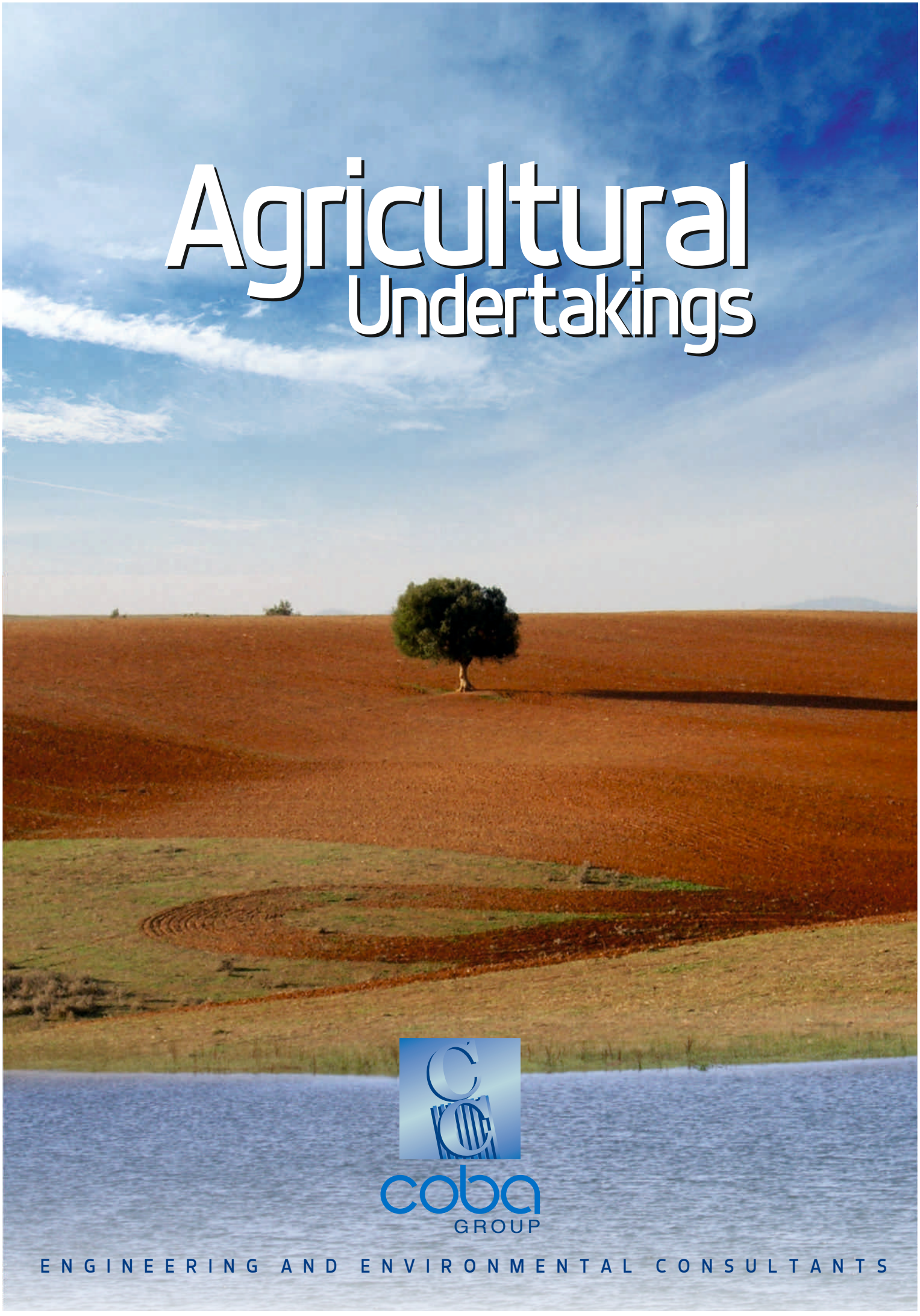
Agricultural Undertakings



coba GROUP

ENGINEERING AND ENVIRONMENTAL CONSULTANTS

PRESENTATION

COBA is a multinational and multidisciplinary group of Engineering and Environmental Consultants, founded in 1962.

The Group provides engineering consultancy services ranging from basic and planning studies, technical, environmental and economic feasibility studies, design and construction design as well as project management and works supervision, to operation follow-up and behaviour monitoring.

The Group has offices/subsidiaries in three continents and experience in more than fifty countries and encompasses several companies in accordance with functional specializations or geographical areas.

The competences acquired along the last six decades, together with the state-of-the-art employee expertise, the stability of its permanent staff and the comprehensive international experience allow to find out the best solutions for the full satisfaction of public and private Clients' needs and expectations.

During its existence, the Group has participated together with public authorities or private developers, in the feasibility of multidimensional projects, some of them being structuring projects and with major impacts on the improvement of peoples' life conditions in the several countries where it worked.

At present, the Group has a wide number of competences and technical areas that allow the composition of multidisciplinary teams who share knowledge and experiences in the execution of projects.

AGRONOMY

COBA has been providing rural engineering consultancy services since its founding in 1962. This results in a vast experience in the field of studies and designs of agricultural development, acquired through the successful achievement of dozens of studies of this nature in several countries and regions around the globe, with particular incidence on irrigation undertakings.

In light of the growing volume of the portfolio of services in this area, technical teams were systematically increased in number and expertise, which, combined with a continuous renewal effort, led to the regular admission of young engineers of the specialty. This promoted the presence of a "school" within the company, able to create the best conditions for the continued provision of services to clients, with the highest quality levels.

In parallel, resulting from its integration in a firm of engineering consultants, all technicians involved in studies of this nature enjoy the continuous collaboration a large number of experts, particularly in hydraulics and water resources, environmental engineering, geology, geotechnics, electromechanics, structures, dams and roads. This interaction confers to their activity a highlighted efficiency in all studies of interdisciplinary nature.

As a result of the expansion of its activities, along with its vast experience in the area, COBA is currently qualified to act in several domains, with capacity to carry out planning and management of studies of water resources, soil, agriculture and forestry studies, regional planning, planning and development of agricultural production, support to producers, designs of hydraulic works, rehabilitation and modernization of infrastructures, thematic mapping and geographic information systems.

The wide experience acquired in Southern Africa and the Maghreb, South America and Europe enables COBA to cooperate with Public Authorities, Governmental Departments, International Organizations, Economic Groups or Private Entrepreneurs, performing for this purpose, the full range of tasks that fall under the scope of technical consulting services.

FIELDS OF ACTIVITY

HYDRAULIC UNDERTAKINGS
Concrete, Earth-fill and Rock-fill Dams. Weirs and Reservoirs Water Conveyance Systems. Hydraulic Structures.

POWER GENERATION AND TRANSMISSION
Hydroelectric Power Plants. Photovoltaic power plants and wind farms. Small Hydropower Plants. Power Plants Rehabilitation and Modernization. Substations High Voltage Transmission Lines. Cooling Water Systems for Thermoelectric Plants.

WATER SUPPLY AND WASTEWATER SYSTEMS
Catchment, Transport and Distribution of Potable Water. Water Treatment Plants. Drainage Systems. Wastewater Treatment Stations. Pumping Stations.

AGRICULTURES AND RURAL DEVELOPMENT
Irrigation and Drainage Systems. Rural Roads. Production Systems. Mapping and Basic Information.

TRANSPORTATION INFRASTRUCTURES
Roads and highways. Railways. Passenger and Freight Railway Stations. Metro and Light Rail. Airports. Bridges and other engineering structures.

ENVIRONMENT
Environmental Impact Assessment. Environmental Management, Monitoring and Auditing. Pollution Control. Landscaping. Land Management. Recovery of Degraded Areas. Waste Landfills.

GEOTECHNICAL STRUCTURES
Tunnels and Caverns. Slopes in Fill and Cut Section. Special Foundations Breakwaters. Embankment Works.

MARITIME AND FLUVIAL WORKS
Wharfs. River Training. Quay Rehabilitation. Flood and Flow Control.

MINING INDUSTRY
Environmental Studies. Design of Tailings Dams and Related Structures. Safety Assessment of Tailings Dams. Design Review of Tailings Dam Closure. Operations Maintenance and Monitoring Manual for Tailings Dams. Risk Analysis.
Mine Closure Plan. Training.

BUILDINGS
Residential and Services Buildings. Industrial Buildings.
Steel and Mixed Industrial Structures. Rehabilitation and Restoration of Ancient Buildings.

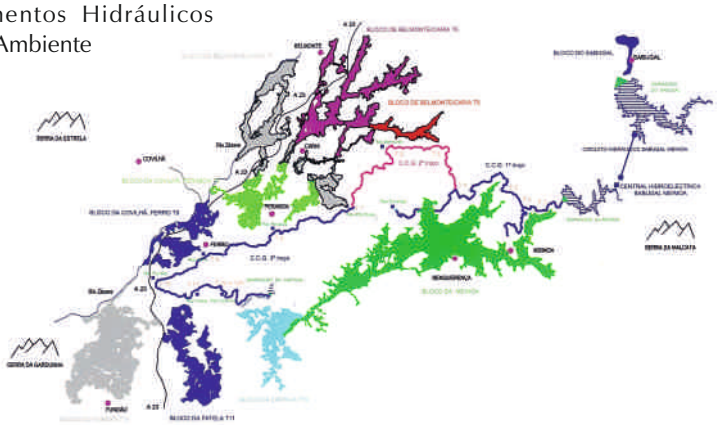
CARTOGRAPHY AND CADASTRE
Geographic Information Systems (GIS). Digital Cartography. Thematic Cartography. Thematic Cadastres. Land Acquisition.

SAFETY CONTROL AND REHABILITATION
Expertise, Monitoring. Inspection and Reinforcement of Dams and Transportation Infrastructures. Works Instrumentation. Project Maintenance and Operation.

PROJECT MANAGEMENT AND CONSTRUCTION SUPERVISION
Project Management. Cost Management. Site Supervision.
Quality Assurance/Quality Control.

Cova da Beira Hydroagricultural Undertaking | PORTUGAL

Client/Owner: Direção Geral dos Recursos e Aproveitamentos Hidráulicos
IHERA – Instituto de Hidráulica, Engenharia Rural e Ambiente
Preliminary Study: 1976/1986, 1998
Detailed Design: 1980, 1983, 1986, 1993, 1999/2001
Design Review Studies: 1993, 1999
Environmental Impact Assessment: 1993, 1999
Technical and Economic Feasibility Studies: 1993, 1997
Technical Assistance during Construction: 1998, 2002/2006
Area under study: 14 500 ha



- Sabugal Dam (storage area: 114 hm^3);
- Meimoa Dam (storage area: 39 hm^3);
- Capinha Dam (storage area: 0,5 hm^3);
- Primary Irrigation Network – main conveyance canal (designed for 9 m^3s-1), Meimoa, Escarigo and Capinha canals, Belmonte 1 and 2 distribution branches, tunnels and syphons – 85 km;
- Current Engineering Structures (culverts, footbridges, etc.), ancillary hydraulic structures (water intakes, spillways, etc) and cross-drainage;
- Secondary and Tertiary Irrigation Network – 7 irrigation blocks, 700 km of penstocks;
- Drainage network;
- River training and flood control structure on the Meimoa Stream and tributaries of the Cova da Beira Hydroagricultural Undertaking;
- Sabugal-Meimoa Water Circuit (tunnel);
- Escarigo, Monte do Bispo, Peraboa, Peroviseu and Fatela Dams; and Belmonte 1 and 2 excavated reservoirs;
- Verification, simulation and analysis of the hydraulic behaviour for frequent and exceptional exploitation situations of the irrigation network. Determination of the feed-back times between the system reserves and quality of operation;
- Development of technical solutions for the improvement of the hydraulic behaviour of the system. Definition of strategies for the water flow regulation in the perimeter;
- Remote control networks of the modules and gates and remote control systems, of the canal modernization works;
- Automation of the irrigation network;
- Filtering systems;
- Access roads to the canal.


Main Conveyance Canal


Sabugal dam

Alqueva Multipurpose Development | PORTUGAL

Client/Owner: EDIA - Empresa de Desenvolvimento e Infra-Estruturas do Alqueva, SA.

The Alqueva Multipurpose Development is a structuring project located in the Alentejo region of southern Portugal, placing itself as the anchor investment of regional development.

One of the main purposes of this project for the region consists in changing the cultural model of the agriculture practiced in the Alentejo region, with the gradual replacement of rainfed production by irrigated crops, with a start-up assurance of improved productivity and profitability rates.

These objectives may be complemented by others, also considered important to the Alentejo region, with special reference made to regulation and training of the Guadiana river basin flood flows, the warranty of a minimum ecological flow, the prospect of development of the regional secondary sector, with the creation of agro-industries, and development of associated support activities, the possibility of fish farming and aquaculture development and promotion of tourism activities in the influence zone of the reservoir.

Other important purposes are the favourable effects in terms of hydrogeology, with recharging of subsoil groundwater levels, increased land valuate and the improvement of the road network. It is important to emphasize the improvement of people's living standards in the short and medium terms, with the creation of jobs in the region, directly or indirectly associated to the construction or operation of this undertaking.

This system is composed by the following infrastructures: Alqueva Dam, Alqueva Hydropower Plant, Pedrógão Dam, Pedrógão Small Power Plant and Global Irrigation System.

The Global System of Alqueva irrigation will benefit an irrigation area in the range of 112,000 hectares. With regard to the main water sources, two were considered in the Guadiana River - Alqueva and Pedrogão. The Global Irrigation System was divided into 3 subsystems: Alqueva, Pedrógão and Ardila.

STUDIES UNDERTAKEN BY COBA AND/OR IN ASSOCIATION

PERIMETERS UNDER OPERATION
(31 527 ha)

PERIMETERS UNDER CONSTRUCTION
(15 521 ha)

PERIMETERS	TOTAL AREA (ha)
INFRAESTRUTURA 12	5 800
LOUREIRO MONTE-NOVO	7 629
BRINCHES-ENXOÉ	4 952
SÃO MATIAS	5 863
PEDRÓGÃO	5 083
MOURA GRAVÍTICO	1 664
ERVIDEL	8 084
BALEIZÃO-QUINTOS	7 994
TOTAL	47 048

DAMS
ÁLAMOS I
ÁLAMOS II
ÁLAMOS III
BRINCHES
LAJE

POWERPLANTS
ALQUEVA II
SERPA

Alqueva Multipurpose Development | PORTUGAL

Pedrógão Pumping Station and Water Circuit

Detailed design: 2005/2009
Technical Assistance: 2011/2013
Area under study: 5 083 ha
Studies undertaken in association with ProSistemas, under COBA's leadership

- Pedrógão Main Pumping Station (design flow and pumping head of 12,5 m^3 s-1 and 81 m, respectively, 6 dry-mounted vertical axis units, with a unit flow of 2,083 m^3 s^{-1});
- Pressure Pipeline (2,8 km prestressed concrete pipeline with steel web, with Ø 2500 mm, designed for a flow of 12,5 m^3 s^{-1}).
- Pedrógão Reservoir (built by ground modelling, net storage capacity of 145 hm^3);
- Primary Conveyance Network (27,8 km, with 1,8 km trapezoidal canal and 26 km buried pipelines, ND 2500 mm to 355 m);
- São Pedro Dam (zoned earthfill, maximum height of 24 m and 733 m crest length, net storage capacity of 10.165 m^3);
- Selmes Dam (zoned earthfill, maximum height of 10 m and 114 m crest length, net storage capacity of 35 hm^3);
- Pedrógão 1 Pumping Station (designed for a flow and pumping head of 0,64 m^3 and s-1 113 m, respectively);
- Pedrógão 3 Pumping Station (designed for a flow and pumping head of 01,7 m^3 s^{-1} and 70 m, respectively);
- Selmes Pumping Station (with two lifting levels, design flows of 0,5 m^3 s-1 and 1,2 m^3 s-1, and pumping heads of 70 m and 90 m, respectively);
- Secondary irrigation networks (10 irrigation blocks, 44 km buried pipelines, ND125 to ND1100 mm);
- Road Network (rehabilitation of 5 rural roads with 13 km);
- Drainage Network (4 km with cleaning/reshaping of water lines);
- Monitoring, Automation and Remote Control System;
- Geographic Information System (GIS).

Alqueva Multipurpose Development | PORTUGAL

Ervidel Irrigation Blocks

Detailed design and Environmental Impact Assessment: 2008/2010
Technical Assistance: 2011/2013
Area under Study: 8 084 ha
Studies undertaken in association with ProSistemas

- Regulating Reservoir R1 (built by soil modelling, net storage capacity of 84 m^3);
- Penedrão Pumping Station (total capacity = 4 480 kW, two elevation stages, with design flows of 2,6 m^3 s-1 and 3,1 m^3 s^{-1}, pumping heads 34 m and 77 m, respectively)
- ;Pressure Pipeline (230 m prestressed concrete pipeline with steel web, ND 1300 mm, designed for maximum flow of 2,6 m^3 s^{-1});
- Reservoir R2 (circular concrete reservoir Ø=f 22 m, net height of 5,3 m, total storage capacity of 1.730 m^3);
- Secondary Irrigation Networks (blocks 1, 2 and 3, 86 km pipelines ND110 to ND1600 mm and 2 filtering plants);
- Road Network (5 rural roads with total length of 18 km);
- Drainage network (33 km with reshaping, cleaning of ditches and compensatory measures);
- Monitoring, Automation and Remote Control System;
- Geographic Information System (GIS);
- Land Acquisition Project.

Alqueva Multipurpose Development | PORTUGAL

Baleizão-Quintos Water Circuit and Respective Irrigation Block

Detailed design and Environmental Impact Assessment: 2009/2011
Technical Assistance: 2013/..
Area under Study: 7 994 ha
Studies undertaken in association with ProSistemas, under COBA's leadership

- Gravity Conveyor (8,4 km prestressed concrete pipeline with steel web, ND2500 to ND2150 mm, maximum flow of 7,2 m^3 s^{-1});
- Estácio" Reservoir (built by soil modelling, total storage capacity of 120 hm^3);
- "Estácio" Pumping Station (total capacity = 3 150 kW, design flow and pumping head of 4,8 m^3 s^{-1} and 53 m, respectively);
- Pressure Pipeline (827 m prestressed concrete pipeline with steel web, ND 1800 mm, design flow of 4,8 m^3 s^{-1});
- Reservoir R1 (circular, reinforced concrete Ø=26 m, net storage capacity of 2.416 m^3).
- Secondary Irrigation Networks (5 irrigation blocks and 102 km of buried pipelines ND63 to ND1800 mm, HDPE, ductile cast iron and concrete);
- Road Network (3 rural roads with a total length of 12 km);
- Drainage Network (57 km with reshaping of water lines);
- Monitoring, Automation and Remote Control System;
- Geographic Information System (GIS);

Rehabilitation of the Xai-Xai Irrigation and Drainage scheme | MOZAMBIQUE

Gaza Province

Client/Owner: ARA Sul / Direção Nacional de Águas
Detailed design: 2003/2005
Fiscalização das Obras: 2006/2009
Assistance during tender launching procedure, bid analysis, assistance during negotiations & procurement: 2006
Course on "Operation, Management & Management": 2010
Area under Study: 11 787 ha
Studies undertaken in association with Consultec and Louis Berger S.A: ENCO, under COBA's leadership

- Network of irrigation and drainage canals (total length: 350 km);
- Umbape Pumping Station (total capacity = 800 kW, design flow and pumping head of 7,9 $m^3 s^{-1}$ and 11 m, respectively);
- Ponela Pumping Station (total capacity = 220 kW, design flow and pumping head of 0,96 $m^3 s^{-1}$ and 10 m, respectively);
- Irrigation Network (13 km buried pipelines, ND160 to ND1200 mm, HDPE and Concrete);
- Road Network (88 km of rural roads);
- Soil and hydrologic studies.

Quiminha Agricultural and Regional Development Project | ANGOLA

Luanda Province

Client/Owner: Ministério da Agricultura e Desenvolvimento Rural
Technical Assistance and Construction Supervision: 2013/..
Area under Study: 5 010 ha

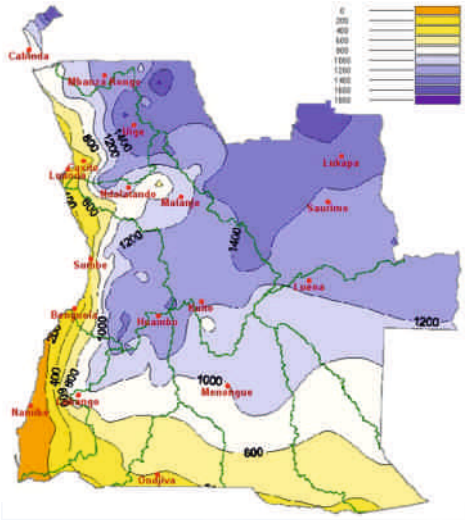
- Rehabilitation of a 1 810 ha-area for family and commercial agriculture and 3 200 ha for private farms (64 farms, 50 ha each);
- Settlement of 300 families: construction of 300 family houses de and 10 settlement houses for employees, teachers, doctors, etc. - single 3-bedroom houses with an area of 100 m^2;
- Preparation of 300 family farms with 3 ha of land each (300 h and 600 ha of rainfed irrigation), including 300 tunnels for production of vegetables;
- Construction of a Logistic Centre that includes a central unit for the production and marketing of eggs, silos for corn storage, cooling chambers to storage of fresh produce, warehouses for chemicals, as well as administrative offices, workshops and warehouses;
- Construction of a Training Centre that includes offices, sanitary facilities, laundry building and courtyard, cafeteria, gymnasium, houses (1, 2, 3 and 4-bedroom typologies) and a guardhouse;
- Construction of an access road to the undertaking with an extension of 4,3 km;
- Construction of a road network within the complex.
- Construction of a water supply network to the complex, comprising: abstraction with a water intake and main pumping station PS1, a feeder canal (PS1-R1), a reservoir R1 (net capacity of 300 000 m^3), feeder canal (PS-R2), a secondary pumping station PS2, two raw water reservoirs (R2 and R3), and a water treatment plant.

Angolan Irrigation Master Plan (PLANIRRIGA) | ANGOLA

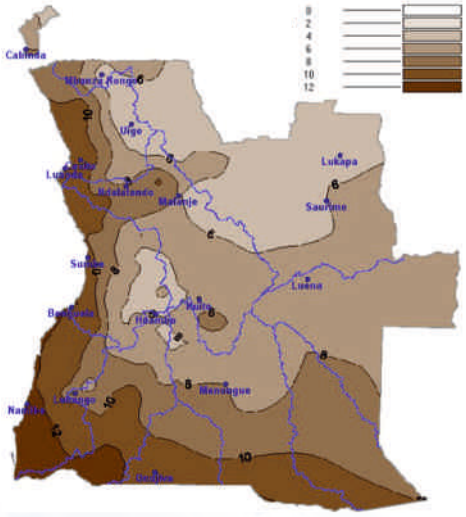
Client/Owner: Ministério da Agricultura e Desenvolvimento Rural
Master Plan: 2008/2012
Area under Study: 17,5 million ha

The PLANIRRIGA was established as a plan to promote regional and national development of Angola, by presenting measures and actions to be undertaken within the hydroagricultural sector on Angolan territory.

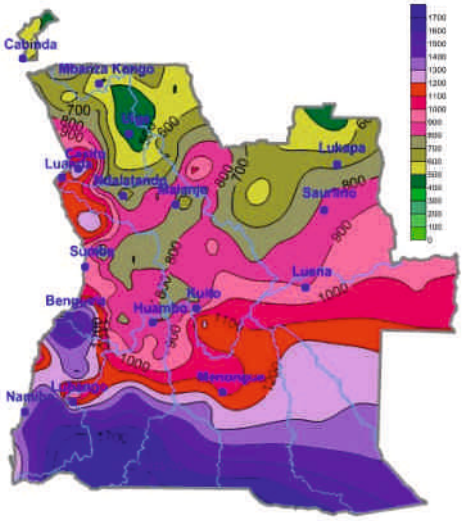
- Characterization of resources (climate, soils, surface and underground water resources, among others);
- Identification and characterization of the existing irrigation perimeters in the region;
- Soil classification and mapping;
- Assessment of soil with irrigation potential;
- Edaphic and climatic zoning of crops;
- Water needs for crop irrigation;
- Demand /Availability water balance;
- Scenarios for agro-economic development and management;
- Environmental framework;
- Proposal for institutional framework;
- Geographic Information System;
- Formulation of objectives, priorities and measures;
- Physical and financial schedule;
- Proposal for training of technical staff and creating entities associated to agricultural and rural hydraulics engineering.



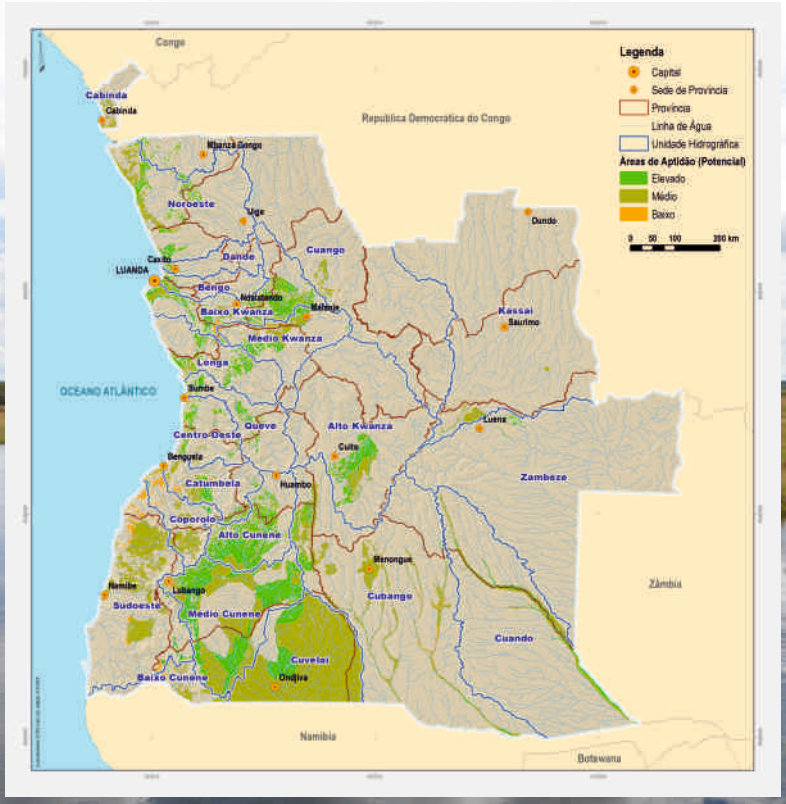
Rainfall (mm/year)



Months with water deficit



Water needs for irrigation (banana) (mm)



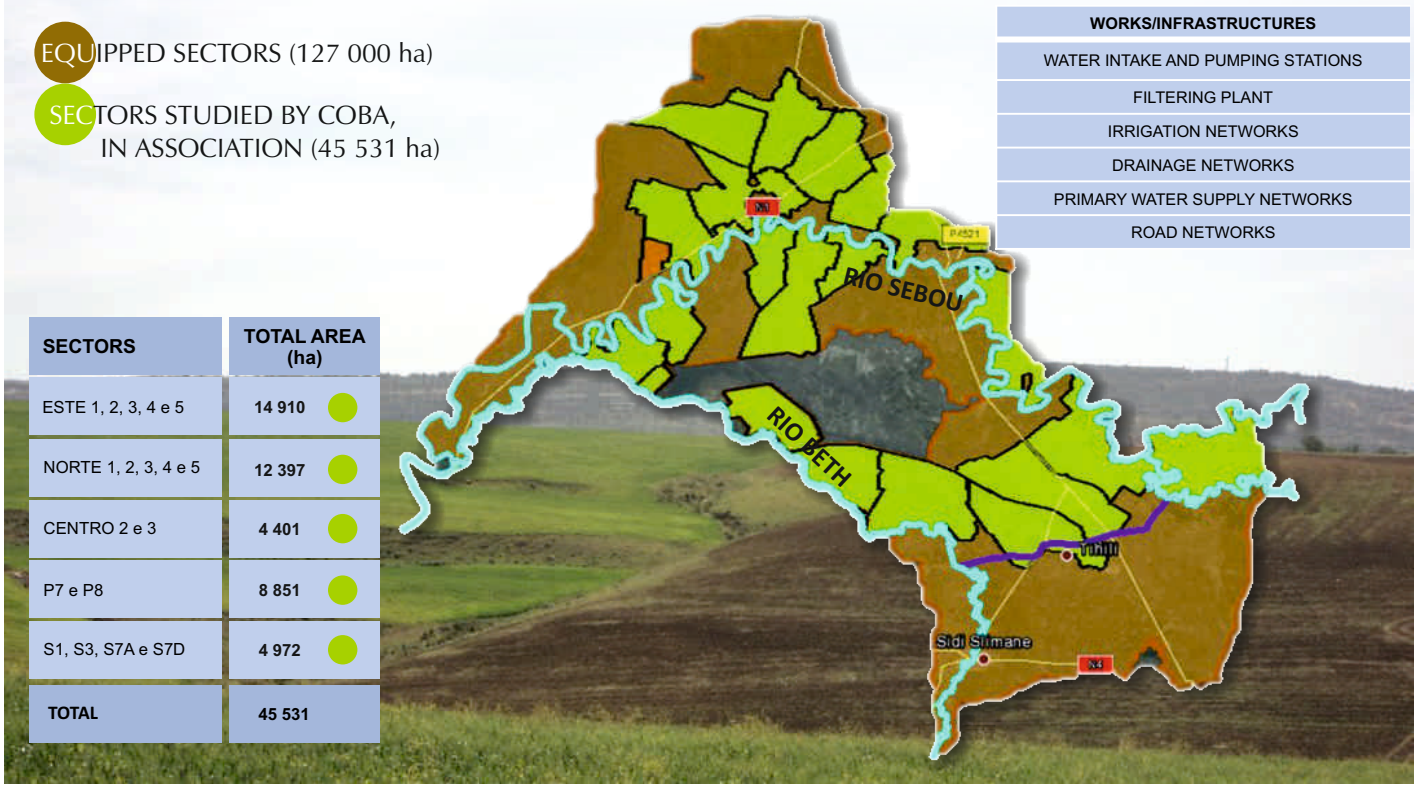
Area with irrigation potential

Gharb Hydroagricultural Development | MOROCCO

Client/Owner: ORMVAG - Office Régional de Mise en Valeur Agricole du Gharb (Ministério da Agricultura)

The Gharb Hydroagricultural Development is located in the north-western zone of Morocco, covering an area of approximately 616,000 ha, with an irrigation potential of 250,000 ha. The currently equipped area with collective irrigated land amounts to 127,000 ha, with localized, sprinkler and gravity irrigation methods.

The Gharb region enjoys a privileged location and a significant potential with regard to water resources (watershed of the Sebaou River), climate and soil, which promoted a major agricultural and agro-industrial development. With about 20% of the potential area for irrigation in Morocco, the Gharb Hydroagricultural Development is the largest and most important irrigated area in the country.



SECTORS	TOTAL AREA (ha)
ESTE 1, 2, 3, 4 e 5	14 910
NORTE 1, 2, 3, 4 e 5	12 397
CENTRO 2 e 3	4 401
P7 e P8	8 851
S1, S3, S7A e S7D	4 972
TOTAL	45 531

Gharb Hydroagricultural Development | MOROCCO

Sectors E1, E2, E3, E4, and E5

Preliminary Report: 1995
Preliminary Detailed Design / Detailed design: 1996/1998
Area under Study: 14 910 ha
Studies undertaken in association with CID, under COBA's leadership

- 298 km irrigation canals;
- 48 km pipelines;
- 2 pumping stations (SRE3 and SPE4);
- Irrigation and Drainage networks (5 irrigation blocks – sectors E1, E2, E3, E4 and E5);
- 3 pumping stations (direct pumping from the river and pumping by canal).

Gharb Hydroagricultural Development | MOROCCO

Study for Reconversion of the Sprinkler Irrigation System into Localized Irrigation

Agronomic, Social & Economic Studies, Feasibility Studies, Diagnosis Studies, Summary Preliminary Design, Preliminary Detailed Design, Detailed Design and Tender Documents: 2009/2012
Area under study: 19 356 ha
Studies undertaken in association with CD, under COBA's leadership

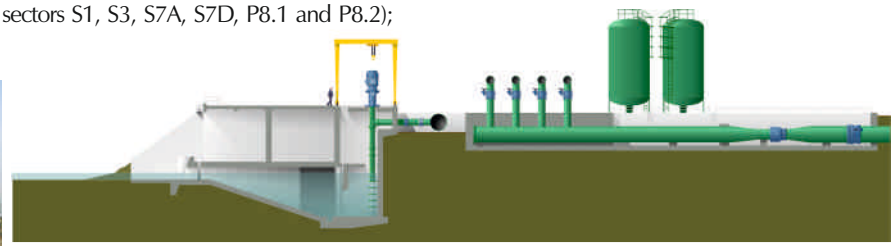
- 351 km pipelines;
- 8 pumping stations;
- 8 filtering plants;
- Irrigation and Drainage Networks (8 irrigation blocks – sectors N1, N2, N3, N4, N5, C2, C3 and P7);
- Road network.

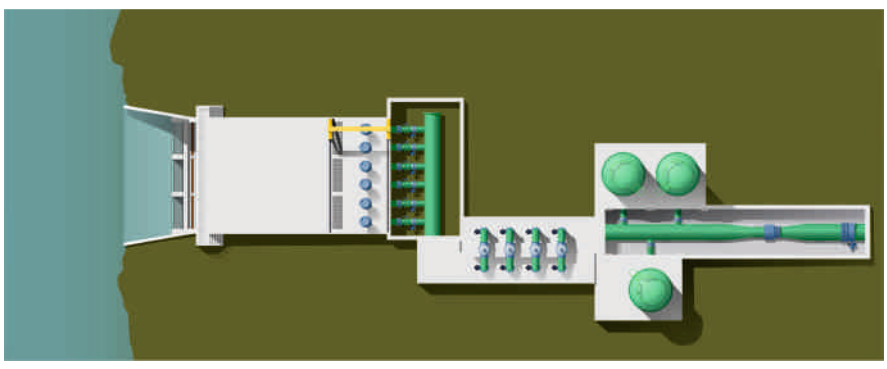
Gharb Hydroagricultural Development | MOROCCO

Study for Reconversion of the Sprinkler Irrigation System into Localized Irrigation

Agronomic, Social & Economic Studies, Feasibility Studies, Diagnosis Studies, Summary Preliminary Design, Preliminary Detailed Design, Detailed Design and Tender Documents
Area under study: 11 265 ha
Studies undertaken in association with CID, under COBA's leadership

- 168 km pipelines;
- 6 pumping stations;
- 6 filtering plants;
- Irrigation and Drainage Networks (6 irrigation blocks – sectors S1, S3, S7A, S7D, P8.1 and P8.2);
- Road network.



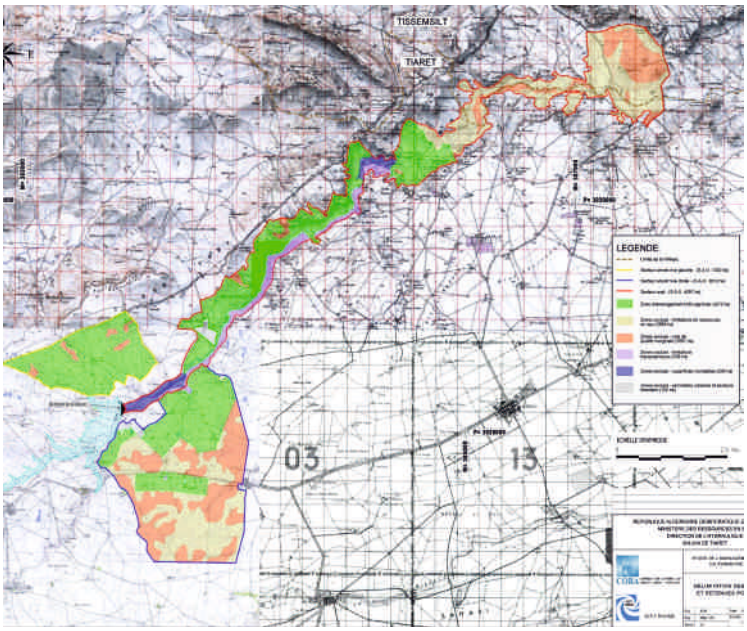


Dahmouni Irrigation Perimeter| ALGERIA

Wilaya de Tiaret

Client/Owner: Direction de l'Hydraulique de la Wilaya de Tiaret
Baseline Studies, Study of Alternatives and Summary Detailed Design of Chosen Solutions, Topographic and Geotechnical Surveys: 2003/2006
Area under study: 4 000 ha
Studies undertaken in association with SCET-TUNISIE, under COBA's leadership

- Water conveyance through:
  - Water main BPAT ND 1 600 mm
  - Pumping station (flow and pumping head of 3,4 $m^3 s^{-1}$ and 96 m, respectively);
  - Regulating water tower (capacity 3 500 m^3);
  - Including fittings, special devices and associated current & special structures.
- Distribution network of downstream irrigation sector (57 km of buried pipelines made of reinforced concrete and HDPE);
- Distribution network of irrigation sector located upstream of left bank (32 km buried pipelines made of reinforced concrete and HDPE);
- Distribution network of irrigation sector located upstream of right bank (37 km buried pipelines made of reinforced concrete and HDPE).



Agricultural Undertakings of Barranquillita-Bajirá, Firavitoba and Pamplonita | COLOMBIA

Department of Antioquia, Boyacá and Santander North

Client/Owner: Fondo de Adaptación
Supervision during the preparation of the three Preliminary Studies, including review and technical, administrative, financial and legal follow-up: 2014/..
Area under study: 42 015 ha
Studies undertaken in association with JHER, under COBA's leadership

BARRANQUILLITA BAJIRÁ UNDERTAKING:

- Total Project Area: 31 800 ha;
- Area located in the northwest of the Department of Antioquia, in the region of Urabá, improving the areas of the Mutatá and Turbo municipalities:
- Main rivers with influence in the study area: Léon River and Vilarteaga River;
- Area predominantly occupied by large farms for mixed cattle breeding (milk and meat);
- Scope of the main interventions: improvement of the drainage system by opening new drainage canals; Cleaning of existing water lines; protection of river banks, dredging operations in the Léon River, zoning of areas with drainage problems; definition of recovery measures and conservation of watersheds.


BARRANQUILLITA BAJIRÁ UNDERTAKING


FIRAVITOBA UNDERTAKING

FIRAVITOBA UNDERTAKING:

- Total Project Area: 4 400 ha;
- Net area: 4 200 ha;
- Area located in the Iza and Pesca River valleys, municipalities of Iza, Pesca, Firavitoba and Sogamoso, in Boyacá Department;
- Main rivers with influence in the study area: Iza River and Pesca River;
- Two dams: El Batan Dam and el Morro Dam;
- Pumping Stations (between 3 and 9 pumping stations, depending on the solution adopted);
- Under pressure irrigation system, with distribution of buried pipelines (approximately 240 km of buried pipelines with diameters between 1600 mm and 75 mm);
- Improvement of the existing road and drainage system.

PAMPLONITA UNDERTAKING:

- Total Project Area: 5 815 ha;
- Net area: 4 300 ha;
- Area located near the border with Venezuela, northwest of the city of Cúcuta, in North Santander Department;
- Main rivers with influence in the study area: Zulia River and Pamplonita River;
- Bypass works in the Zulia Canal (existing canal) / direct water abstraction from the Pamplonita River / Dam on the Pamplonita River;
- Under pressure irrigation system, with distribution of buried pipelines;
- Pumping stations;
- Improvement of the existing road and drainage system.

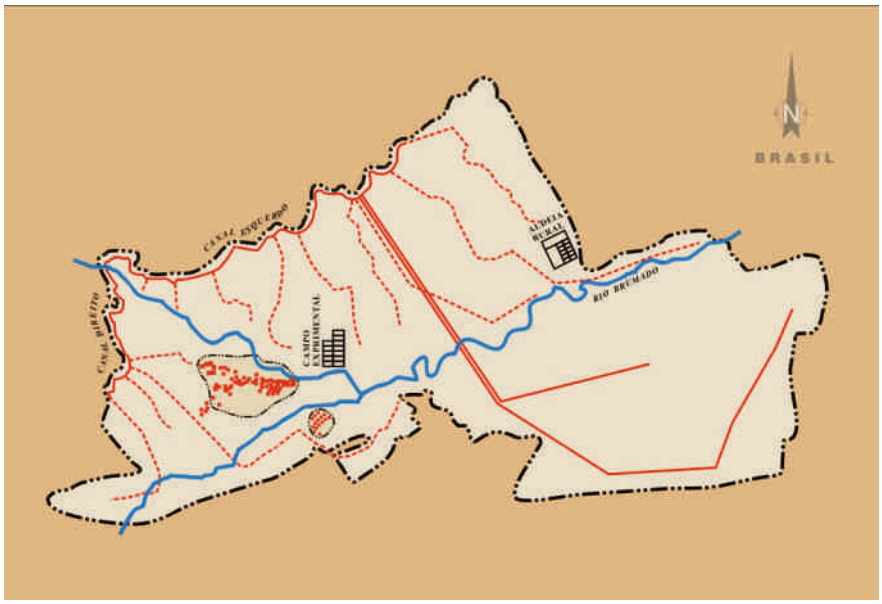

PAMPLONITA UNDERTAKING

Rio das Contas Hydroagricultural and Hydroenergetic Undertaking | BRAZIL

Bahia State

Client/Owner: DNOCS – Departamento Nacional de Obras Contra as Secas Ministério do Interior
Technical & Economic Feasibility Study and Detailed Design: 1973
Area under study: 100 000 ha
Studies undertaken in association with ERN – Engenharia de Recursos Naturais, S.A.

- Assessment of the existing situation (livestock facilities, industrial activities);
- Summary analysis of the developing prospects of the relevant markets for the region;
- Characterisation of the climatic and hydraulic systems of the basin;
- Pedological studies for selection of areas in which a hydroagricultural development could be located:
- Economic studies for establishing the guidelines of the human occupation of the territory aiming at a more adequate exploitation of natural resources, plan of an agricultural, livestock and forest development for the basin;
- Preliminary design of 6 irrigation perimeters, including drainage and irrigation works, planning of irrigation and agricultural experimentation, evaluation of lodging, education and sanitation requirements, cost estimates and financial and economic analysis;



- Selection of dam sites and, for each of them, geological and geotechnical studies were carried out, the water availability was determined and the characteristics of the dam works, the producible energies and the capacities to be installed were defined;
- Among the selected developments, 8 are hydroagricultural, 31 are hydroelectric and 4 are multipurpose developments:
- Soil map (3 950 000 ha for the reconnaissance survey at scale 1/250 000, and 118 400 ha for the semi-detailed studies at scale 1/20 000);
- Map of Land suitability for irrigation (188 400 ha at scale 1/20 000);
- Existing land use map (3 950 000 at scale 1/250 000);

Curu-Paraipaba Irrigation Project – 3rd Phase | BRAZIL

Ceará State

Client/Owner: DNOCS – Departamento Nacional de Obras Contra as Secas Ministério do Interior
Social, Technical & Feasibility Study: 1993
Basic Design and Environmental Impact Assessment: 1996/1998
Area under study: 4 720 ha
Studies undertaken in association with AGUASOLOS

- Studies: Climatology, Hydrology, Topography, Geotechnics, Socio-Economics, Marketing and Commercialization, Agricultural Planning, Engineering Alternatives:
- Summary Preliminary Design, Implementing Analysis, Economic and Financial Assessment, Project Organization and Management;
- Design of water intake and conveyance structures (26 km canals, 40 km buried pipelines and 6 pumping stations), water tanks, distribution networks (29 km buried pipelines), drainage and road networks (65 km of main and secondary roads), culverts, electricity network (distribution lines under tension and substations, and pressure pipelines;
- Design of irrigation system to plot level;
- Study of support infrastructures to the production;
- Tender Documents of the works, equipment supply and assembly.

Micro basins of the Santo Antônio de Pádua and Cardoso Moreira Municipalities BRAZIL

State of Rio de Janeiro

Client/Owner: SEA – Secretaria de Estado do Ambiente
Agronomic Studies and Basic Designs: 2012/2013
Area under study: 5 230 ha

- Technical, Environmental & Economic Feasibility Studies;
- Characterization of the physical and rural environment;
- Baseline Studies;
- Design of irrigation systems – study of alternative solutions (water mains – 203 km, dams, direct river intakes, pumping stations and artesian wells);
- Collective Irrigation Perimeters (4 pumping stations, 2 regulating reservoirs, pumping stations – 2 km, and water mains – 107 km);
- Areas proposed for environmental protection (protection of springs and riparian forests, reforestation and afforestation of special areas of side bands and green corridors);
- Preparation of the Strategic Plan for Intervention.


Santo Antônio de Pádua Municipatity


Santo Antônio de Pádua Municipatity


Cardoso Moreira Municipatity


Cardoso Moreira Municipatity


Cardoso Moreira Municipatity

coba GROUP

JULY | 2023

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