bearing on the success and viability of the projects. The process of grouping of these farmers, training foreseen for both the farmers and the trainers and providing necessary organisational backup has already been provided for in the training programme of WUCS, financed under the IFAD RDP. The *Irrigation Authority* needs to continue its support in monitoring and advising after IMT and to provide technical assistance in the functioning of the irrigation system. Hence some 7 technical staff of the *Irrigation Authority* were given the training under the IFAD programme.

III.5. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The upland forests around the Midlands Dam and the Mare aux Vacoas reservoir form part of the main catchment areas for Mauritius and play a vital role in soil and water conservation. The annual precipitation rate for the region is amongst the highest with a mean annual rainfall of around 4,000 mm. These two reservoirs have a combined storage capacity of 68 Mm<sup>3</sup> which represents around 62 percent of the total storage capacity of all the reservoirs. The Midlands Dam is the biggest reservoir in the country with a capacity of 42 Mm<sup>3</sup>. It satisfies 100 percent of the demand for the domestic, commercial, industrial and tourist sectors in the North. It also provides water for the irrigation needs in the Northern Plains, irrigating some 2,000 ha of land under the first phase of the NPIP and an additional 3,200 ha. The second biggest reservoir, the Mare aux Vacoas reservoir, is also situated on the Central Plateau and it feeds the largest water supply system that serves 1/6 of the water needs of the Mauritian population. About 6 km south-east of Mare aux Vacoas is the sacred lake of the Hindus, Grand Bassin.

III.6. Besides providing water for irrigation purposes, the catchment areas also play an important environmental part in soil and water conservation. These functions have however been impaired over time due to reduction of stocking. The planted forests are the most affected during the passage of cyclones. It is therefore essential to restock these forest areas in order to maintain and enhance the above mentioned forest functions. This project component is also in line with the *National Environment Strategic Plan* which addresses the issue of protection of water resources and efficient water management. It also provides for the prevention of siltation of these reservoirs to guarantee continuous water supply to the Plaines Wilhems and Northern regions.

#### IV. PROJECT OBJECTIVES

IV.1. The main objective of the project is to increase the area under sustainable small-scale irrigation and water control in Mauritius, through infrastructure development, human capacity building and catchment protection. The objectives of the various project components are provided below:

IV.2. **Component 1: Irrigation Infrastructure – Subcomponent 1.1.** The objectives concerning the *Victoria Small Scale Irrigation Scheme* will be:

- To provide irrigation to 116 ha of land in the Victoria Region;
- To stop the trend of farmers to abandon their lands due to non availability of water for agriculture;
- To ensure availability of vegetables throughout the year at reasonable prices in the nearby regions and to encourage agricultural diversification.

IV.3. **Component 1: Irrigation Infrastructure – Subcomponent 1.2.** The *Small Scale Irrigation Schemes Using Boreholes* will aim at helping planters to group themselves in small clusters and benefit from underground water resources for agricultural development in their lands, something which due to the high costs would have individually hindered them to build up a project.

IV.4. **Component 2: Capacity Building of Petite Victoria WUCS.** The main objectives will be to enable farmers to:

- Improve group participation skills for irrigation management and to increase social capital;
- Improve their abilities in technical and administrative management of projects;
- Increase understanding and awareness of cost-effectiveness in their investment and management decisions;
- Establish better informed links with local markets through improved understanding of demand and supply for their production.

IV.5. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The overall objective of this project component is to maintain and enhance the soil and water conservation functions of the upland forests and prevent the siltation of reservoirs, thus safeguarding the water supply for industrial, agricultural (irrigation) and domestic uses. The objectives are as follows:

- To restock forest plantations around reservoirs;
- To protect these plantations from adverse biotic and abiotic factors;
- To prevent siltation of reservoirs.

## V. PROJECT DESCRIPTION

### **Component 1: Irrigation Infrastructure**

#### ***Subcomponent 1.1: Victoria Small Scale Irrigation Scheme***

V.1. The *Victoria Small Scale Irrigation Scheme* would comprise the following components:

- A diversion weir and a pumping station;
- A ductile iron buried delivery main of diameter 400 mm and length 5.6 km;
- Submains and laterals of total length 16,000 m and diameters ranging from 300 to 150 mm;
- Store/office;
- Consultancy services for the supervision of works;
- Training of farmers and formation of WUAs.

V.2. The *Irrigation Authority* conducted an analysis of the hydrological data obtained from the WRU and concluded that the abstraction of water from Deep River is more feasible than that from Riviere Seche. Hence the source of water will be from Deep River flowing about 5.9 km uphill from the project area. The *Irrigation Authority* shall construct an irrigation structure for them comprising of a diversion weir, a pumping station, a delivery main 5.6 km long conveying water into the infield buried network over the 116 ha.

V.3. Pressurized water will be distributed to a solid set system wherein 4 bars operating guns will be moved from one hydrant to another on a 75 m x 50 m grid to irrigate the lands of the small farmers. The abstraction point will be located after the convergence of Deep River and Grand River South East, after the last abstraction point of Deep River Beau Champ Ltd. Some 300 hydrants will be installed with a water application of 25 mm every 4 days (based on collection of agrometeorological data). This represents a monthly supply of water of around 292 m<sup>3</sup> over 12 months. Irrigation will be provided all year round for sugar cane but this will vary for the other crops cultivated. The semi solid sprinkler system has been chosen over other irrigation systems because the drip system would be costly and difficult to manage and maintain and the centre pivot would be inappropriate for the undulating and sloppy lands of the region.

V.4. The Petite Victoria WUCS would be responsible for the day-to-day running of the irrigation system including moving the sprinkler guns across the hydrants. The application efficiency of this system has been estimated at around 70 percent with practically no water leakage in the transmission network.

#### ***Subcomponent 1.2: Small Scale Irrigation Scheme using Boreholes***

V.5. It is a demand-driven scheme that will last 3 years and 9 boreholes will be drilled in all, i.e. three boreholes are scheduled to be drilled each year together with the setting up of the appropriate irrigation infrastructure. The *Irrigation Authority* has purchased a drilling rig and planters are being channelled to the *Central Water Authority* to get the necessary ground water licences to drill and exploit their boreholes. Once the planters have obtained their licenses, the *Irrigation Authority* will drill the boreholes and implement the infield networks.

### **Component 2: Capacity Building of Petite Victoria WUCS**

V.6. The capacity building programme for the *Petite Victoria WUCS* will replicate the project components of the IFAD financed training programme of irrigation beneficiaries. It will thus comprise the following:

- Training of farmers (including field demonstrations);
- 2 study tours for trainers (engineers and agronomist);
- 2 study tours for farmers to witness WUAs in other countries.

V.7. The programme will be dispensed by local trainers (IA staff and other participating institutions) to the farmers on a part-time basis. The total duration of the programme covers nine working days but spread over one calendar month. Field demonstrations will also be organised to consolidate the training programme. The 18 training capsules (prepared by an Indian consulting firm) will be dispensed in afternoons at the rate of 2 capsules per day. Upon completion of the training of the farmers, the latter will have the opportunity to study the operations of WUAs in other countries. The capacity building scheme will be completed with an evaluation of the training programme.

### **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes**

V.8. It will run over five years and will comprise 4 main subcomponents:

- ***Fencing and Land Preparation.*** The selected areas would be fenced and cleared of all noxious growths prior to planting;
- ***Reafforestation.*** The fenced areas would be planted with suitable tree species like *Pinus elliottii* and *Cryptomenia japonica*. It is expected that the planting process would be completed in two years. Silvicultural operations, like weeding and recruiting will be undertaken until the successful establishment of the plantations.
- ***Access Road.*** The project areas are situated within the main catchment areas of the island and as such the periphery is accessible by the existing road network. However, access roads will have to be improved to facilitate reafforestation activities in the core region. Some 10 km of pliable roads would be upgraded and maintained. Rough stones will be used for metalling the road surface. This will not require major engineering works and can be easily carried out by the labourers of the *Forestry Service*.
- ***Maintenance Works.*** Maintenance works like weeding and recruiting operation would be undertaken to establish a fully stocked forest plantation.

## VI. INDICATIVE COSTS

Component 1: Irrigation Infrastructure – Subcomponent 1.1: Victoria Small Scale Irrigation Scheme Cost Summary per Main Item per Year (Rs'000)						
Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Diversion weir and pumping station	7,500	500				8,000
2. Delivery main	24,500	1,000				25,500
3. Infield network	35,500	5,000				40,500
4. Store/office	1,000					1,000
5. Miscellaneous	4,500	500				5,000
<b>Total Baseline Costs</b>	<b>73,000</b>	<b>7,000</b>				<b>80,000</b>
Physical contingencies	7,000	3,000				10,000
Price contingencies						
<b>Total Subcomponent Costs</b>	<b>80,000</b>	<b>10,000</b>				<b>90,000</b>
Component 1: Irrigation Infrastructure – Subcomponent 1.2: Small Scale Irrigation Scheme Using Boreholes Cost Summary per Component per Year (Rs 000s*)						
Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Drilling of boreholes	1,800	1,800	1,800			5,400
2. Construction of infield system	8,000	8,000	8,000			24,000
3. Miscellaneous	200	200	200			600
<b>Total Baseline Costs</b>	<b>10,000</b>	<b>10,000</b>	<b>10,000</b>			<b>30,000</b>
Physical contingencies						
Price contingencies						
<b>Total Subcomponent Costs</b>						<b>30,000</b>
Component 2: Capacity Building of Petite Victoria WUCS – Cost Summary per Component per Year (Rs 000s)						
Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Training of farmers	500					500
2. Study tours for trainers (overseas)	300					300
3. Study tours for farmers	400					400
<b>Total Baseline Costs</b>						<b>1,200</b>
Physical contingencies						
Price contingencies						
<b>Total Component Costs</b>						<b>1,200</b>
Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes – Cost Summary per Component per Year (Rs 000s)						
Item	Year 1	Year 2	Year 3	Year 4	Year 5	Total
1. Fencing	1,250	1,250				2,500
2. Land preparation	1,500	1,500				3,000
3. Planting	500	500				1,000
4. Weeding and recruiting	1,250	2,500	2,500	2,500	1,250	10,000
5. Purchase of vehicles	2,500					2,500
6. Miscellaneous	1,000					1,000
<b>Total Baseline Costs</b>	<b>8,000</b>	<b>5,750</b>	<b>2,500</b>	<b>2,500</b>	<b>1,250</b>	<b>20,000</b>
Physical contingencies						
Price contingencies						
<b>Total Component Costs</b>	<b>8,000</b>	<b>5,750</b>	<b>2,500</b>	<b>2,500</b>	<b>1,250</b>	<b>20,000</b>
<b>Notes:</b>						
All prices excluding 15 percent VAT.						
Cost estimates do not include land preparation and other support services that may be required for the implementation of the project.						
These would be incurred by the farmers from their own budgets unless financing is provided from other sources.						

## VII. PROPOSED SOURCES OF FUNDING

VII.1. **Component 1: Irrigation Infrastructure – Subcomponent 1.1.** The improvement and extension of irrigation facilities is a priority for the Government in the agricultural sector. In the recent budget speech of 2004–2005, the Government has announced that it will provide Rs127 million for irrigation projects and these would include the full/partial financing of small-scale irrigation projects at Victoria and Calebasses covering a total area of 208 ha for the benefit of 170 planters. The capital budget of 2004–2005 makes provision for Rs 3,5 million for the financing of the Victoria Small Scale Irrigation Project.

VII.2. **Component 1: Irrigation Infrastructure – Subcomponent 1.2.** There are no funding propositions as yet.

VII.3. **Component 2: Capacity Building of Petite Victoria WUCS.** Ideally, this scheme would welcome financing from international agencies, as was the case when IFAD funded the training programme for 8 WUAs in Mauritius. In many countries, the IMT process has been driven and promoted by international agencies, where a range of technical assistance programs has been implemented, including the formation and training of WUAs.

VII.4. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** In the draft capital budget of 2004–2005, the Government of Mauritius has made provision for Rs1.5 million for the reforestation programme. However, as stated by the Forestry Service, this budget can only provide for the reforestation of clearfelled plantations and would not be able to finance the reforestation scheme proposed above.

## VIII. PROGRAMME BENEFITS

VIII.1. **Components 1 & 2: Irrigation Infrastructure & Capacity Building of Petite Victoria WUCS.** The provision of irrigation to these rainfed areas would have direct positive effects on agricultural production and on the targeted agricultural community.

### VIII.2. *Agricultural Benefits:*

- There will be an average increase in the sugar cane yield (ton/ha) by around 80–100 percent. In the case of the Victoria scheme, the average yield of 15–20 tons/acre would double to around 30–40 tons/acre. The total sugar production of the Victoria Region in good weather is around 2 000 tons annually.
- There is currently 17 percent of the project area in Victoria which is under vegetable cultivation. Irrigation will bring an average increase of vegetable production (ton/ha) by around 70 percent and will encourage the cultivation of crops such as cabbage and watermelons, which would not have been possible without irrigation.
- Bringing water to the region would increase the potential for interline cropping and for full stand diversified crops.
- While some farmers would be motivated to start cultivation on the 53 ha of bare lands, the current farmers will be given the incentives to stay in agriculture. Sugar and food crop production will increase for the benefit of the country and most immediately for the locality, where most of the crop produce are sold.

- With the capacity building scheme of the WUCS, farmers will be able to better manage and maintain the irrigation system implemented, the benefits of which would accrue directly to the production of foodcrops.

### VIII.3. *Socio-economic Benefits:*

- With incentives given to potential farmers to start up cultivation, jobs will be created both in the fields and in the subsectors of agricultural activities such as marketing and distribution.
- Generally, all the farmers will experience an upgrading of their standard of living with the increased yields generating more revenue. Overall, the community can expect development in the region.
- The farmers, grouped under the Petite Victoria Water Users Cooperative Society, will be given the adequate training and support in irrigation management and development, for the betterment of the farmer community.

### VIII.4. *Environmental Benefits:*

- Increased cultivation of the land and possibly on a more intensive level would reduce the incidence of soil erosion caused by wind and rain.
- With the creation of more green areas and less bare lands, there would be an improvement in the quality of the air, with higher capacity for CO<sub>2</sub> absorption.
- A more effective and efficient use will be made of the water and land resources.

VIII.5. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The reforestation of the area would increase the stocking capacity of the main catchment area of the country and safeguard the supply of water for irrigation in the Northern Plains. It would also bring with it other benefits such as:

- The replanted forests will be more effective in soil conservation and would be more resistant to adverse biotic and abiotic factors.
- There will be an increase in the life span of the reservoir and dam through the prevention of siltation.

## IX. IMPLEMENTATION ARRANGEMENTS

IX.1. **Component 1: Irrigation Infrastructure – Subcomponent 1.1.** The *Irrigation Authority* will provide the irrigation infrastructure to irrigate the 116 ha of land gazetted. The planters will collaborate with the *Irrigation Authority* as far as wayleaves and access to their fields are concerned. It is a pre-requisite by the *Irrigation Authority* that the beneficiaries of any irrigation scheme regroup themselves under a WUCS or WUA. The beneficiaries of the Victoria Irrigation Scheme are grouped under the *Petite Victoria WUCS* and once the irrigation infrastructure has been put in place, this cooperative society will be responsible for the day-to-day running of the project. The *Irrigation Authority* will be responsible for the maintenance of the buried pipes and accessories while the infield systems will be maintained by the planters individually or through the *Petite Victoria WUCS*. The *Farmer’s Service Centre* of Bon Accueil will act as a facilitator for the planters’ community and will,

amongst others, provide assistance in the contracting out of land preparation and derocking works to the *Sugar Planters Mechanical Pool Corporation (SPMPC)*. A consulting engineer will be hired out for the supervision of the works and upon their completion, the Agricultural Research and Extension Unit will step in to consider the possibility of diversification and will provide advice on the potential crops for cultivation.

IX.2. The implementation arrangements for this project are summarised in the table below:

Agency/Institution	Responsibility
Ministry of Agriculture, Food Technology and Natural Resources	Contracting Authority
Irrigation Authority	Project Implementation Agency for Irrigation Infrastructure Component
Consulting Engineer*	Supervision of works
Sugar Planters Mechanical Pool Corporation (SPMPC)	Derocking and land preparation works
Farmer's Service Corporation (FSC)	Grouping of farmers and providing them incentives
Agricultural Research and Extension Unit (AREU)	Extension services on diversification (foodcrop and fruits)

\* The services of a consulting engineer will only be needed in the case of the Victoria Project

IX.3. **Institutional Capacity.** *Sugar Planters Mechanical Pool Corporation (SPMPC)*. The SPMPC is a para-statal body which operates under the aegis of the Ministry of Agriculture, Food Technology and Natural Resources. The Corporation offers its services to mainly small sugar cane planters, irrespective of their size, location and accessibility. Moreover the tractor hire rates charged to small sugar cane planters have remained unchanged for the past twelve years and are highly subsidized. The Corporation provides the following services:

- Light/heavy bulldozing including derocking;
- Ripping and cross-ripping;
- Raking and rock-pushing;
- Furrowing;
- Levelling;
- Rock breaking and soil compaction for in-field road making.

IX.4. **Farmers Service Corporation (FSC).** The FSC is a para-statal body which offers ‘*quality and cost effective services to some 30,000 small sugarcane growers*’. It provides technical assistance, training and various incentive schemes to these small planters. Technical assistance is in the form of advice on proper harvesting methods, fertiliser application, land preparation and weed control among others. The FSC also organise training programmes and disseminate agricultural news and information through radio programmes and printed material. The FSC regroups small growers’ fields into larger viable units which are either grouped as *Land Area Management Unit (LAMU)* whereby every field operation is performed in all plots simultaneously or as *Block Management Unit (BMU)* whereby plots within a locality/region may be regrouped for specific activities.

IX.5. **Agricultural Research and Extension Unit (AREU).** AREU arose out of DARE (*Directorate of Agricultural Research and Extension*), which was established in 1994 within the Ministry of Agriculture. Its objectives were to facilitate government’s goals of improving the productivity of the farming community and diversifying the production base. It was also given the responsibility to conduct research in non-sugar crops and livestock, and to provide extension services to all farmers in Mauritius including its outer islands.

IX.6. **Component 1: Irrigation Infrastructure – Subcomponent 1.2.** The *Irrigation Authority* has purchased a drilling rig and planters are being channelled to the *Central Water Authority* to get the necessary ground water licences to drill and exploit their boreholes. Once the planters have obtained their licenses, the *Irrigation Authority* will drill the boreholes and implement the infield networks.. It is a pre-requisite by the *Irrigation Authority* that the beneficiaries of any irrigation scheme regroup themselves under a WUCS or WUA. The beneficiaries of the irrigation schemes will thus form WUCS and once the irrigation infrastructure has been put in place, this cooperative society will be responsible for the day-to-day running of the irrigation facility.

IX.7. **Component 2: Capacity Building of Petite Victoria WUCS.** The services of an Indian consulting firm (Consulting Engineering Services PVT Ltd) were contracted for the development, planning and implementation of the IFAD financed training programme. The consulting firm conducted a training needs assessment and prepared a curriculum which was used for the training of the 8 WUAs. A set of training capsules, addressing both the technical and institutional aspects of water management, have thus been planned, designed and developed for the capacity building of the water users. The logical framework developed for each training capsule were discussed and validated in a stakeholder workshop. In the first phase of the project, 24 trainers from various stakeholders, including 7 staff from the *Irrigation Authority*, were trained to create a multi-disciplinary team of trainers to continue the training programme for the beneficiaries.

IX.8. The *Irrigation Authority* will now replicate the training to the beneficiaries of the Victoria small-scale irrigation scheme, using the training curriculum already formulated. The capacity building programme will seek the assistance of other organisations who have followed the training programme, as and when required for e.g. the FSC, the SPMPC and AREU. As for the choice of the training centres, it is proposed that the nearest village hall or FSC be used, as was in the case under the IFAD programme. The training arrangements will be as follows:

- The 18 training capsules, equally divided between the institutional and technical aspects, will be dispensed over nine working days, i.e. 2 capsules per day. Given that farmers are generally busy in the fields in the mornings, the training will be provided in two 1h afternoon sessions.
- After each capsule, the participants will be requested to fill in feedback forms, that would allow the trainers to make an ‘impact assessment’ of the training and adjust the training accordingly.
- Arrangements will be made for field demonstrations, especially on the operation and management of the different irrigation systems. Provision is also made in the project cost for the trainees to have study tours abroad to visit irrigation schemes.

IX.9. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The reforestation projects would be implemented by the *Forestry Service*. All the resources of the Service would be used to support this project. Some of the labour intensive operations will be contracted out.

## X. TECHNICAL ASSISTANCE REQUIREMENTS

X.1. **Component 1: Irrigation Infrastructure – Subcomponent 1.1.** The execution of civil works will be carried out under the supervision of a team of Consulting Engineer whose services will be recruited by bidding. The team will comprise of a Resident Engineer possessing a degree in Civil

Engineering and having with minimum 15 years and one deputy Resident Engineer possessing a degree in Civil Engineering and having with minimum 10 years. The cost estimate for this consultancy services is Rs5 million.

X.2. **Component 1: Irrigation Infrastructure – Subcomponent 1.2.** No technical assistance requirements have been identified so far.

X.3. **Component 2: Capacity Building of Petite Victoria WUCS.** It is assumed at this stage that the *Irrigation Authority* has all the technical competencies to dispense the training.

X.4. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** The *Forestry Service* has the adequate technical capacity to undertake such a project and no technical assistance would be required for the implementation of these projects.

## XI. ISSUES AND PROPOSED ACTIONS

### XI.1. **Components 1 & 2: Irrigation Infrastructure & Capacity Building of Petite Victoria WUCS:**

- **Capacity Building of WUAs.** The beneficiaries grouped under the *Petite Victoria WUCS* need training in irrigation management to ensure the successful operation and management of the in-field irrigation system. The capacity building programme proposed above will address this issue and will provide for better utilisation of the irrigation facilities provided.
- **Incentives.** Apart from irrigation, the farmers need the adequate backup and support incentives that would include technical assistance on weed control, fertiliser application and cultural operations, market information and training. The *Farmer’s Service Centre* of Bon Accueil will provide these various incentives and additional ones in the form of fertiliser subsidy scheme, subsidy on cane planting material and refund on minimum tillage practice.
- **Monitoring and Evaluation.** The successful implementation of these project components will depend on proper monitoring and evaluation. While a consulting engineer will be supervising the irrigation works for the Victoria scheme, no monitoring and evaluation structure has been proposed once the irrigation system is handed over to the WUCS. In formulating the capacity building programme for the farmers, thoughts should be given to the design of a monitoring and evaluation framework with the possible use of key performance indicators.
- **Planning of Production.** Production in Mauritius at the planters level has been done mostly based on experience of planters accrued over the years, which somehow provide useful indications. However, a good reflection of climatic, seasonal, geographical and market indexes is essential in the optimisation of agricultural production, which has however so far not been taken into consideration while planning production. To avoid the problems of gluts or shortages in the markets due to poor planning of production, the beneficiaries could make use of the *Market Information System (MIS)*, which is being run by the AREU. The MIS provides weekly information on market prices of fruits and vegetables and on movements in demand and supply in the 3 main markets of Mauritius

(Flacq, Vacoas and Port Louis). AREU could also suggest a cropping pattern to the farmers in line with the diversification of agriculture in Mauritius.

- *High Costs of Irrigation.*

XI.2. **Component 3: Protection & Rehabilitation of Water Catchments Areas in Support of Existing Irrigation Schemes.** Due to the limited manpower capacity of the Forestry Service, labour intensive operations will need to be contracted out and provision has already been made for this. The project area must also be watched over 24 hours a day to prevent vandalism, incidence of fire and grazing by animals.

## XII. POSSIBLE RISKS

XII.1. *Disbursements delays or insufficient disbursements.* For projects that have received part/full financing from government sources, there is the risk of implementation delays caused by untimely or insufficient disbursement of funds. For example in the case of the *Victoria Small Scale Irrigation Project*, only Rs3.5 m of a total of Rs90m will be disbursed in the financial year 2004–2005. Disbursement for this project in any year will also depend on how much financing is being granted to other pipeline capital projects for the MAFTNR.

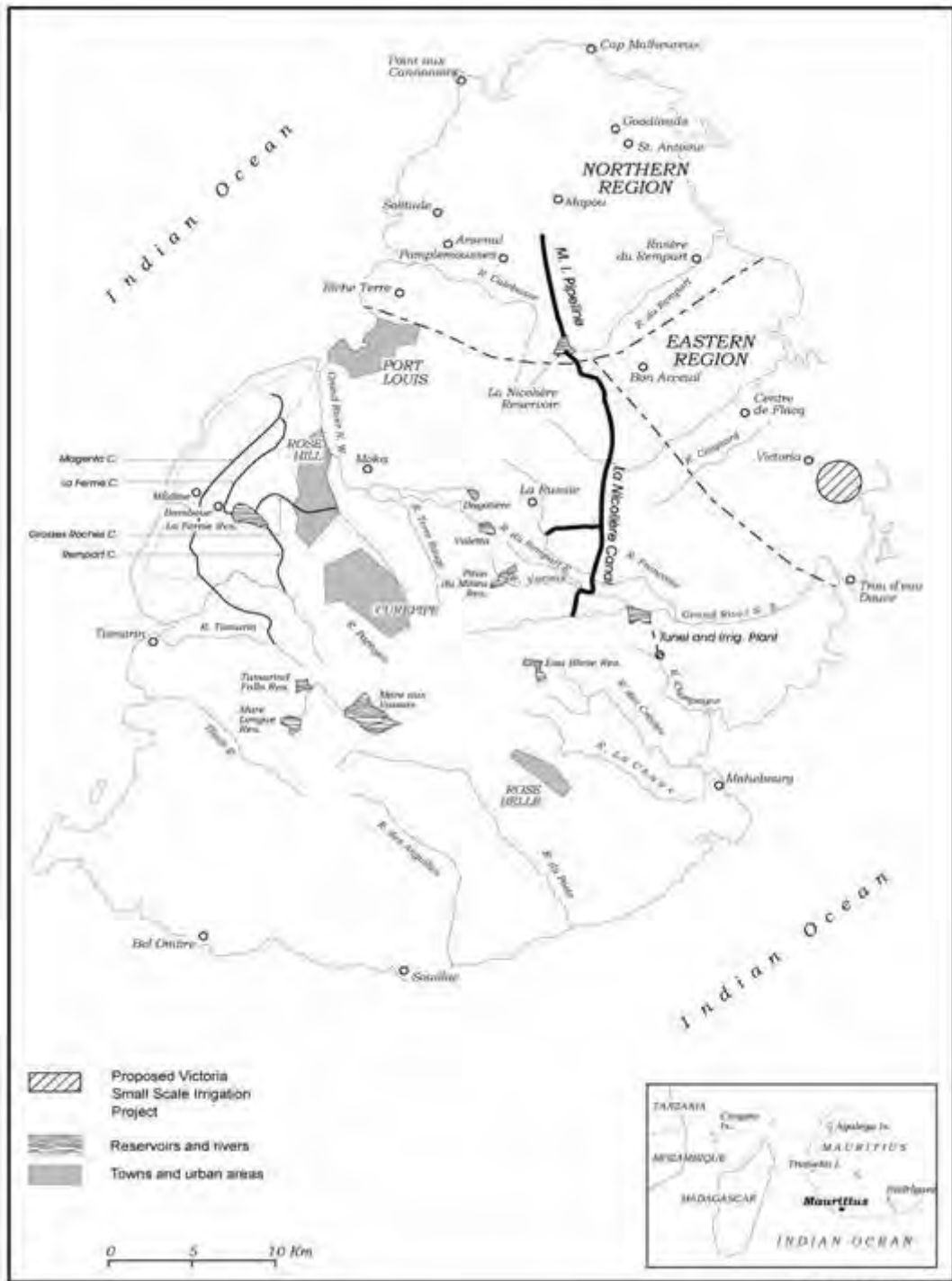
XII.2. *Farmer interest in irrigation and participation.* So far, it has been assumed that all the farmers would be using the irrigation facilities that would be made at their disposal. When the project area was gazetted, the *Irrigation Authority* did not receive any complaints from the targeted beneficiaries. Thus, it is assumed that there would no problems in land demarcation and for wayleaves. Through consultative meetings with the planters concerned, it has been generally felt that the project would receive full participation.

XII.3. *Marketing strategy for additional production.* The ability of the farmer to generate sustainable income from his produce will depend on the marketing strategy developed. Gluts in the local market would drive down prices with the risk that the standard of living of the farmer would not be improved. Assistance should be provided to the farmer in devising his cropping pattern ideally at the same time as his marketing strategy. A joint effort between AREU and AMB can be envisaged for the development of such strategies.

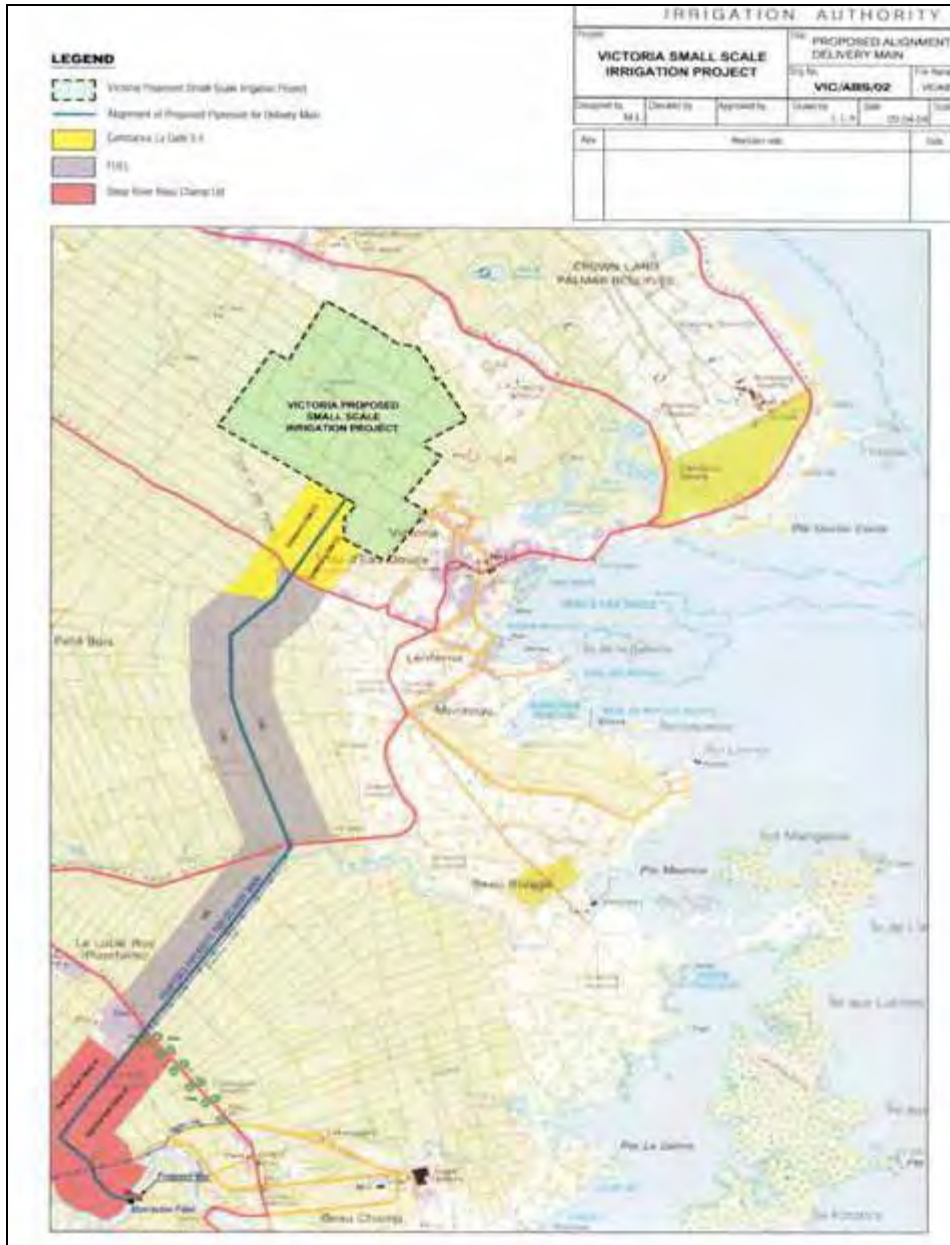
Appendix 1: Maps Showing Project Sites/Areas

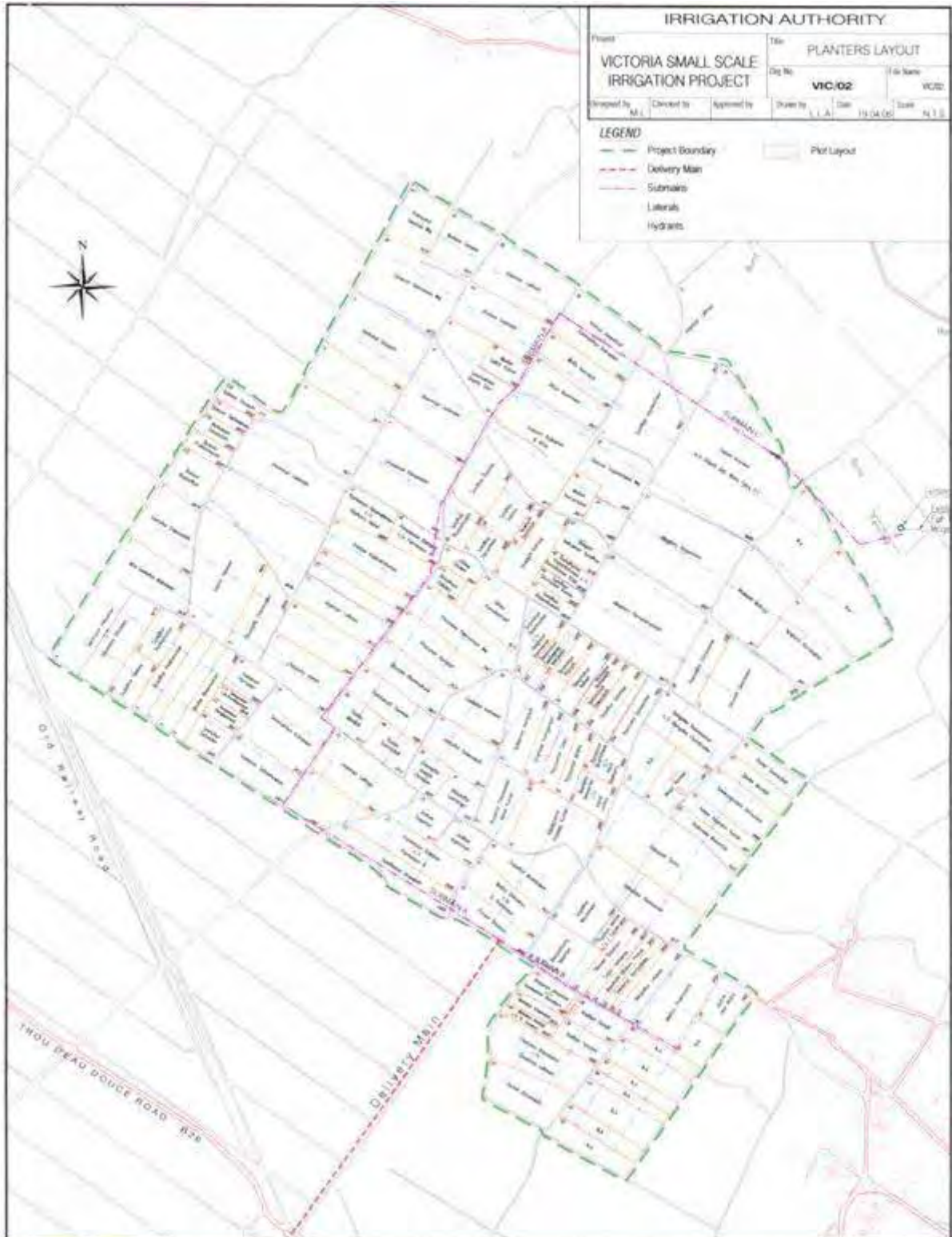
**Component 1: Irrigation Infrastructure**

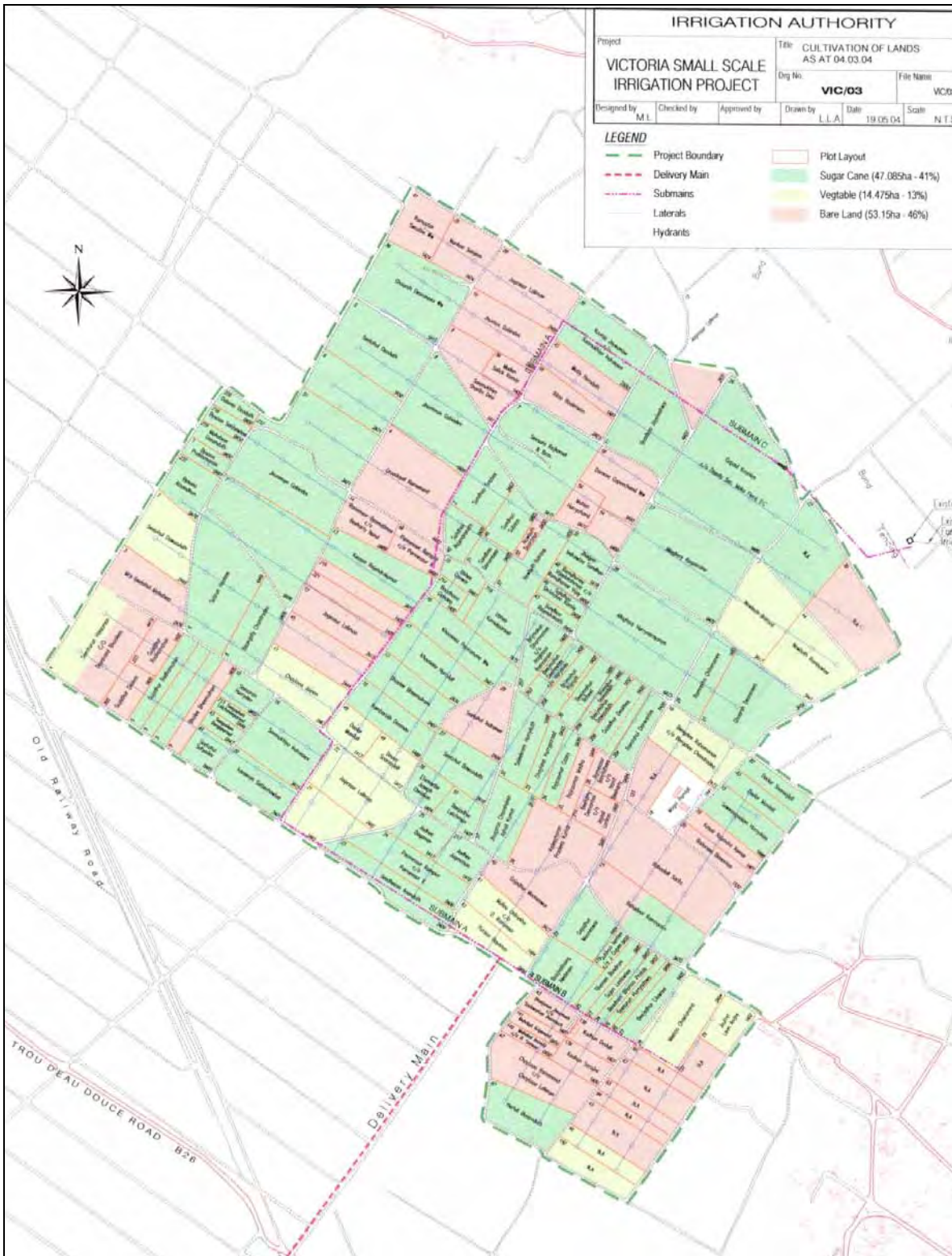
***Subcomponent 1.1: Victoria Small Scale Irrigation Scheme***



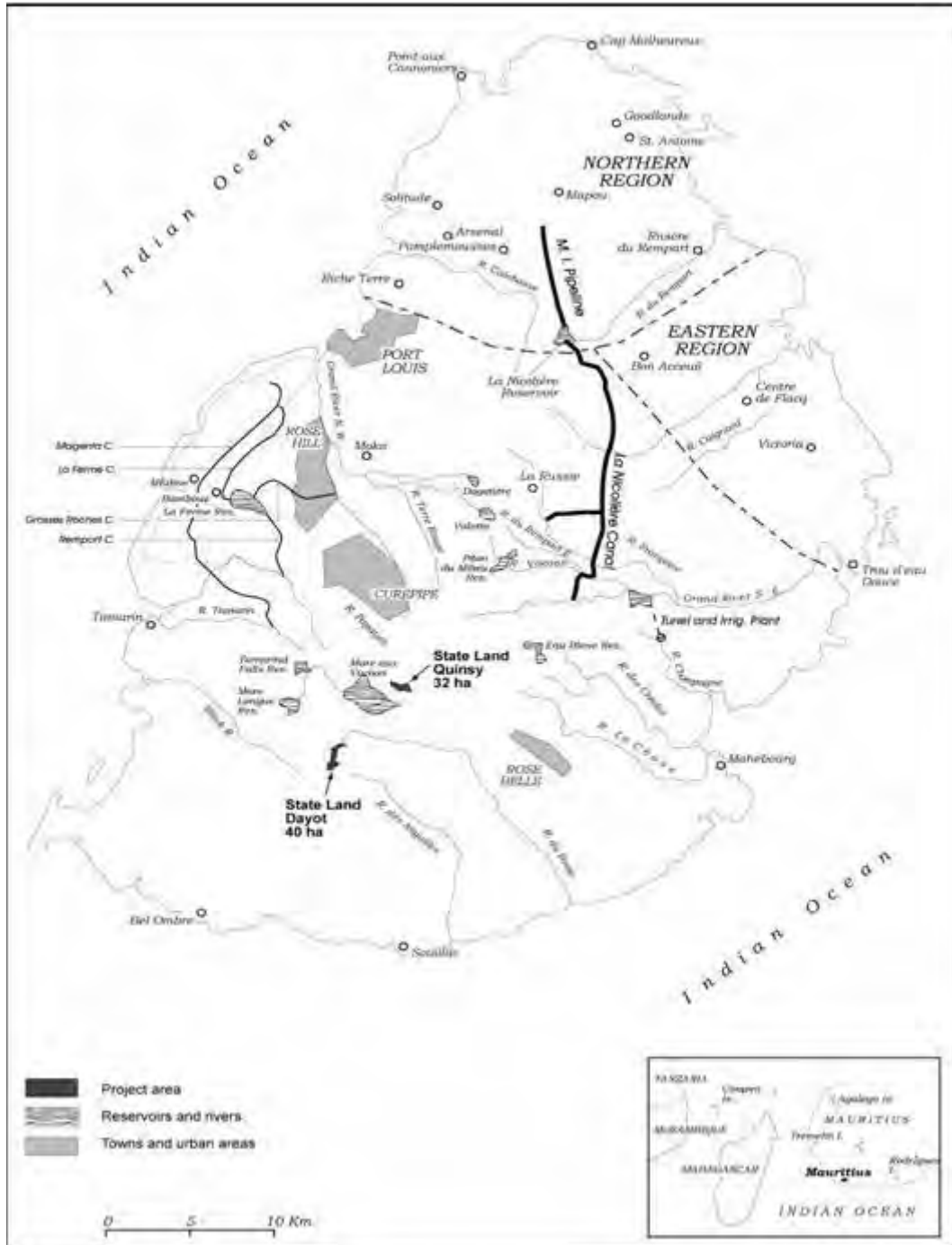
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**Component 3: Protection & Rehabilitation of Water Catchment Areas  
in Support of Existing Irrigation Schemes**



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## Appendix 2: Operating Schemes of the Irrigation Authority

Scheme	Area (ha)	No. of Planters	Project Value (Rs)	Year of Operation	System of Irrigation	Crops Grown
1. Northern Plains Irrigation Project Stage 1	1,985	1,700	110	1982	Overhead high pressure sprinkler system	Sugarcane, tobacco vegetables and foodcrops
2. Belle Mare SSIP	217	465	35	1987	Low pressure sprinkler	Onion and vegetables
3. Souvenir Drip Irrigation Pilot Project	162	184	22	1988	Drip	Sugarcane, vegetables and foodcrops
4. Palma SSIP	137	125	7	1987	Low pressure (drag line system)	Sugarcane, vegetables and foodcrops
5. Plaisance SSIP	66	132	7	1982	Low pressure (drag line system)	Sugarcane, vegetables and foodcrops
6. Bel Ombre SSIP	32	68	9.6	1989	Low pressure (drag line system)	Vegetables and foodcrops
7. Trou d'Eau Douce SSIP	15	64	1.7	1983	Low pressure sprinkler	Onion and vegetables
8. Arsenal Litchi SSIP	11	25	0.6	1990	Low pressure sprinkler	Litchi, vegetables and foodcrops
9. Riche Terre SSIP	95	215	6.6	1990	Low pressure sprinkler	Vegetables and foodcrops
10. Western Coast Irrigation Project (Rehabilitation of La Ferme & Magenta Canal)	1,238	66	145	1992/1996	Surface/drip/sprinkler	Sugarcane and vegetables
11. Solitude SSIP	95	141	20	1993	Drip	Vegetables and foodcrops
12. Cressonville SSIP	9	28	5.5	1996	Low pressure sprinkler	Litchi, vegetables and foodcrops
13. Rivière du Rempart SSIP	179	320	50	1996	Semi-solid set sprinkler system	Sugarcane and foodcrops
14. St Felix LAMU Irrigation Project	95	141	35	1997	Medium Pressure sprinkler	Sugarcane and vegetables
15. Solitude II Irrigation Project	70	117	26	2000	Drip	Sugarcane and vegetables
16. Western Coast Turnkey Drip Project	230	46	50	2000	Drip	Sugarcane and vegetables
17. Pointe aux Piments Irrigation Project	42	90	8.2	2001	Centre Pivot	Sugarcane, vegetables and foodcrops
<b>Total</b>	<b>4,588</b>	<b>3,927</b>	<b>539.2</b>			