



## High-Level Conference on:

### Water for Agriculture and Energy in Africa: the Challenges of Climate Change

Sirte, Libyan Arab Jamahiriya, 15-17 December 2008

## National Investment Brief

### LIBYAN ARAB JAMAHIRIYA

#### EXECUTIVE SUMMARY:

The cultivable area of the Libyan Arab Jamahiriya is estimated at about 2.2 million ha (1.2% of the total area), with 1.8 million ha for annual crops and 0.3 million ha for permanent crops; in addition to 13.3 million ha of permanent pastures. Agriculture contributes to about 9 percent of GDP and provides employment for about 5 percent of the total economically active population. Women account for 67% of the labour force in the agricultural sector.

At least 80 percent of agricultural production depends on irrigated agriculture; however, yields from rainfed as well as irrigated agriculture are generally low. Irrigation potential has been estimated at 750 000 ha, but when considering renewable water resources, it is estimated that a maximum of 40 000 ha could be irrigated in the coastal areas. The total water managed area is approximately 470 000 ha, all equipped for full or partial control irrigation, out of which an area of 316 000 ha was actually irrigated in 2000. About 99 percent of this area is irrigated using groundwater, while the remaining 1 percent is irrigated by treated wastewater and surface water. The irrigation sector provides 50 percent of the cereal production and 90 percent of the fruit and vegetable production. Agriculture uses about 83 percent of the total water withdrawal.

Food security is felt as a moral imperative for the Libyan leaders and huge efforts have been made to develop irrigated agriculture based on local water resources and to create the conditions for the rehabilitation and development of the coastal agriculture through water transport from the south to the north. However, with very limited renewable water resources, the country relies heavily on imports to satisfy its food requirements. In 2000 the import of cereals, sugar and oil represented a contribution of 68 percent to the national calorie budget. The degree of need satisfaction and quality of diet at household or individual level varies, but less than 2.5 percent of the population is undernourished, a situation that has not changed significantly from 1990-92 to 1999-2001. The food imports bill has rapidly increased over the past 30 years, going from around US\$ 100 million in 1970 to nearly 1270 million in 2005.

Most water used in the Libyan Arab Jamahiriya comes from the fossil reserves of four main aquifer systems located south of the 29° North latitude. The total groundwater abstraction in 2000 was more than 4 200 million m<sup>3</sup>, up from 1500 million in 1975. This rate of abstraction is nearly 8 times the annual renewable groundwater resources. The coastal aquifers are the only ones that are being recharged by rainfall but uncontrolled groundwater development from these aquifers exceeds the annual replenishment. This has caused a severe water level decline and seawater encroachment, which makes the coastal groundwater resources almost unusable because of their high salinity. Libya is affected by climate change in many ways, in particular, crop production and food security, water resources, human health, population settlement and biodiversity. Adaptation to climate change will require major shifts in policies and practices aimed at protecting natural resources from further degradation and stopping desertification.

The rapid growth of municipal and industrial water demand and the low performance of agriculture relative to its potential have led decision-makers to embark on a reform process of the policies and institutional framework of these sectors with a view of managing national natural resources in a sustainable manner, improving productivity and meeting changing patterns of demands for food and water. The reform process gives due consideration to socio-economic implications and institutional re-alignment to support the new policies and strategy measures. Developing medium and long term water resources and agricultural production projections as well as a national legal framework capable of supporting the emerging policy options will also be given due consideration in the process.

# 1. CONTEXT

## 1.1 AGRICULTURE AND FOOD SECURITY

### Agriculture

The cultivable area of the Libyan Arab Jamahiriya is estimated at about 2.2 million ha (1.2% of the total area), with 1.8 million ha for annual crops and 0.3 million ha for permanent crops; in addition to 13.3 million ha of permanent pastures.

Total Gross Domestic Product (current US\$) was US\$19 100 million in 2002 with an estimated growth rate of 3.2 percent per year. It has increased to US\$ 58 333 million in 2007, with a growth rate of more than 5%, thanks to high oil prices. The Libyan economy depends primarily upon revenues from the oil sector, which contributes practically all export earnings and about 25 percent of GDP. The non-oil manufacturing and construction sectors, which account for about 20 percent of GDP, have expanded from processing mostly agricultural products to include the production of petrochemicals, iron, steel, and aluminium. Agriculture contributes to about 9 percent of GDP and provides employment for about 5 percent of the total economically active population. While 25 percent of the total economically active population are women, in the agricultural sector they account for 67 percent of the labour force. The unemployment rate is about 30 percent. With a population close to 5.5 million, Libya had an estimated per capita GDP of US\$ 6,800 in 2005.

Annual rainfall is extremely low, with about 93 percent of the land surface receiving less than 100 mm/year. The highest rainfall occurs in the northern Tripoli region and in the northern Benghazi region, these two areas being the only ones where the average annual rainfall exceeds the minimum value (250-300 mm) considered necessary to sustain rainfed agriculture. Rainfall occurs during the winter months, but great variability is observed from place to place and from year to year. Average annual rainfall for the country as a whole is 26 mm.

It is estimated that at least 80 percent of agricultural production depends on irrigated agriculture. However, yields from rainfed as well as irrigated agriculture are generally low. Apart from the aridity of the climate which reduces rainfed yields, this is due to prevailing shallow, coarse soils with limited natural fertility and high erosion risks. The average yield of irrigated wheat and barley is much lower than the yields obtained in other Mediterranean countries. The yields for irrigated fruits, vegetables and oil crops are generally also lower than in the surrounding countries but for these crops the differences are smaller.

In 1995, 54 percent of the Libyan population lived in the western coastal area and 21 percent in the eastern coastal area. This means that 75 percent of the population is concentrated over 1.5 percent of the total area of the country. In 2002, 72 percent of the population had access to improved drinking water sources (72 percent of the urban population and 68 percent of the rural population). About 97 percent of the urban population and 96 percent of the rural population had access to improved sanitation services.

### Irrigation and water control

Irrigation potential has been estimated at 750 000 ha. However, the development of this potential would have to rely mainly on the use of fossil water. Considering renewable water resources, it is estimated that a maximum of 40 000 ha could be irrigated in the coastal areas. The total water managed area is approximately 470 000 ha, all equipped for full or partial control irrigation. On almost the entire area sprinkler irrigation is practised, because of the sandy soils prevailing in most areas of the country. The costs of installing sprinkler irrigation on a farm amount to about US\$10 000/ha. It was estimated that of the total area of 470 000 ha, 316 000 ha was actually irrigated in 2000. About 99 percent is irrigated using groundwater, while the remaining 1 percent is irrigated by treated wastewater and surface water.

Because of the importance of private irrigation, representing some 81 percent of the net irrigated area in the Libyan Arab Jamahiriya, the figure of 316 000 ha should be considered a rough estimate, probably underestimated. With a cropping intensity that varies from 1.3 to 1.5 according to the area, the total harvested irrigated area (winter + summer irrigation) is estimated to range from 440 000 to 500 000 ha.

Private irrigation farming, generally on 1-5 ha plots, is mostly concentrated in the traditional development areas (Jifarah Plain, Jabal Al Akhdar, and Murzuq Basin) with an actual irrigated area of

about 257 000 ha in 2000. Large-scale state farming are located mainly in the southern areas, where new irrigation schemes have been set up based on highly productive deep wells supplying water to blocks divided into small plots and cultivated by small-scale farmers. Also located in the desert areas are large-scale state farms (usually pivot systems) operated by state technicians and workers.

Only about 2 percent of the irrigated land is estimated to be equipped with some form of drainage because of the lack of experience in the concept of drainage and the high cost of drainage installation. Improper irrigation and drainage practices have resulted in substantial degradation of soil in the southwestern part of the country. The planned use of transport water for irrigation along the coast of Sirte where brackish aquifers exist at a shallow depth may also result in waterlogging and salinity problems if appropriate irrigation and drainage techniques are not applied.

**Food security**

Food security is felt as a moral imperative for the Libyan leaders and huge efforts were made in the 1970s and 1980s to develop irrigated agriculture based on local water resources, and in the 1990s to create the conditions for the rehabilitation and development of the coastal agriculture through water transport from the south to the north.

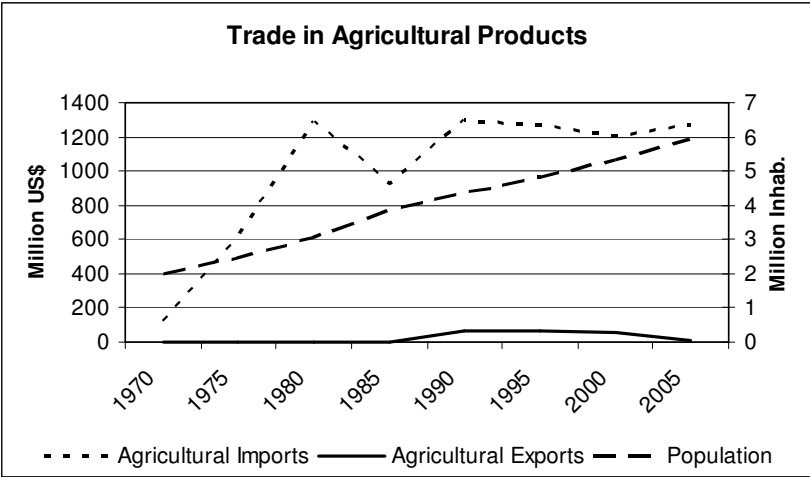
Given the arid nature of much of the Libyan Arab Jamahiriya, irrigated farming systems have always been of crucial importance in generating much of the country’s agricultural output. Irrigated farming systems have always been of crucial importance in generating much of the country’s agricultural output. About 50 percent of the cereal production and 90 percent of the fruit and vegetable production originates from irrigated agriculture.

However, food security is distinctly different from food self sufficiency which is now impossible and will be more and more difficult to achieve in the future. A debated question is whether irrigation, mostly the one based on costly water transfer, remains justified in a situation of water scarcity where the only source of water is non-renewable groundwater and where economic returns from other sectors (oil industry) would allow an easy access to the international food market.

With very limited renewable water resources, the Libyan Arab Jamahiriya relies heavily on imports to satisfy food requirements. In 2000 the import of cereals, sugar and oil represented a contribution of 68 percent to the national calorie budget. The degree of need satisfaction and quality of diet at household or individual level varies. Less than 2.5 percent of the population is undernourished. The situation has not changed significantly from 1990-92, benchmark period of the WFS (World Food Summit) and the MD (Millennium Declaration), to 1999-2001, the last period available.

**Food and agriculture trade and import balance**

The food imports bill has rapidly increased over the past 30 years, going from around US\$ 100 million in 1970 to nearly 1270 million in 2005 (see figure below). The growth was sharp from 1970 to 80 before dropping during the fist half of the eighties as a consequence of the oil price crisis, then picking up again during the second half. The bill has been more or less stabilized since the early nineties. Cereals contribute the largest share of the bill with 35% and wheat alone accounts for approximately 6% of the total.



**1.2 WATER RESOURCES AND HYDROPOWER**

The total mean annual runoff is roughly estimated at 200 million m3/year, but the regular renewable surface water resources (after evaporation and infiltration) are estimated at 100 million m3/year. Currently there are 16 dams in operation with a total storage capacity of 385 million m3 and an

average annual storage capacity of about 61 million m<sup>3</sup>. Aquifers are recharged only in the northern regions where renewable groundwater resources are estimated at 500 million m<sup>3</sup>/year.

Most water used in the Libyan Arab Jamahiriya comes from the fossil reserves of four main aquifer systems located south of the 29° North latitude. The volume of these reserves is not known with precision but it is estimated to be huge.

The existing operating capacity of installed desalination plants is about 65 million m<sup>3</sup>/year but the total water produced is only between 20 and 30 million m<sup>3</sup>/year and is used exclusively for domestic and industrial purposes. The level of wastewater treatment is estimated at about 40 million m<sup>3</sup>/year and is used for agricultural purposes.

The total groundwater abstraction in 2000 was more than 4 200 million m<sup>3</sup>, up from 1500 million in 1975. The rate of 4200 million m<sup>3</sup>/year is nearly 8 times the annual renewable groundwater resources and therefore the Libyan Arab Jamahiriya depends heavily on fossil groundwater. The coastal aquifers are the only ones that are being recharged by rainfall but uncontrolled groundwater development from these aquifers exceeds the annual replenishment. This has caused a severe water level decline and seawater encroachment, which makes the coastal groundwater resources almost unusable because of their high salinity.

This situation has accelerated the process of water transfer through the implementation of "The Great Manmade River Project" (GMRP), which is designed to transport eventually 2 300 million m<sup>3</sup> of fossil water from the Libyan South to the North where the water is urgently needed. The project is ongoing and consists of five phases, of which Phase I and II have been implemented. For Phase I, two well fields have been designed to convey 730 million m<sup>3</sup> of water per year to the coastal areas extending from Binghazi to Sirte. Phase II consists of several well fields designed to transport some 910 million m<sup>3</sup> of water per year to the plain around Tripoli.

Of the total water withdrawal of 4 268 million m<sup>3</sup> in the year 2000, about 83 percent was used for agricultural purposes, 14 percent for domestic use and 3 percent for industrial use. More than 30 percent of the present domestic water demand is supplied by the GMRP. Most of the industrial water is used for the oil industry (injection, processing and some domestic use).

According to the assumptions made about water productivity in agriculture, the total water requirement to support basic food self-sufficiency and to meet the domestic water demand of the 12 million Libyans in the year 2025 is estimated to range between 10.5 and 16.4 km<sup>3</sup>/year, compared to 4.3 km<sup>3</sup>/year at present. When the GMRP is fully operational, the total amount of water available for all uses, assuming that the present groundwater production equipment will be maintained until 2025, will be in the order of 6.5 km<sup>3</sup>/year and will thus barely cover 50 percent of the total water requirement.

### **1.3 CLIMATE CHANGE**

As it is the case for all Mediterranean countries, Libya is greatly affected by climate change. According to a recent study, the temporal and spatial temperature changes in the country indicate remarkably different annual and seasonal trends over the long observation period 1946-2000 and the short observation periods 1946-1975 and 1976-2000. Variability of seasonal precipitation over Libya are more strikingly experienced from 1976-2000 than from 1951-1975 indicating a growing magnitude of climate change in more recent times. Annual cloud amount totals decreased at most study stations in Libya over both long and short periods. Remarkably large spatial variations of climate changes were observed from north to south over the country, showing high correlation between temperature increasing over Libya and CO<sub>2</sub> emissions.

Libya is affected by climate change in many ways, in particular, crop production and food security, water resources, human health, population settlement and biodiversity. The effects of climate change depend on its magnitude and the rate with which it occurs. Jifara Plain, located in north-western Libya, has been seriously exposed to desertification as a result of climate change, landforms, overgrazing, over-cultivation and population growth.

Adaptation to climate change will require major shifts in policies and practices aimed at protecting natural resources from further degradation and stopping desertification. The country has established a policy framework for actions to mitigate climate change and combat desertification. The country has also implemented several laws and legislative acts, with a number of ancillary and supplementary

rules to regulate. Despite these efforts, urgent actions and projects are needed to mitigate climate change and combat desertification in the near future.

## 2. NATIONAL STRATEGIES FOR WATER, AGRICULTURE AND ENERGY

### 2.1 POLICY CONTEXT

The Libyan Jamahiriya is facing severe water scarcity problems with virtually no rainfall, except in the narrow coastal belt, and reliance on groundwater resources – most of which are non renewable – for covering its needs. Although the fossil reserves are important, the country is already experiencing heavy over-draft and mining of aquifers associated with growing problems of quality deterioration and saline water intrusion.

The country has made serious efforts to address its water deficit problems, mainly through implementation of "The Great Manmade River Project - GMMR". On full completion, this project is expected to transport approximately 6.5 million cubic meter of water per day from the South, where large quantities of fossil groundwater are available, to the North where the water is urgently needed. The total water withdrawal for agricultural, domestic and industrial purposes was estimated at over 4000 million m<sup>3</sup> in the year 2000, corresponding to about seven times the annual renewable water resource. Such rates of withdrawal are evidently unsustainable due to the fast depletion of the water resources availability. Moreover, the supply side response under implementation – the long-distance transfer through the GMMR – represents a huge financial commitment.

Up till now, Libya has done little to moderate demand for water, particularly in the agriculture sector which consumes the vast bulk of available water. In fact, management measures that previously existed, such as regulation of well development, support to efficient irrigation and control of cropping patterns, have weakened with the decentralization of regulation and support functions.

Rapidly growing municipal and industrial water demand is placing enormous pressure on allocations to irrigated agriculture. This is clearly the case in the Jifarah Plain (where Tripoli is located), where the domestic water demand in the year 2025 is projected to grow to 2 million m<sup>3</sup>/day, i.e., almost one third the amount of the planned water transport through the GMMR.

Irrigated agriculture plays an important role in the country’s food security but it clearly cannot be expected to meet the bulk of Libya’s long term food demand. Therefore key policy decisions need to be taken to allow economic and social development to proceed within the country’s natural resource constraints.

At the root of these developments lie the problems of the water and agriculture sectors governance and institutional capacity. The organizational framework for the water sector is characterized by fragmentation of responsibility among agencies, with water resource and investment allocation decisions effectively in the hands of a number of different agencies with limited coordination. At the same time, performance of the agriculture sector is well below the potential with low crop yields and very low water productivity as a result of the prevailing conditions and practices.

To address these issues, the country is embarking is a reform of its policies and institutional framework with a view of managing its natural resources in a sustainable manner, improving productivity and meeting changing patterns of demands for food and water. The reform process gives due consideration to socio-economic implications and institutional re-alignment to support the new policies and strategy measures. Developing medium and long term water resources and agricultural production projections as well as a national legal framework capable of supporting the emerging policy options will also be given due consideration in the process.

### 2.2 INVESTMENT ENVELOPE

The investment envelope for the short, medium and long term is presented in the Table below and expressed in million US \$ (based on CAADP investment projections).

Time scale	Type of investment (million US\$)			
	Small scale water control	Rehabilitation of irrigation	Large scale hydraulic projects	Total
Short-term	103	42	65	210

Medium-term	65	99	391	555
Long-term	32	19	804	855
Total	200	160	1260	1620

### **2.3 PROJECT PORTFOLIO**

Section 3 presents recently achieved, active and pipeline projects related to the above investment envelope.

### 3. PROJECT PROFILES (ON-GOING AND PROJECTED)

Project title	Funding Partners	Lifeline	Total Budget	Description
<b>I. PROJECTS RECENTLY IMPLEMENTED</b>				
Mapping of Natural Resources for Agricultural Use and Planning	UNDP	2003-2008	US\$ 3.3 million	Establishment of a GIS supported database of natural resources
Wadi Gattara Dam Rehabilitation	Libya	2000-2004	US\$ 30 million	Water storage for irrigation purposes
Wadi Al-Wishka Dam	Libya	2004-2006	US\$ 5 million	Water Storage for flood protection and groundwater recharge
Dam Site Studies	Libya	2000-2005	US\$ 5 million	Final studies and detailed design of dams in northern Libya
Drilling of Exploratory Wells	Libya	2000-2020	US\$ 80 million	Hydrogeological investigations and monitoring networks
Soil and Water Studies of SW region	Libya	1990-2001	US\$ 0.8 million	Soil mapping, hydrogeological and geological investigations
Hydrogeological Investigations of Sarir Tibesti	Libya	2001-2008	US\$10 million	Reconnaissance drilling and hydrogeological studies
Groundwater Vulnerability Studies	Libya	2001-2008	US\$0.2 million	Assessment and mapping of aquifers to determine vulnerability to pollution
<b>II. ON-GOING PROJECTS</b>				
Development of a Seed and Propagation Material System in Libya	Libya	2005-2010	US\$ 11.8 million	Support and strengthening of the seed sector development
Wadi Talal Flood Management	Libya	2007-2009	US\$ 8 million	Flood control of Sirte city
Wadi Abu-Shayba & Al-Rumman Dams	Libya	2007-2010	US\$ 34 million	Water storage for irrigation and flood protection purposes
Wadi Ahmar Dam	Libya	2008-2010	US\$ 22 million	Water storage for irrigation and flood protection purposes
Wadi Derma Dams Rehabilitation	Libya	2008-2010	US\$ 30 million	Water storage for irrigation, water supply and flood protection purposes
Soil and Water Studies of SE Region	Libya	1990-2008	US\$ 3 million	Soil mapping, hydrogeological and geological investigations
Shared Aquifer Studies	Libya, UN	2000-2008	US\$ 6 million	Water resources assessment, modeling, data base, consultation mechanism
Karst Spring Studies in Eastern Region (Ayn Zayana)	Libya	2007-2009	US\$ 1.6 million	Study of the flow regime of the karst system in the eastern zone
Study of the Coastal Under-sea Karst Springs	Libya	2007-2009	US\$ 6 million	Determination of the occurrence of under-sea fresh water springs
Study of Evapotranspiration in the Coastal Sabkhas and Dam Reservoirs	Libya	2008- 2010	US\$ 0.4 million	Quantification of evapotranspiration
Electronic Archiving and Construction of Water Resources Data Bases	Libya	2005-2009	US\$ 0.8 million	Digitizing of hard copy reports and data sheets, maps, reports and design and operation of data bases.
Study and Inventory of Irrigated Areas, Phase I	Libya	2003- 2009	US\$ 0.2 million	Use of remote sensing images to define areas under full irrigation by season, south of latitude 29N.
Evaluation of Irrigation Systems	Libya	2004-2009	US\$ 0.3 million	Evaluation of the performance of the different irrigation techniques applied in Libya
Application of GIS in Irrigation	Libya	2003-2009	US\$0.3 million	Use of GIS in the fields of irrigation and drainage.
Rehabilitation of Rajmah Irrigation Scheme	Libya	2002-2009	US\$ 4 million	Renovating the irrigation equipments, network, water storage at Benghazi area
South Jabal Akhdar Irrigation Project	Libya	2005-2010	US\$ 20 million	Land reclamation and installation of irrigation systems, wells, reservoirs...
Study and Inventory of Irrigated Areas, Phase II	Libya	2003- 2009	US\$ 0.2 million	Use of remote sensing images to define areas under irrigation

				north of latitude 29N
Soil Mapping of Central Zone	Libya	2008-2010	US\$ 5 million	Production of soil maps for an area of 1.5 million hectares located between Misratah and Sirte
<b>III. PIPELINE PROJECTS</b>				
Food Security Scheme (Wheat, Dates & Olives, Seed Production)	FAO-NEPAD, Government, Private Sector	5 years	1031million US\$	Objective: to improve national food security by increasing production of seeds, wheat, olives and dates. Components: (i) increased wheat production based on rehabilitation and expansion of cropped areas, (ii) increased olive production and processing, (iii) increased date palm production, preparation and storage, and (iv) increased seed production for cereals, vegetables and forage crops.
Wadi Derna Water Collection Project	Libya	2009-2010	US\$ 8 million	Water collection and storage for water supply purposes
Wadi AL-Khalij & AL-Muallaq Dams	Libya	2009-2011	US\$ 20 million	Water storage for irrigation and flood protection purposes
Wadi Zaghadah and Shuhbayyin Dams	Libya	2009-2011	US\$ 40 million	Water storage for irrigation and flood protection purposes
Wadi Turghat, Qirrim and Ghanima Dams	Libya	2010-2012	US\$ 27 million	Water storage for irrigation purposes
Capacity Building	Libya, UN	2009-2012	US\$ 2 million	Training GWA staff members in different fields of water resources management
Shared Aquifers	Libya, UN	2009-2012	US\$ 6 million	Operation of the Regional Centre for Management of Shared Aquifers in Africa (UNESCO Category 2 Centre)
Laboratory and Field Equipments, software , hardware, and Publications	Libya, UN	2009-2012	US\$ 3 million	Upgrading and renewal of laboratories, equipments and computer facilities.
Sea-Water Intrusion Studies	Libya- UN	2010-2012	US\$ 10 million	Assessment of current situation of seawater intrusion along the Libyan coast
Water Resources Strategy	Libya- UN	2010-2012	US\$ 7 million	Updating Libyan Water Strategy (2000-2025) to cover the period (2010-2030)
Wheat production scheme	Proposed : Government, private sector, foreign investors	5 years	US\$ 950 million	Achievement of higher level of self sufficiency of wheat through the expansion of irrigated agriculture, in regions where enough water is available. The project involves 3 parallel phases, which would include expansions through rehabilitation of existing projects, new expansions in existing projects and expansions in new areas.
Olive production project	Proposed : Government, private sector, foreign investors	5 years	US\$ 454 million	Expansion in olive trees planting to meet the national demand for olive oil. The project involves the following components: Olive trees nursery, olive trees farms, extension farms and olive oil processing. It is mainly rain fed production.
Date palm production project	Proposed : Government, private sector, foreign investors	5 years	US\$ 454 million	Expansion in palm trees planting in Libyan Oases and the Coastal Belt to boost the importance of date palm in the agricultural sector. The project involves the following components: Olive trees nursery, olive trees farms, extension farms and dates preparation and storage facilities. It is mainly rain fed production.
Great Man Made River	Proposed :		US\$ 325 million	The project aims at creating a huge network that will supply a

	Government, national and international private investors			total of 6.0mm <sup>3</sup> / day of fresh water, with 30% allocated for domestic and industrial use and 70% to irrigate around 200000 hectares of existing and newly reclaimed agriculture land.
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**ANNEX 1: MAP OF WATER CONTROL IN LIBYAN ARAB JAMAHIRIYA:**



## ANNEX 2: COUNTRY STATISTICS

<b>Country and population</b>								
Area of the country	2005	175954	1000 ha					
Cultivated area as % of the total area of the country	2005	1.2	%					
Total population	2005	5853	1000 inhab					
• of which rural	2005	13	%					
Population economically active in agriculture	2005	92	1000 inhab					
• as % of total economically active population	2005	4	%					
• female	2005	67	%					
• male	2005	33	%					
<b>Economy and Development</b>								
Gross Domestic Product (GDP) (current US\$)	2007	58333	million US\$/yr					
• value added in agriculture (% of GDP)	1987	5.05	%					
• GDP per capita	2007	9476	US\$/yr					
<b>Access to improved drinking water sources</b>								
Total population			%					
Urban population			%					
Rural population			%					
<b>Water Resources and management</b>								
Average precipitation	2007	98.5	10 <sup>9</sup> m <sup>3</sup> /yr					
Total actual renewable water resources	2007	0.6	10 <sup>9</sup> m <sup>3</sup> /yr					
Dependency ratio (transboundary rivers)		0.0	%					
Total actual renewable water resources per inhabitant	2007	103	m <sup>3</sup> /yr					
Total dam capacity	2000	0.385	10 <sup>9</sup> m <sup>3</sup>					
Total water withdrawal	2000	4.326	10 <sup>9</sup> m <sup>3</sup> /yr					
• as % of total actual renewable water resources	2000	711.33	%					
<b>IRRIGATION AND DRAINAGE</b>								
Irrigation potential	2007	40	1000 ha					
<b>Water Management</b>								
<b>Total area equipped for irrigation</b>	2000	470.000	1000 ha					
• as % of cultivated area	2000	21.86	%					
• annual increase rate			%					
• power irrigated area as % of total area equipped	2000	100.00	%					
• % of total area equipped actually irrigated	2000	67	%					
Non-equipped cultivated wetlands and inland valley bottoms	2000	0.000	1000 ha					
Non-equipped flood recession cropping area	2000	0.000	1000 ha					
<b>Total water-managed area</b>	2000	470	1000 ha					
• as % of cultivated area	2000	21.9	%					
• drained area as % of cultivated area	2000	0.4	%					
<b>Typology of irrigation schemes</b>								
Small-scale schemes (<ha)			1000 ha					
Medium-scale schemes ( - ha)			1000 ha					
Large-scale schemes (>ha)			1000 ha					
<b>Irrigated crops</b>								
Wheat	2000	70.000	1000 ha					
Barley	2000	50.000	1000 ha					
Potatoes	2000	10.000	1000 ha					
Pulses	2000	10.000	1000 ha					
Vegetables	2000	60.000	1000 ha					
Citrus	2000	10.000	1000 ha					
Tobacco	2000	1.000	1000 ha					
Fodder	2000	70.000	1000 ha					
Groundnuts	2000	10.000	1000 ha					
Other perennial crops	2000	150.000	1000 ha					
<b>ENERGY INDICATORS</b>								
Energy Production	2005	94.97	Mtoe					
Net Imports	2005	-75.83	Mtoe					
TPES	2005	19.05	Mtoe					
- TPES/Pop	2005	3.25	toe/capita					
- TPES/GDP	2005	0.43	toe/thousand 2000 US\$					
- TPES/GDO (PPP)	2005	0.46	toe/thousand 2000 US\$ PPP					
Electricity Consumption	2005	19.53	TWh					
- EC/Pop	2005	3336	kWh/capita					
<b>ENERGY SUPPLY AND CONSUMPTION (2005)*</b>								
	Coal	Gas	Crude oil	Petroleum products	Hydro	Other Renewable & Waste	Others	TOTAL
Production	0	9554	85257	0	0	154	0	94965
Imports	0	0	0	29	0	0	0	29
Exports	0	-4410	-66378	-5074	0	0	0	-75862
International Marine Bunkers	0	0	0	-86	0	0	0	-86
Stock Changes	0	0	0	0	0	0	0	0

<b>Total Primary Energy Supply (TPFS)</b>	0	5145	18879	-5132	0	154	0	19046
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\* in thousand tonnes of oil equivalent (ktoe) on a net calorific value basis

## REFERENCES

- AQUASTAT - FAO's Information System on Water and Agriculture.  
<http://www.fao.org/nr/water/aquastat/countries/libya/index.stm>
- NEPAD, FAO. 2004. National Medium Term Investment Programme.  
<ftp://ftp.fao.org/docrep/fao/007/ae415e/ae415e00.pdf>
- The commercial import/Trade and Food Security (TFS) database, FAOSTAT, 2004.  
<http://faostat.fao.org/site/342/default.aspx>
- The commercial import/Trade and Food Security (TFS) database, FAOSTAT, 2004.  
<http://faostat.fao.org/site/342/default.aspx>
- World Bank. Countries Information. Libya.  
<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/LIBYAEXTN/0,,menuPK:410789~pagePK:141159~piPK:141110~theSitePK:410780,00.html>
- Climate change in Libya and desertification of Jifara Plain  
<http://ubm.opus.hbz-nrw.de/volltexte/2005/794/>