



**COVA DA BEIRA
HYDROAGRICULTURAL
DEVELOPMENT. Design
Review of the Primary
Irrigation Network and
Automatic Management**

**Client: IHERA – Instituto de
Hidráulica, Engenharia Rural
e Ambiente**

**Preliminary Design:
1998**

**Final Design:
1998/99**

AGRICULTURE AND RURAL DEVELOPMENT

Irrigation Infrastructures

COVA DA BEIRA PRIMARY IRRIGATION NETWORK

PORTUGAL

DESCRIPTION:

The Cova da Beira Hydroagricultural Development (with an area of approximately 14500 ha) comprises essentially a multipurpose canal that starts at the Meimoa Dam water intake, implanted on the right bank of the the Meimoa river. It develops throughout 65 km up to Fratel, on the left bank of the Meimoa river.

The canal has a first trapezoidal transverse section 2 m wide, 1.5/1.0 sloping shoulders, 2.30 high and a constant slope of 0.0002 m/m throughout its entire development. The dimensions of the conveyance sections reduce as the flow is intercepted, consequently reducing the transport capacity of the current section.

The ditches, constituted by penstocks, start at the main channel and distribute the water to the irrigators..

SERVICES PROVIDED:

Preliminary Design

- Evaluation and Diagnosis of the present operating conditions
- Verification, simulation and analysis of the hydraulic behavior for frequent and exceptional exploitation situations of the irrigation network. Determination of the feed-back times between the system reserves and operation quality,
- Development of technical solutions for the improvement of the hydraulic behavior of the system. Definition of strategies for the water flow regulation
- Cost/benefit analysis. Selection of most advantageous solution, from the technical and economic point of view

Final Design – Tender Documents and Procurement Processes

- Design of the remote control networks of the modules and gates and tele-vigilance systems, as defined in the Preliminary Design, with the necessary adaptations; smoothing systems, accesses to the canal and drainage system
- Detailed Design of the pumping stations and respective regulating reservoirs
- Cost estimate for each infrastructure and equipment





**MASSINGIR DAM AND
SMALLHOLDER
AGRICULTURAL
REHABILITATION PROJECT
(MDSAR)**

Client:

Ministry of Public Works and
Housing

**Review, Design of Drainage
Infrastructures:**
2003/05

Construction Supervision:
2005/09

Studies carried out in
Association

Financing: AfDB – African
Development Bank

The Xai-Xai Irrigation and Drainage scheme is located in the lower basin of the Limpopo river, in the vicinities of the Xai-Xai city (170 000 inhabitants), capital of the province of Gaza and located some 200 km to the north of Maputo. The National Highway passes through the scheme (south-east), linking Maputo in the south to Inhambane/Maxixe in the north.

The irrigation scheme disposed of a great deal of infrastructures, although by 1993 it was not yet entirely utilized, and is subdivided in three irrigation units – Magula, Chimbonhanine and Ponela (550 ha, 400 ha and 200 ha in 1993), being each one of these units served by a large pump station

STUDIES CARRIED OUT

Phase I: Review and Design

- Study existing documents and drawings
- Review the current situation of the existing structures and define rehabilitation measures and works
- Soil suitability assessment
- Prepare the design documents
 - Irrigation conveyance and distribution systems
 - Drainage collectors and Drains
 - Pumping stations
 - Roads
 - Improvement of flood protection dykes
 - Power supplies
 - Operation and maintenance
 - Organization and Management
- Assistance on Tendering Process, analysis of Tenders, assistance during negotiation and signing the Contractor's contract.

Phase II: Construction Supervision





AGRICULTURE AND RURAL DEVELOPMENT

Irrigation Infrastructures

ALQUEVA MULTI-PURPOSE DEVELOPMENT

PORTUGAL

ALQUEVA MULTIPURPOSE DEVELOPMENT. IRRIGATION BLOCK TO BE IMPROVED BY INFRASTRUCTURE 12

Client: Empresa de Desenvolvimento de Infraestruturas do Alqueva (EDIA)

Detailed Design:
1997/99

Normal and Special Technical Assistance to the 1st Phase construction works:
2000/2003

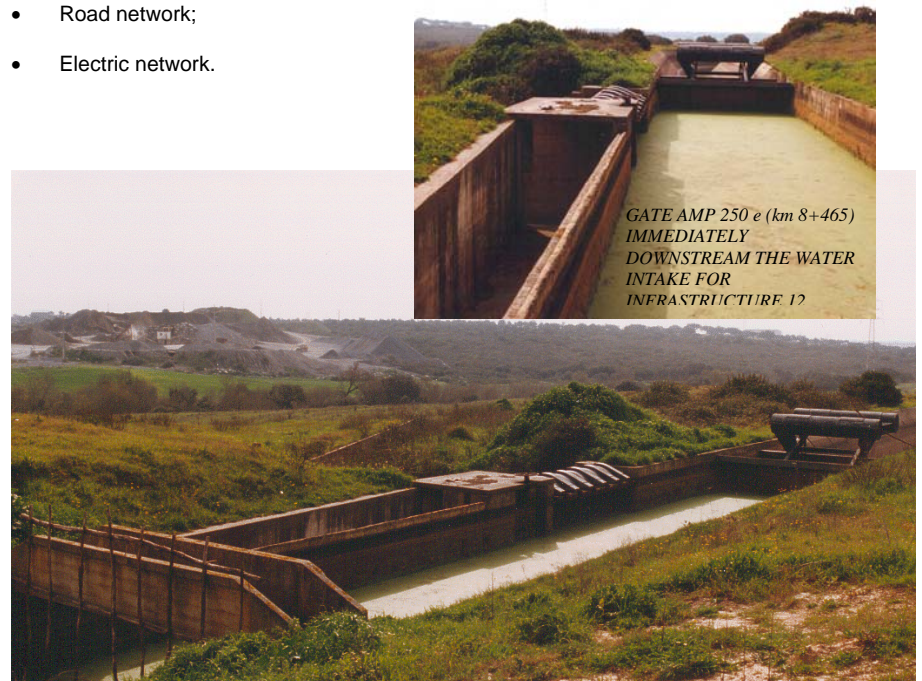
Studies carried out in Association

DESCRIPTION

The area to be improved by infrastructure 12 is about 5 800 ha and is located in the Sado river catchment area, in the Ferreira do Alentejo and Figueira de Cavaleiros parishes, Ferreira do Alentejo municipality, Beja district. This region has a temperate climate, medium annual rainfall of 550 mm and it's land structure is composed of medium and large parcels (80%) and small parcels (20 %); the crops of the area are cereals in the winter, permanent prairies, cork-trees and small irrigated areas.

The studies included:

- Infrastructure 12 canal: the primary irrigation system is composed of a canal about 16 km long.
- Remote control system;
- Automation of the canal operation;
- Modelling and mathematic simulation of variable systems;
- Regulating reservoirs: 2 regulating reservoirs (small dams) are to be built, with storage capacities of 647 000 m³ (irrigation block nr.2) and 220 000 m³ (irrigation block nr.3). An existing dam with a total capacity of 612 000 m³ is to be rehabilitated.
- Pumping Stations. To guarantee the necessary pressure for the irrigation network of the three blocks, three pumping stations are foreseen, located downstream each reservoir/dam, with a total capacity of 2266 kW, 2432 kW and 2577 kW;
- Secondary irrigation networks: Each of the three irrigation blocks was divided in two energetic levels, being the water to the hydrants supplied by underground pipes. The irrigation method foreseen is the aeration method. The dimensioned flow of the secondary network for the medium and large land parcels is of 1,4 l/s ha and for the small land parcels is of 2,5 l/s ha;
- Drainage and drying networks;
- Road network;
- Electric network.



VIEW OF THE MAIN CANAL AT THE END OF THE FURADOURO WEIR



**GHARB
HYDRO-AGRICULTURAL
DEVELOPMENT**

Client: Office Régional de Mise
en Valeur Agricole du Gharb
(Ministry of Agriculture)

Preliminary Report:
1995

**Detailed Design / Final
Design, Tender Documents
and Procurement Processes:**
1996/98

Studies carried out in
Association

Financing:
AfDB – African Development
Bank

DESCRIPTION

The Gharb Irrigation Project integrates the E1 sector (sprinkler irrigation), E3, E4 and E5 (gravity irrigation), located on both banks of the Oued Sebou (Northeast of Rabat), covering an area of approximately 41 910 ha. Its climate is semi-arid, with Mediterranean characteristics and oceanic influence and its dominant soils mainly alluvial soils with clayey contents ranging from 15 and 55%.

The studies comprise the preparation of the Preliminary Report; the Preliminary Design of two pumping stations (SR3 and SPE4); the Detailed Designs of the irrigation and drainage networks of the four irrigation blocks as well as of three pumping stations (direct pumping from the river and pumping in channel); Specifications and Final Designs of all the works. The studies also include the economic and financial feasibility of these sectors and an Environmental Impact Assessment.



VIEW OF THE MAIN CANAL



AGRICULTURE AND RURAL DEVELOPMENT

Irrigation Infrastructures

COVA DA BEIRA HYDROAGRICULTURAL PROJECT. MAIN CANAL AND RESERVOIR

PORTUGAL

COVA DA BEIRA HYDROAGRICULTURAL PROJECT. MAIN CANAL. CONSTRUCTION OF 2ND PHASE (T4-T7) ANDE MONTE DO BISPO RESERVOIR

Cliente: Instituto de Hidráulica,
Engenharia Rural e Ambiente
(IHERA)

**Technical Assistance to
Construction Supervision:**
2002 / 06

Amount of Investment:
20 056 165 €

- v) Clarifications in the reading of memoirs and drawings
- vi) Clarifications on equipment, engineering structures and definition of reservoir shapes;
- vii) Adaptation of design to the encountered conditions;
- viii) Follow-up of the system start-up, tests on plant and provisional acceptance.

DESCRIPTION:

The irrigation network consists essentially of a concrete-lined canal that starts at the Meimoa dam water intake at right bank and develops throughout 57,6 km; the section of the 2nd phase develops throughout 44 km, starting at km 13+387, after the water intake T4 that supplies the Escarigo canal (in operation) and ending at km 57+610.

Within this project, COBA provided the following services to the Owner:

Procurement phase:

- i) Assessment of tenders from contractors concerning hydromechanical equipments, sensors and communication systems, including technical advices.
- ii) Assessment of tenders from contractors regarding the works organisation, involved equipment, excavation procedures, embankments and concreting methods, including technical advices.

Initial phase of award:

- i) Technical Assistance to IHERA in the clarification of questions put by the contractor regarding materials, construction methods and techniques;
- ii) Analysis and clarification of reclamations put by the contractor regarding design errors and omissions or calculations.
- iii) Assessment of technical documents presented by the contractor regarding the study and definition of construction methods to be adopted and the construction buildings, execution details and the design aspects of the contractor's responsibility.

Construction phase:

- i) Redesign of the main canal
- ii) Design of some modifications or alternative solutions to the existing solution;
- iii) Technical assistance to supervision in the assessment of materials quality to be used in the construction of canal and in the Monte do Bispo;
- iv) Technical assistance to supervision with regard to the specific conditions of dam foundation and ancillary hydraulic structures and the foundation treatment;





**REHABILITATION AND
MODERNISATION OF THE
ODIVELAS HYDRO-
AGRICULTURAL
DEVELOPMENT**

Client: Instituto de Hidráulica,
Engenharia Rural e Ambiente
(IHERA)

Preliminary Design:
1998/99

Detailed Design:
1999/01

Studies carried out in
Association

DESCRIPTION

The Odivelas development is located between the Figueiras and Odivelas streams and irrigates an area of about 6 800 ha of the Ferreira do Alentejo, Grândola and Alcácer do Sal municipalities.

The primary irrigation network is about 62 km long, and is composed of three main canals: Odivelas canal, 23,6 km long; Sado canal, 34 km long and the Murche valley canal, 4,4 km long.

The Odivelas Hydro-agricultural development is one of the blocks of the Lower Alentejo Irrigation System, integrated in the Alentejo Irrigation Plan and in the Alqueva Multi-purpose Development. The Project includes the rehabilitation and modernization of the primary conveyance infrastructures, regulating reservoirs, pumping stations, secondary irrigation networks, remote control systems, drainage and drying networks and road network.

The project also included the implementation of an IMS/GIS for the management of the agricultural irrigation system of Odivelas.



VIEW OF THE CANAL