

UNITED NATIONS DEVELOPMENT PROGRAMME
Project of the General Authority for Agriculture, Animal and Marine Wealth
The Great Socialist People's Libyan Arab Jamahiriya.
PROJECT DOCUMENT

Number and Title: LIB/00/004 "Mapping of Natural Resources for Agricultural Use and Planning"

Duration: 3 years

Project site: Tripoli

ACC/UNDP sector & sub-sector: (UNDP Class and Code) Agriculture, Forestry & Fisheries (04) Agriculture Development Support Services (0410)

Sector and Sub-sector: Agriculture, Agricultural Planning

Implementing Agency: General Authority for Agriculture, Animal and Marine Wealth

Executing Agency: Food and Agriculture Organisation of the United Nations (FAO)

Estimated starting date: October 2000

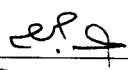


Government Cost Cash Contribution: 1,132,560 (LD)
(GCCC)

UNDP and cost sharing financing

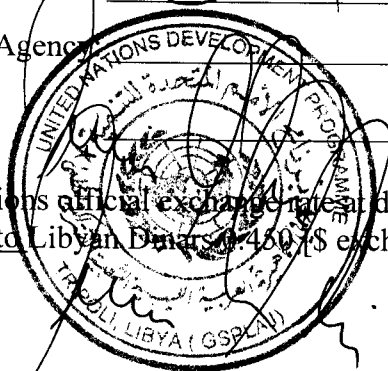
UNDP, IPF 0.00

Government cost sharing **\$2,885,300** (Including AOS)

Brief description: In order to improve the planning base for agricultural and rural development, the project will reorganise all natural resources data in a geographically referenced computerised data base and improve information access for enhanced natural resources monitoring and agricultural land use planning.

On behalf of:	Signature	Date	Name/title
The Government:		5/9/2000	Gen. Secret. of the Authority of the Agri. Animal and Marine Wealth
Executing Agency:		5/9/2000	UNDP, Resident Representative
UNDP:		5/9/2000	Resident Representative

United Nations official exchange rate at date of the signature of project document (\$1,0 is equivalent to Libyan Dinars 0.450 [\$ exchange rate])



A. CONTEXT

1. Description of sub-sector

Since the Great September 1st Revolution in 1969, the Jamahiriya has made rapid economic and social advances. The new development strategy is creating a diversified economy based on modernised agriculture and industry, which aims to reach a high level of self-sufficiency to meet the demand of its estimated 5.6 million people (1997). Currently, approximately 20 percent of the workforce are engaged in the agricultural sector and that the contribution to the non-oil sectors share of GDP is 20 percent.

The economy of the Jamahiriya is centrally planned with a system of annual plans formulated within five-year plans, which in turn are within the framework of a long-term plan to the year 2015. Agriculture has been constantly given one of the highest priorities in these plans. The current level of annual growth in the agricultural sector is in the order of 7 percent. Such rapid development requires co-ordinated economic and physical planning at national, regional and local levels.

To secure a high level of local production further vertical expansion is anticipated in the coastal belt chiefly in the vicinity of the Jebel Akhdar and Jebel Nefusa, and extensive horizontal development in the areas where natural resources are favourable. The natural environment, however, provides severe constraints in terms of desert conditions, water restraints and climatic circumstances.

Moreover, the unregulated exploitation of natural resources, including the proliferation of human settlements in the Libyan Arab Jamahiriya has increasingly degraded the environment and encroaches on arable lands, forests, and coastal areas, and has jeopardised the reproductive capacity of the natural environment. Environmental problems include salinization of the coastal zone, deforestation, loss of soil fertility and erosion, degradation of coastal areas, and air and water pollution, and in some places, permanent damage to ecosystems. The consequences of over-exploitation and pollution include decreased agricultural production and fish catches deleterious effects on human health, and decreased biological diversity.

These ecological and socio-economic impacts raise an urgent need for the establishment of appropriate policies for the sound management and use of natural resources in Libya, based on cross-sectoral planning, particularly in prioritised coastal areas where competition for natural resources is the most severe. However in order to achieve this, the institutional capacity of agencies responsible for the planning and implementation of programmes to regulate the conservation and use of the natural resources of Libya require strengthening and several base levels of inventory and monitoring of the natural resource base have to be undertaken/ and or integrated to create a multi-purpose resource database which will provide a holistic appraisal of the current situation upon which rational development can be planned or alternative scenarios simulated.

Irrigated agriculture projects in interior regions have been created aimed at a measure of self-sufficiency to slow migration to coastal regions and secondary economic activities give the opportunity for developing new centres to deflect growth away from Tripoli and Benghazi. One implication of this development is its impact upon the resource base. Without careful planning and control, it can lead to rapid resource depletion and to the deterioration of an

already fragile environment.

Recent proactive environmental legislation, public awareness campaigns and institutional changes by government reflect acceptance of sustainable development principles and the imperative of holistic, scientific approaches to ecosystem management. However, the adoption and effectiveness of such management schemes depends crucially on the quality and extent on the underlying information-base. Operational management of sensitive environments and associated resources requires time series of spatially-referenced, multivariate data on key parameters and resource dynamics, that are coupled with information on area usage. It also necessitates an efficient information infrastructure, one capitalising upon advanced technologies for data acquisition, integration and dissemination. Despite pressing needs for natural resource management in Libya, the necessary base-line data and information infrastructure is currently lacking. This has recently prompted urgent calls for the establishment of a Libyan Resources Information Management System to support improved management. There is a concern that conventional approaches involving geographic information systems alone will not enhance the ability of the few critical decision-makers to redress these problems. Conventional GIS do little, in isolation, to improve access to information on the contrary they tie up information in limited access mediums with fewer people having access. It is the objective of the proposed project to bridge this critical gap.

The aim of this collaborative project is to build the expertise in information management, land evaluation, computer science, remote sensing, resource monitoring, to achieve the goal of creating a self-supporting natural resources monitoring capacity that will be integrated into decision making processes, and to advise on appropriate institutional and legal frameworks facilitating natural resources management processes. Once developed and tested in the context of the first priority area the Gefara Plain, this system could then be applied to other management situations in the country, the underlying information infrastructure also in principle being of use for inland monitoring programmes. The emphasis on local capacity building from the ground up and user-driven functionality characterising this approach to resource information systems is both unique and important in the country. This work can ultimately serve as a model for information system implementation elsewhere in the developing world, where the need for operational resource management is great but perhaps for which the existing local infrastructure or knowledge base is currently lacking.

2. Host country strategy

In agriculture, the objective is to establish a modernised agriculture, which complements the industrial development programme, and achieve a measure of self-sufficiency in staple foods. Being capital intensive, its success depends on effective training of farmers to use modern techniques. The modern form is characterised by irrigated agriculture using large amounts of water from fossil sources. It is necessary to determine whether there is, therefore, a potential conflict between current production goals and long-term use of resources.

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) recognises the importance of providing reliable comprehensive data required for the development planning of the agricultural sector and for further strengthening its capacity to formulate, implement and monitor various policy measures at national and sub-national levels. To achieve this the General Authority for Agriculture, Animal and Marine Wealth

(GAAAMW) has established co-operation with many international agencies and technical centres. The multitude of data produced now requires co-ordinating; archiving and integrating in ways which will permit maximum information extraction using the latest technology in these fields. In particular it requires the establishment of an appropriate policy, strategy and mechanism for information management.

with the highest potential for agricultural intensification and diversification is required alongside the areas where land and terrain characteristics are such that the agricultural potential is severely affected. Therefore the preparation of databases and maps based on the use of existing studies of these areas as a base for agricultural development and rehabilitation projects, are a high priority to the government. The planning process will also require a strategic approach to the development of the databases the other core elements of a Land Resource Information Management System.

Briefly, the Land Resource Information Management System must deal with:

Data	Land Resource Information Management System will contain a set of core data sets covering key themes that are regularly and easily maintained and expanded.
Standards	Data standards will be the key to the maintenance and use of the system, as will metadata
Infrastructure	some new computer hardware and software are needed. Even so, the systems should be built so that users with readily available technology and common platforms are able to use it.
Functionality	The MIS must be easy to use; provide straightforward access to organisational data and metadata; provide some query, analysis and map-building capabilities; be able to grow to meet new needs and take advantage of new data sources; and, be a tool for sound decision-making in support of aid programme objectives.
Training	will be an important component in the system implementation and field test. Training programs will be supplemented by on-line help systems, manuals, and communications.

3. Prior or on-going assistance

Extensive studies have been carried out in the Jamahiriya in the last fifteen years. More than three million hectares were mapped at a scale of 1:50 000 leading to maps showing soil types, land capability, soil erosion, soil salinity and soil optimal use by different organizations. Russian or French taxonomy was utilised as soil classification system. The immediate requirement is to convert this data into digital form along with many other studies conducted during the last 10 years. Moreover, this information/data sets needs to be integrated, made compatible with each other through consistent coding and data cleaning and create a contiguous layer. It also requires to be converted into conventional FAO classification both in

spatial and the database form.

Ecological studies were completed in the Middle zone and various other parts of the Jamahiriya dealing with types of natural vegetation and percentage of vegetation cover. The Great Man Made River produced a wealth of ground water studies and investigation reports; in addition to a large amount of groundwater data that has been collected covering different areas of the Jamahiriya.

During the last fifteen years, a number of FAO, UNDP, and unilateral Trust Fund projects were implemented for technical capacity building, particularly in the field of natural resources inventory and assessment:

UTFN/LIB/004 - Land & Water Investigation - national assessment of ground-water resources and surface hydrology for water development in the Jamahiriya.

UTFN/LIB/005 - Gefara Plain Water Management Project - a multi-disciplinary team collected and collated considerable quantities of data on all aspects of the hydrological cycle, soil resources, hydrology, historical and current land use using remote sensing data and integrated it into a model for rationalising water use in the region.

UTFN/LIB/011 - Development of Range & Livestock - monitored the condition of grassland in various project locations.

UTFN/LIB/017 - Planning & Statistics - developed a methodology for acreage estimation integrating the use of satellite remotely sensed data using an area frame sample. Generation of land-cover maps of three regionals.(municipalities).

- Screw Worm.
- SCNA/LIB/020/LIB Programme for Eradication of the Screw Worm
- UTFN/LIB/027/LIB Assistance to the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW).
- TCP/LIB/0051 & 0052 Pilot Test for the Eradication of the Screw Worm.

4. Institutional framework for sub-sector

National development planning in Jamahiriya is undertaken by the Secretariat of Planning based on data from all the sectors. All agricultural policy and development plans are the responsibility of the Planning Department of the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW). The Agricultural Research Centre undertakes research and advises on operational agricultural programmes. The agricultural plans are implemented through the autonomous General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) at the regional level. The scope of this project calls for the review of the basic sectoral planning which has to date accrued using independent data sets and the establishment of a co-ordinated network of contributions to achieve improved resource management based on an approach of co-operation and integration of information from all

sources where there is a comparative advantage.

It has become apparent that there is considerable momentum being made (by a whole variety of organisations), each of which is recognising the need for the establishment of improved methods and mechanisms for information management. Each organisation retains a goal for attaining a harmonised environment for data capture, exchange, and utilisation of information emanating from a variety of line Secretariats each collecting and analysing several potential sets of information which, if integrated and standardised, could form the nucleus of a viable National Spatial Data Infrastructure (NSDI). These organisations have to become a part

of the system. **An NSDI can be conceived to be an umbrella of policies, standards and procedures under which organisations and technologies interact to foster more efficient use, management and production of geo-spatial data.** Attainment of the vision of efficient production, easy access, and shared use of vast stores of data in a distributed environment are based on the critical building blocks:

- Communications
- Ensuring means to share and use data
- metadata,
- data collection etc.)
- Education and training
- Partnerships.

B. PROJECT JUSTIFICATION

1. Problem to be addressed - the present situation

Environmental conditions and socio-economic factors largely control the structure of the Jamahiriya. Desert land and water shortages have eliminated the possibility of developing a substantial portion of the country.

The most favourable living conditions are in the more humid coastal plains, mainly in the Tripoli and Benghazi regions, comprising only 1.7% of the total country land area. They are the most densely populated, heavily cultivated and economically developed parts of the

accommodate 75% of the total population, host 84% of the total urban population and 94% of the manufacturing employment. The overall arable land in Libya represents only 1.4 percent of land area, allowing some 0.4 ha per capita.

This concentration of urban and economic functions creates problems of planning and management and a substantial effort is needed to reduce economic domination of the major metropolitan areas through a policy of decentralisation and regional development.

The most important limitation for regional development is undoubtedly the extent of water resources. Of the total consumption of water the agricultural consumption for irrigation etc. represents 87% (1994), whilst domestic and industrial consume much less, 11 and 2 percent, respectively. Ninety three percent of the population lives in the coastal belt where the main agricultural areas are also located. Here the resources are being depleted /salinated at an

alarming rate due to seawater intrusion.

There is an abundance of data covering such areas, but it remains discontinuous, presented at various scales, using different criteria for evaluation and much of this data is dispersed amongst several Secretariats. The urgent requirement of the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) to undertake national planning with an emphasis on regional development has led to establishment of the Technical Committee for Agricultural Resource Mapping. This Committee is to inventory and map the natural resources for agricultural management and planning.

The largest water resources occur in the Sarir-Kufra and Murzuk Nubian Sandstone basins as well as in the mountain areas. Currently, capital intensive programmes are underway to transport this water to the coastal region to assist in the vertical expansion of agriculture. In conjunction with this a process of evaluating internal regions for horizontal expansion of agriculture, in areas, which were once considered marginal or unproductive, is required.

Although data (in statistical and map form), as presented above, on the status of Libya natural resource base does exist, it is now outdated and contains many contradictions. Moreover, facilities and expertise to create or develop new data are in limited supply.

The information has in the past been used for land use and agricultural project planning for Libya, through the GAAAMW. Responsibilities today have changed with survey data used for land use policy development, land use and agricultural project planning, land protection (including soil erosion control and site reclamation), rangeland development and protection and the development of techniques to support this work. Desertification is particularly pronounced in the Jamahiriya and the project will serve to support the national attempts to monitor and combat it. The project is supportive to the convention to combat

In recent years, with the realization in Libya of the severe state of natural resource degradation, the need for up-to-date information on land characteristics such as type, condition, location, value, responsibility/ownership, productivity, change (including damage), and environment has become quite evident. The current methodology used by the relevant Government department is now considered as being inadequate to meet these anticipated needs for up-to-date, countrywide land survey and monitoring.

Plans call for new, additional maps, databases and information systems to be used in be combined with estimated land value, ownership and jurisdictional boundaries from other Secretariat/projects to be initiated) across the nation, as well as for up-to-date maps (of, for example, range condition, land cover/land use change, forest area, soil erosion and desertification). These maps, associated statistics, and analysis are intended to support critical soil conservation, environmental protection, wise land use, and productivity goals.

It has become abundantly clear that an integrated land resource information system, and associated technology (e.g. modern remote sensing for revision, geographic information systems for spatial analysis and advanced but simple to use information management systems are required in order to assure that data and information which is generated from this project is accessible and can be utilised by those decision makers who most need it) is the only realistic

way of meeting these data requirements and other needs in the foreseeable future.

At present, the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) produces its maps and information through an entirely manual process in a very limited area at a time. The result is that, on the average, one region can be surveyed for soils, vegetation and land use per few years but for many years no substantive updates have been conducted. Data is collected on intermittent project basis rather than systematically and annually.

Analysis of alternative land use possibilities, and preparation of recommended land use maps and reports is also an entirely manual process.

Unfortunately, little training in database creation or information management has been given. These technologies, together with remote sensing for monitoring and statistics for trend analysis, have proven to be decisive tools in meeting similar land survey, monitoring, analysis and planning requirements in other developing countries and are recommended for introduction in the Jamahiriya.

Resources- have changed from the central to the provincial level have occurred in the last few years with much of the responsibility transferred to the local Regional. Development of the agricultural and industrial sector of the economy still remains of paramount importance, as does environmental protection. However, this transition has encouraged, among other elements, proposals for the rehabilitation of public lands, decentralization of Government-related, local land use planning activities to the provinces, and inclusion of a strong environmental protection policy.

To support these changes, the new framework of the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) is designed to maintain a strong network of field offices at the regional level.

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) also supports the central environmental protection centre, and performs important investigations related to natural resources and the environment. Departments within it also provide, in cooperation with the local jurisdictions, land and natural resource survey and monitoring data, and serve as a major source of agricultural development and environmental sector planning.

Among other activities, the Libyan Jamahiriya seeks to provide criteria of ecological balance, and to make improvements with respect to environmental protection. The Authority is also requested to assist in acceleration of rangeland and forest production, to initiate efforts to reclaim destroyed land (e.g. those affected by severe soil erosion and site degradation), and to assist in renewing traditional methods of using the land. The project will within limits and constraints imposed by time and financial resources will use modern remote sensing techniques to establish a modern monitoring procedure. These activities will be conducted through the Biruni Centre for Remote Sensing (BRSC) and the Libyan Centre for remote sensing and (LSRSSH) Space Sciences.

In order to accomplish these tasks, for which there is a critical need, the Libyan Jamahiriya is proposing the development of a new assessment of the natural resource base of the country and the subsequent creation of a natural resources database and information management

infrastructure which will facilitate decentralized information access and rationalization of the spatial data infrastructure used for the generation, access and updating of information pertaining to the planning and development of the natural resources of the country.

The realization by the Libyan Jamahiriya of the disparity of the available data has led to the GAAAMW's request for this project, with which it hopes to identify areas for potential agricultural development in full recognition of the local constraints in each region, and assign areas for priority development.

2. Expected end of project situation

The plan for the proposed project is to develop a Land Resources Information Management System (LRIMS) that will play a central role in the organization and analysis of environmental data, for the purpose of developing a comprehensive integrated resource plan for agricultural development. As noted, much of the data required for this planning already exists, but is distributed among a variety of agencies and as such is not being fully utilized. One objective of the LRIMS will be to compile existing resource data into an Information Management System for the purposes of enhanced utility and analysis of the data. Environmental data anticipated for use in planning for both vertical and horizontal expansion of agriculture include soil fertility, salinity and erosion as well as water quality and quantity, and access to transportation. All of these data become more useful when used in conjunction, so that the resulting resource plans are more comprehensive and consider more factors.

At the end of the first three-year phase of the project, necessary facilities, including equipment, initial contingent of trained manpower and expertise and supplies of materials would be in place; a standardized database will have been introduced to General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) desktops displaying maps of the distribution of soils and other natural resources, as well as the land suitability for agriculture. A core database will have been established containing all existing data, remote sensing will have been used to generate current land cover (supported by the Libyan Centre for Remote Sensing and Space Sciences and the Biruni Centre for Remote Sensing) and resource inventories and land evaluation will be ongoing. A methodology for establishment, operation and manipulation of the information management system will have been defined and implemented. The facility will contain a document retrieval system to create an on-line document retrieval system. It will also contain a metadatabase and activity tracking system to enable government officials to follow the activities of projects underway at anytime.

The result of the land evaluation process using ALES software will enable identification of the most suitable areas for agricultural intensification or expansion. Land potential data would be available for the users.

Provided the availability of financial resources for the project, there may be a requirement to further develop experimental examples of suitability for a variety of land uses in the form of pilot areas. The established database could be utilised for environmental monitoring of such features as land degradation, desertification, expansion of agricultural and urban areas. Further development of trained personnel will be a necessary requirement to ensure both managerial and technical support. A second phase of the project could have such objectives.

The direct assistance to the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) is expected to result in an operational and informed land resources management programme that can carry out routine surveys, analyse results, and store, share, access and manipulate digital data to produce supportive information products. The training

resource assessment, land evaluation, soil correlation, and enable key staff to effectively use the high-tech GIS workstation technology.

In particular, Land Resource Information Management System (LRIMS) components

a Desktop Information Access System, a Metadata System, a Web Information Access System, and a Core Database, all of which are described below.

Building GIS-enabled systems based on this approach will:

- quickly deliver simple integrated desktop solutions;
- put in place both the high-end specialist systems and common information user systems which bring data access and mapping capability to anyone who needs it;
- take full advantage of new powerful Windows-based software technologies and 32-bit PC computers;
- deliver more than GIS functionality; and,
- Enable solutions to be delivered at a fraction of the cost / time of traditional systems.

Links will be explored with the direct users of these materials as well policy makers at the highest level, as well as with **Agricultural Extension and Agriculture Departments to provide assistance to** farmers in need of advice for diversified and enhanced production methods.

The project is also expected to strengthen technical and scientific relations with other countries in the region by providing them with links to the Internet and by **Anticipated benefits.**

A detailed benefit cost ratio calculation for assistance of this kind is difficult if not impossible to do, as the effect of an operational vital service for the country is not easily put in figures. The incremental effect of better planning and management procedures by having readily access to reliable physical data on land resources and their potential, is not quantifiable. The information management benefits, however, will be substantial. A small sample of benefits from this approach is outlined below.

Access: A primary thrust is to provide access to data. Whether its specific access for use in one of the customized business applications, or general access via the Internet, data access will become a new reality for resource managers, policy-makers, and others. Over time, improved and timely data access will translate into better decisions, planning, and communications.

Cost Avoidance and Reduction: Other partners are expected to adopt an open data access policy to avoid costs associated with duplicating data collection and use. These systems, such as their ability to access metadata, will help ensure this goal is quickly achieved by making it easily and quickly apparent who has what data.

Standards: The availability of data and metadata and the systems supporting their use and compare data, and reducing costs associated with data cleaning and re-collection.

Indicators: The data and information systems will enable the tracking and identification of key indicators and their spatial relationships to assist in program evaluation, planning and priority setting.

The expected outputs of the full project will also include methodological documents describing the elaboration and establishment of an Information Management System for conservation and rehabilitation of land and water resources and land cover/land use. It will result commensurate with current international standards.

The project will undertake to establish the core database and information system in accordance with a series of priority areas according to the availability of financial resources and time available. The areas have been prioritized according to the following:-

Telecartre maps	Jebal	and the additional area covered by
The Eastern Zone - Jebal		isohyet
	Sirte - less than 150mm of rainfall	

The Southern zone associated with intermediate agricultural areas.

Work will be undertaken according to a systemic schedule with completion of each area in rotation. It is recommended that given the nature of the work during the first stage of the project emphasis/preference will be given to appointing a CTA with Information Management background with the intention to have the appointment changed to land evaluator/land-use planner during the 2nd half of the project. In this way the establishment of the databases and information system is undertaken first after which the analysis and modeling can begin.

The project will produce an integrated Land Resource Information Management System with some components and data broadly available to resource managers, decision-makers and staff. The components of the LRIS can be seen in three categories:

Basic information access tools for most management and staff;
Advanced information access and processing tools for trained GIS professionals; and,

Data acquisition and management tools for database administrators.

spatial data, metadata, and eventually non-structured (document, text, etc.) data. People accessing and using the data will need to do so in different ways and do so with varying levels of systems, technology, and as outlined in the table below:

Community	Technology
Basic Information Consumers and Management (the broad 90% of the user base)	Desktop Information Access System (DIAS) Web Information Access System (WIAS) Microsoft Office Reporting DB
Analytical Information Consumers Programme specialists	ArcView and extensions Statistical Tools Other desktop GIS tools Reporting DB
Data Administrators	Arc/Info NT FAO AIMS Image Analysis System Other data acquisition and processing tools Data management tools Production DB

This design proposed for LRIS will:

- quickly deliver easy-to-use integrated desktop solutions (DIAS and WIAS);
- put in place both the high-end specialist systems and common information user systems which bring data access and mapping capability to anyone who needs it;
- take full advantage of new powerful Windows-based software technologies and 32-bit PC computers;
- deliver more than GIS functionality; and,
- enable solutions to be delivered at a fraction of the cost / time of traditional systems.
- enable the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) to add other data -as necessary- to the system in the future.

The Desktop Information Access System

The Desktop Information Access System (DIAS) will provide the user a versatile, inexpensive, and easy-to-use front end to the Reporting Database component of the Core Database.

DIAS will enable:

- access to data and metadata describing the data set and associated standards;
- map creation;
- basic spatial queries such as distance between points, areas of features, etc.; and,
- direct links with M/S Office applications such as PowerPoint and Word for the development of interactive maps and graphs.

In effect, it will provide the functionality required by most users in the majority of their business situations.

The Web Information Access System

The Web Information Access System (WIAS) component will provide broad access over the Internet to the structured data and metadata in the Reporting dB component of the Core Database as well as non-structured information holdings such as reports and text files and other Web-based information sources and links. WIAS, like DIAS, is an inexpensive and easy

clients using PCs and Internet-browser software. A key component of this deliverable will be an Internet Web Site that will promote the work of the various agencies involved.

Analytical Information Systems

Programme specialists with sophisticated spatial analysis requirements will need appropriate skills, workstations, and powerful GIS technology. This will include ArcView and its extensions and/or other GIS desktop tools and various statistical applications relevant to their field of work. They also will access the Reporting Database component of the Core Database.

The Core Database (Production and Reporting DB Components)

The Core Database will be an integrated collection of vector map and image data, structured tabular data, and can incorporate non-structured (document-type) data. The Core Database will be divided into Reporting and Production components to help ensure data integrity and user confidence. The Reporting database will be a read-only copy of the

Data standards and metadata will be inherent in the Reporting and Production databases. The metadata will be input for the databases as they are registered by the Database Administrators and will describe the standards associated with the information holding along with other important administrative information.

Data themes will be determined by the priority requirements of the project. The and attribute information as business priorities change and new data become available.

details. The registry will keep track of:

- available databases;
- layers associated with each database;
- layer names and feature types;
- physical location of layers;
- default layer rendering properties;
- key maps for each database;
- identify feature item name to be used for interactive feature identification;
- whether a layer is selectable or simply viewable;
- the date that each layer and tile were posted and subsequently modified.
- Relevant research papers and studies

A database management tool will be developed for modifying the database definition.

Updates to the Core Database(s)

Updates to the Core database will be done on the Production Database component by trained staff with advanced workstation technology and software. A database management register the database layers and input their metadata. The database administrator(s) will validate the data and update the Production Database and the Reporting database, and will distribute /notify users of changes to the Reporting Database.

Because the Reporting Database will be broadly distributed i.e. multiple copies of the database will reside on different user computers/ nodes, there will be a need to maintain the currency of those distributed copies with the Production Database. Each user will be able to check their version of the reporting database against the master version. If changes have been made an automatic update can be initiated with the local version of the database. This automated update facility will be implemented in LRIMS.

Data themes will be determined by the priority requirements of the project. The attribute information as business priorities change and new data become available. The tabular data in the core database are in M/S Access format while the spatial data are in File format (this is an industry de-facto standard). The core database will incorporate:

- (i) Regional and district boundaries;
- (ii) Watershed boundaries;

- (iii) Climactic regions;
- (iv) Physiographic zones;
- (v) Agro-ecological zones

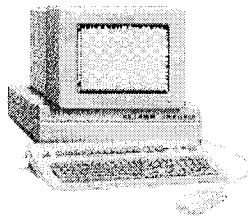
as well as metadata describing administrative details and standards for all available data sets.

More specifically, the database will contain:

- (i) a soil and terrain database (based on SOTER) for the prioritised areas undertaken progressively (i.e the coastal zones above 200 mm isohyet) at the equivalent scale of 1:250,00 stored in the core Database ;
- (ii) an actual land cover map and database which will include information on presently cultivated land areas - work to be conducted by the Biruni Centre for Remote Sensing under contract.
- (iii) an agro-ecological zones map including soil, terrain, land use, and climatic factors for the prioritised areas at the scale of 1: 250,000 which can be used as a basis for producing land suitability maps, and for the identification of areas with high agricultural potentials or production constraints;
- (iv) i.e from year 3 will undertake land
evaluation studies, as well as sound methodologies for agricultural land use planning and scenario development.

Technology Architecture

Most components of LRIS will use commonly available and familiar technologies to ensure the system is inexpensive, and easy to integrate and upgrade. This attention to common formats ensures technology is readily available and supported, and it will not become obsolete as newer better technologies are introduced, but can be easily upgraded to meet those new benchmarks.



- Windows '95 operating system
- Pentium-class, 16mb+ RAM, etc.
- Internet / network access
- Web browser: Internet Explorer v3.02+ / Netscape Navigator v.3.01+
- DIAS, WIAS
- M/S Office '97

Client-Server Architecture

Server software includes:

- M/S Windows NT server V.4;
- M/S Internet Information Server
- ESRI Map Server
- M/S Access Database

Tentative specifications for some equipment are shown in Annex I.

Note: Technical specifications of all equipment are to be finalized by the International team in close consultation with the National team and presented to the PSC for endorsement before the procurement action takes place.

Phased Approach

The development of the Libyan Resource Information Management System components will take a phased approach. Phase I (Gefara Plain) will establish the key system

Project (months 18-24) . The project will continue and emulate the results of the pilot project on the Gefara Plain. The continuity of the project will involve the roll out and expansion of the LRIMS components and database to all other areas identified above. All components are envisaged to be completed during the implementation of the 3 year project provided the continuity/replenishment of funds is forthcoming.

Pilot Project and Organizational Capacity Building

A pilot project that is tightly controlled, with clear and double objectives, and with a committed steering committee and project team is important because it will produce meaningful results quickly. A successful pilot project will go a long way in ensuring overall project implementation success. Briefly, the pilot project will:

- specific geographic areas of the country;
- desertification, range ploughing, etc. based on the priorities of the country;
- reflect data that are or could quickly be made available;
- have an aggressive time-frame;
- place; and,
- have a management structure with clear responsibilities.

These will all be used in Phase II to translate into regional / national implementation strategies and the growth of databases, user information management capacity, data standards, and business applications.

In summary, Phase I will provide the **knowledge, experience and confidence** to proceed with a broader scale institute and national capacity-strengthening project.

Pilot Evaluation Process

Evaluation and communications will be very important in the pilot project . Specific evaluation components will include a detailed questionnaire for those involved and a seminar

areas.

Outcomes

In conclusion, the Government and the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) and in particular TCARM expect the following at the end of this project as the result of the simultaneous implementation of two phases of this project:

Pilot Project (duration 18 to 24 months)

- (i) A Pilot Project in one key area of the country (Gefara Plain) will develop and test the LRIS components and help determine priority data requirements, key specific applications requirements, and the overall scope of the system.

The development and delivery of the Desktop Information Access System (DIAS) and introduction of the inexpensive and easy-to-use GIS technology for the pilot area and other users throughout Libya will support their basic mapping and data access requirements.

The development and delivery of the Web Information Access System (WIAS) will provide Internet-based access to the Core DB along with basic mapping capabilities and potentially links to other information sources for users and clients.

Note: the effectiveness of both the DIAS and WIAS will improve substantially as the Core Database is populated and the quality and quantity of the data improve. WIAS will also benefit over time from improved Web links and the development of other Internet components (such as, say, a government resource management web site with which it could be integrated with).

- (ii) A 1:50 000 scale land-cover map of financial) will be produced with priority given to the delineation and assessment of the state of degradation of the country's agriculture, rangeland, and desert areas. This data will be available via the LRIMS tools and will be an important component of the Core DB.
- (iii) The land-cover maps will be available digitally in the various departments and the land cover statistics made available to decision makers according to relevant divisional units e.g. Regional, watershed, climatic zone, physiographic zone, agro-ecological zone etc. These digital layers will be key components to the Core DB and made available to users via the LRIMS tools.
- (iv) Existing and /or new Imagery Landsat-TM / IRS-C will be procured and processed to produce a series of photomap products for the prioritised areas. This

will form one layer for the Core DB.

- (v) Sectorial reviews of each major discipline of interest in the resources fields i.e. agriculture, rangelands, desertification and the use of remote sensing, GIS and digital mapping will be prepared by national consultants.

Project Expansion to other areas

years of the existing project).

All the components for the residual part of the project cannot be described in detail, because their scope, process and priorities will be determined partly through the results and experience of Pilot project and its evaluation. The application of the methodology to other areas will involve the maturing of LRIMS and its components. For example:

- Priority applications will be determined and developed to meet government information / analysis requirements.
- New priority databases will be determined, data standards established and data creation / cleaning efforts stepped-up or started.
- Remote sensing will mature as a key method for data maintenance through LSRSSS and Biruni Centre for Remote Sensing.
- Broad national data sharing, access and maintenance arrangements will be put in place between among secretariats / departments.
- Co-operation among government organizations involved in land inventory, assessment, development, management and monitoring. Each will use the same Desktop Information Access System, the Web Information Access System, and the Core Database and its maintenance and metadata components.
- Staff specialists whose skills have been upgraded in Phase I through a training initiative will use the advanced GIS software and provide information products with complex analysis and mapping.
- A metadata standard will enable the input of descriptive information about national and development.
- Communications and information access will be significantly enhanced through an Internet-based Web Information Access System, which will be a common and easy-to-use front end to the data and information holdings (this depends on the lifting of Govt restrictions on communications) a process which is ongoing at present.

Other long-term objectives of the project include:

- Setting up of multi-disciplinary teams in central office in Tripoli and in key regions.
- Strengthening the experts capabilities at national level in the field of assessment and monitoring of range types and for remote sensing application: organization of seminars, field visits, practical work in the field and also participation in the seminars abroad for the national experts. This component will be organised and funded through the National contribution in Dinars.

- Training the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) experts and technicians in special courses organized in the country. The training will also be organized with participation of national and international specialists in the field of land cover classification, plant ecology, range type determination and classification, range improvement and management, etc. This component will be funded by the local contribution in Dinars.
- Production of detailed management tools including detailed maps and statistics and strategic development guidelines for the agriculture and rangeland sectors. It is

National component in Dinars.

Overall, the Land Resource Information Management System (LRIMS) will by the end of Phase 2:

- make key data sets accessible and shareable among the broad community of users and data creators;
- provide inexpensive, easy-to-use business applications and data access tools on the desktop of those who need them; and,
- enable users of the data to do simple analysis and mapping without having to depend on specialists for every day needs.

3. Target beneficiaries

The primary goal of the project is enhanced agricultural production, which is to be achieved by the identification of areas for vertical and horizontal expansion of agriculture. However the products will serve a greater user base than the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) and will perpetuate co-operation between the parties of the evolving national spatial data infrastructure (NSDI). The project will also result in better monitoring and management of the environment through the Land Cover mapping to be undertaken.

The immediate beneficiaries of the project would be the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) at the regional level and the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) which will be responsible for the decision- making process and implementation of the expansion of agriculture into newly defined areas. They will directly utilize the core database and its inherent maps and numerical data present in the LRIMS.

The Secretariat of Planning would benefit directly at the macro planning level, whilst the Survey Department whose staff are also expected to be involved in the project will have a new information set available provided by the satellite data and will have participated in the interpretation and map generation process. The improved quality of data emanating from such a centre will also greatly enhance the capabilities of the Statistics section of both the Secretariat of Planning and the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW).

The Libyan Centre for Remote Sensing and Space Sciences and the El-Biruni Centre for Remote Sensing will also benefit through the involvement in an operational programme

which whilst placing heavy demands on their production capacity will also serve to enhance its capacity through intensive programmes of training.

The Biruni Centre for Remote Sensing will benefit from the programme through the establishment of an extensive resource information database for which it will be responsible the existing studies.

The indirect beneficiaries would be farmers through improved standards of living and employment opportunity as a result of increased farm productivity after the successful implementation of development plans.

4. Project strategy and institutional arrangements

In view of the vastness of the territory to be analysed and mapped, the complexity of the problem to be solved, and, hence, the wide range of resource information needed, the program should be carried out according to a concept of a pragmatic approach, consisting of six steps.

- (a) Prioritise the areas for study as described above.
- (b) Collect and correlate data of existing studies.
- (c) Complement deficiencies in previous studies according to priorities.
- (d) Establish an information management policy, strategy and mechanism to place resource based information in the hands of critical decision-makers.
- (e) Establish a permanent facility for the collection, collation, screening and standardisation of information pertaining to natural resources.
- (f) Undertake to capture all existing map data and establish it within a core database standardised according to a predefined set of criteria.

In order for the program to reach the required goals in support of the sustained and rational development and management of the national resources, the programme should be conducted along the following principles: -

Integration of disciplinary activities

The various sectoral resources analysis departments should participate in the programme in accordance with their respective responsibilities, expertise and experience. The integration of the functional participation could be achieved by means of the programme and objectives of the Technical Committee for Agricultural Resource Mapping (TCARM). The partners in the programme can be divided according to providers and users of information e.g.

Providers

General Authority for Agriculture, Animal and Marine Wealth (GAAAMW)
 Soil and Water Authority
 Documentation Centre
 Agriculture Research Centre
 Industry Research Centre

Libyan Centre for Remote Sensing and Space Sciences.
 Biruni Centre for Remote Sensing
 Great Man Made River Water Utilization Authorities
 Great Man Made River Management and Implementation Project
 Surveying Department

Users

Planning and follow up
 Secretariat of Planning
 Great Man Made River Water Utilization Authorities
 The Libyan Centre for Remote Sensing and Space Sciences
 Biruni Centre for Remote Sensing.

Establish a spatial data infrastructure between co-operating partners.

An NSDI can be conceived to be an umbrella of policies, standards and procedures under which organizations and technologies interact to foster more efficient use, management and production of geospatial data.

Integration of base mapping with the resources inventory

The integration of the base mapping with the resources inventory could be optimised through the following measures:

- (a) The introduction of a photo map as a base map in areas where no topographical maps are available, facilitating the transfer of the resource information to the base map;
- (b) The provision of a geographic grid uses the UTM projection system as a reference system for the resource information, facilitating the computerised overlaying of resource information.

Integration of survey techniques

Remote Sensing and other spatial data management approaches will be used to make inventory of resources in marginal lands of very limited agricultural potential (range lands). This activity is to be coordinated and performed in coordination with Libyan Centre for Remote Sensing and Space Sciences and Biruni Centre for Remote Sensing, both in Tripoli.

The techniques and capacities of remote sensing as developed by the two co-operating remote sensing agencies namely Libyan Centre for Remote Sensing and space sciences facility and Biruni Centre for Remote Sensing, would be beneficial to the committee in many of the tasks it is responsible for, and the development of its use will, in the long run, bring savings in the cost of collecting information whilst accelerating the speed of collection and increasing the quality of data. Only a negligible few personnel in the whole country have had hands-on

Such expertise and training can optimally be provided through the international recruitment and worldwide placement possibilities which the UNDP/FAO has access to. The programme will also be supported through the utilisation of the training capacities of the co-operating agencies.

There are two main reasons why external assistance is required to execute this project:

- (1) Expertise: considerable indigenous expertise exists in Libya for the implementation of the project, however, to date no co-ordinated operational inventory and monitoring facility has been established and sustained for the purpose of monitoring the natural resource base of the country. The establishment of an operational database facility and the implementation of LRIS also require external support.
- (2) Timing and our shared heritage: Libya needs to act quickly to provide the land-related information necessary for a rational integration of its natural forest and rangeland resources. The protection and wise development of an extraordinary array of natural and

At present, Libya does not have the capability to provide the anticipated information needed in a timely way. Outside assistance is required.

6. **Special considerations**

The Project, through its programme, adheres to environmental issues and provides strategies for the rehabilitation of deteriorated agricultural and other land as well as for the conservation of neglected or vulnerable areas.

One of the largest concerns of this project is the identification of areas for agricultural expansion in a fragile environment. The primary problems in terms of environmental fragility are soil erosion (primarily due to deflation), soil salinization, and limited groundwater supplies that are susceptible to over pumping. Planning for the agricultural expansion under the threat of environmental degradation from these processes requires the development of a comprehensive integrated resource plan. Data required for such a plan exist in the form of soil salinity maps, soil erosion maps, optimal soil-use maps and groundwater flow and salinity data for an extensive system of test wells throughout the country. The problem is that these data exist in forms that make their combined usage difficult, and are scattered across different agencies. Within the structure of a computerized geographic information system it will be possible to select areas for agricultural development that have an appropriate combination of many factors, like soil fertility, salinity, and erosion levels as well as adequate quantity and quality of groundwater. Thus, the development of a geographic information system will greatly enhance the ability to develop a comprehensive integrated resource plan that takes into consideration the fragility of the physical environment.

7. **Co-ordination arrangements**

The Project will be managed by an International Chief Technical Advisor (CTA) supported with full time National Project Director (NPD), both to be recruited by the project to perform the Terms Of References detailed in Annex II.

Through a Project Steering Committee (PSC) the project activities will be facilitated, co-ordinated, linked to other efforts in the same sector and provided with necessary advice and support. TOR of the PSC are provided in Annex No. II/1.

The PSC will be chaired by the Project National Co-ordinator (NPC) while the Project CTA will be the Committee Secretary. The PSC membership will include Senior Representatives from General Authority for Agriculture, Animal and Marine Wealth (GAAAMW), Soil and Water Authority, Agriculture Documentation Centre, Agriculture Research Centre, Libyan Centre for Remote Sensing and Space Sciences, Birini Centre for Remote Sensing, Great Man Made River Water Utilization Authorities, the Secretariat of Planning, NPD, FAO/CTA and UNDP .

8. Counterpart support capacity

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) recognises the importance of providing reliable and comprehensive data required for the development planning of the agricultural sector and for further strengthening its capacity to formulate, implement and monitor various policy measures at national and sub-national levels. In pursuit of this the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) has requested FAO for technical assistance in fields of development of the Information Management System based on the components of primary data capture of the existing mapping of national resources, including database organization, remote sensing, geographical information systems, land evaluation, and land use planning methodologies.

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) has the capacity to support the project in terms of counterpart personnel trained in the various disciplines related to natural resources and is able to supply trainable staff for the technology expertise to be developed.

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) will also provide the project with the necessary administrative support and will facilitate work of the project International and National staff.

The Technical Committee for Agricultural Resources Mapping (TCARM) recognizing the urgent requirement for implementing this programme are considering the establishment of a Land Resources Information Management System and intend to make available all necessary facilities and inputs, including all required counterpart staff which will be assigned on a full-time basis to the project.

C. DEVELOPMENT OBJECTIVE

The development objective of the project is to strengthen the GAAAMW capacity to manage land resources at national and sub-national levels, in the priority areas identified, by increasing the quality and widening the range of information available for planning in this sector. This long term objective of the project buttresses the objectives set for the agriculture sector in the previous five year perspective plan ending in 1995 and which are reiterated in the current five-year development plan 1995-2000. These objectives are:

- Laying emphasis on conservation, restoration, expansion and rational exploitation of renewable resources and marine life, and
- Setting up a statistical and spatial information system to provide timely and reliable educational, research, economic and social data for use and application in the process of decision-making.

The development and implementation of LRIMS components will ensure broad access to information and contribute to greater organizational co-ordination, planning and effective resource programme delivery. The overall LRIMS objectives can be summarized as:

- clients, partners and other interested audiences;
- Deliver its capabilities quickly, cheaply and easily;
- Lessen the dependency on technology experts, and basic information products, such as maps, and for the access and use of data;
- Capitalize on
- Provide the tools and operational framework to support data standards, sharing, and partnership opportunities.

With the achievement of the immediate objectives of the project as set out below :

- The national capability will rise to where the latest land use and land cover type baseline information for all agricultural land in the country(dependent on available funds and time) is available in a unified and systematic classification format in map as well as numerical form;
- A systematic methodology for classification and mapping of agricultural land resource information using remote sensing techniques is in place;
- A methodology for establishment, operation and manipulation of a digitised geographic information database is defined; and,
- A firm foundation is established for the GAAAMW to use RS/GIS and IS technology in the gathering of agricultural land resources information for the planning of national development.

D. IMMEDIATE OBJECTIVES, OUTPUTS AND ACTIVITIES

Immediate Objective 1

Undertake a pilot model for the Gefara Plain to establish user needs, system functionality requirements, and test the prototype components as precursor to national implementation of the Land Resource Information Management System (LRIMS) in support of the natural resources renewal objectives of the country. Upon developing and testing of the Pilot model in the Gefara Plain, it will be replicated in other areas previously identified.

Output 1.1

Gefara Plain

Activity: 1.1.1 Prepare / refine a comprehensive definition of the natural resources / environmental information needs that the project will address. The pilot stage will reflect, in part, the requirements as below.

Activity: 1.1.2 Prepare a Pilot project workbook that will contain:

- communications and background materials;
- a work plan;
- a system description and end-user documentation;
- a database description;
- proposed data and metadata standards and associated materials;
- proposed access and use policies for the sharing of data between the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) and its partner ministries / agencies;
- an LRIMS evaluation questionnaire;

Activity: 1.1.3 Review other national IT initiatives to identify linkages with LRIMS, potential partnerships, etc.

Output 1.2 *Project Acceptance and Committee Structure*

Activity: 1.2.1 Prepare draft terms of reference for Information Management Steering Committee to oversee the Pilot stage and Implementation of LRIMS.

Activity: 1.2.2 Prepare draft terms of reference for Project Technical Steering Committee to resolve technical issues encountered in the Pilot Project.

Activity: 1.2.3 Demonstrate the pilot system components and database to the broad community of stakeholders through meetings and facilitated workshops.

Activity: 1.2.4 Undertake a detailed evaluation of the Pilot stage deliverables with the stakeholder community to determine:

- the usefulness of the tools and database for the end user community;
- additional system functionality and data requirements; and,
- user and management expectations.

Output 1.3 *Full System Definition*

Activity: 1.3.1 Based on the results of the pilot evaluation, a detailed set of requirements and an implementation plan will be defined for later project activities. This stage will focus on broadening the system scope both in terms of functionality and data, as well as tackling the institutional, organizational and management issues.

Output 1.4 *Information Policy*

Activity: 1.4.1 Draft information access policy to support data sharing and use among various transferability to other areas, once complete.

Activity:1.4.2 Prepare issues and options paper and presentations for Management

Immediate Objective 2

To design, build and implement the Core Database and related metadata, data standards, and data maintenance processes and tools.

Output 2.1 *Core Database*

Core database themes and related inventory methodologies are outlined in more detail previously and also below. These sections highlight the inventory work proposed and will support the general Core Database development activities outlined below.

Activity: 2.1.1 Identify / compile a complete list of supporting data and providing a description of their source, usage and suitability in relation to the information needs. Collate and evaluate data to determine their suitability based on accuracy, timeliness, coverage and relevance. Digitise, scan data.

Activity: 2.1.2 Identify data effort for data clean-up, validation and database e.g soils maps at 1:50,000.

Activity: 2.1.3 Design and construct an integrated Core Database structure for all key data sets; specifically and in particular those data sets noted below for base thematic layers and imagery.

Activity:2.1.4 Clean, convert, structure and validate data for incorporation in initial Core Database.

Activity: 2.1.5 Create final version of the core database and associated documentation. Package database for delivery and installation.

Output 2.2 *Metadata Standard*

Activity: 2.2.1 Investigate / compile metadata standard(s) in use in Libya.

Activity: 2.2.2 Introduce draft metadata standard for both geographic and tabular data sets as part of the Pilot study in Gefara.

Activity: 2.2.3 Facilitate discussion / ratification of metadata standard among users.

Activity: 2.2.4 Document metadata standard and distribute.

Activity: 2.2.5 Incorporate metadata standard components into database maintenance and management tools.

Activity: 2.2.6 Facilitate the compilation of metadata for data sets within the Core Database.

Output 2.3 *Data Standards Process*

Activity: 2.3.1 Define data standards process.

Activity: 2.3.2 Facilitate discussion / ratification of data standards process among users.

Activity: 2.3.3 Document process and distribute along with sample data standards and data collection methodologies (developed below)

Output 2.4 (Core Database Maintenance Tools for Database Administrator)

Activity: 2.4.1 Define procedures for maintenance of software and Core Database.

Activity: 2.4.2 Develop custom tools (KB-IMS) for database update and distribution.

Activity: 2.4.3 Produce appropriate system documentation for the system maintenance tools.

Activity: 2.4.4 Develop training programs for systems (database) administrators in installation, maintenance and use of LRIMS core technology components. Combine with training.

Immediate Objective 3

To develop and implement the end-user components of the Libyan Land Resource Information Management System for physical planning of agricultural development at regional and sub-regional level.

Output 3.1 *Desktop Information Access System (DIAS)*

Activity: 3.1.1 Adopt existing DIAS tool to work with the prototype database for immediate use in the Pilot stage.

- Activity: 3.1.2 Modify DIAS software design to reflect new user needs, unique requirements as appropriate.
- Activity: 3.1.3 Develop DIAS software and documentation
- Activity: 3.1.4 Test and package.
- Activity: 3.1.5 Prepare software end-user documentation, on-line help and user manuals.
- Activity: 3.1.6 Define and document installation process for systems administrator and / or users.

Output 3.2 *Web Information Access System (WIAS)*

- Activity:3.2.1 Adopt existing WIAS tool to work with the prototype database for immediate use in Pilot Project.
- Activity: 3.2.2 Modify WIAS design to reflect new user needs, unique requirements as appropriate.
- Activity: 3.2.3 Develop WIAS software and documentation
- Activity:3.2.4 Test and package.
- Activity: 3.2.5 Prepare software end-user documentation, on-line help and user manuals.
- Activity: 3.2.6 Define and document installation process for systems administrator and / or users.

Output 3.3 *Establish an agro-climatological database*

- Activity: 3.3.1 Collate, enter and process climate data from all over the country through establishing contacts with centers and institutions active in this field.
- Activity: 3.3.2 Update the agro-climatological map of Libya and the basis of the data zonation.
- Activity: 3.3.3 Develop the necessary application programme for agro-climatological analysis.

Output 3.4 *End-User Applications*

Phase 1 pilot project.

- Activity: 3.4.1 Design and develop business specific applications which use the Core Database and high-end workstation and desktop GIS tools in support of

specific analytical requirements of the programme staff. (Note: usual RAD systems development life-cycle approach will be used, including user needs analysis, prototype development and final system build)

Activity: 3.4.2 Design and deliver appropriate training in the use of the applications.

Activity: 3.4.3 Develop and produce appropriate system and user documentation.

Output 3.5 *User Training*

outlined.

Activity: 3.5.1 Work with programme specialists to design an appropriate end-user training package for using LRIMS software components.

Activity: 3.5.2 Prepare training package.

Activity: 3.5.3

Immediate objective 4

Creation of a new land cover / land evaluation model for the 4 priority areas as defined above.

Output 4.1 *New series of current land cover maps for the priority areas of the Jamahiriya*

Activity 4.1.1 Review and determination of suitability of procurement of new imagery where required.

Activity 4.1.2 Geometric rectification of data, collection of ancillary data, training in image interpretation using LCCS (Land Cover Classification System)

Activity 4.1.3 Interpretation, validation and final interpretation of land cover classes

Activity 4.1.4 Creation of digital database of land cover, establish uniform systems for the storage of the land-cover information.

Output 4.2 *Trained Personnel (as required) for the interpretation, creation of the database, operation of GIS and remote sensing update capacities*

Activity 4.2.1 Investigate user requirement for a GIS to provide instant information on land resources and other components of land use planning. I

Activity 4.2.2 Select candidates for study tours and institutional training, identify suitable

institutions and arrange for fellowships and study tours.

Activity 4.2.3 Identify training needs in various disciplines and Organize organize in-country group training courses, draw up programmes, arrange for in-service training, and conduct the courses.

Activity 4.2.4 Select appropriate software that can be linked with various relevant databases.

Output 4.3 *By October 2001 a series of evaluation models for selected crops such as wheat, millet, barley, oat, citrus, fodder varieties, for different management levels will have been drawn up.*

Activity 4.3.1 Select crops in suitable crop production areas for the development of evaluation models, particularly in respect of the quality and quantity of water applied, and collect yield and management data.

Activity 4.3.2 Develop qualitative (if only limited data available) and quantitative land evaluation models for crops as selected in activity 5.3.1.

Activity 4.3.3 Validate the models as developed in activity 5.3.2

Activity 4.3.4 Write accompanying reports.

Output 4.4 *By the end of the project, quantitative and qualitative land evaluation will have been undertaken for selected areas with the aid of models developed under activity 5.3.2 and 5.3.3.*

Activity 4.4.1 Based on the FAO land evaluation guidelines, and with the aid of a land evaluation software package, develop the necessary programmes to integrate the soil data base, agro-climatological data base and crop evaluation models into a computerized land evaluation programme.

Activity 4.4.2 Apply the land evaluation package to selected crops and specific areas presenting the results in tables, including yield predictions under various management levels, and suitability maps.

Activity 4.4.3 Prepare a land evaluation manual and write accompanying reports for the specific studies carried out under activity 5.4.2.

Immediate Objective 5

Review of current natural resources strategy and advise on an improved planning base for agricultural and rural development schemes.

Output 5.1 *General Soil Legend of the Jamahiriya soils*

Activity 5.1.1 Design and finalize a suitable Soil legend comprising all of the Jamahiriya

soil types.

Activity 5.1.2 Classify all existing and new soil data according to the Revised FAO Legend of the Soil Map of the World and USDA Soil Taxonomy, and group them according to the Libyan Soil legend.

Activity 5.1.3 Prepare Soil maps at original scales of previous surveys with the units classified according to the National Legend.

Output 5.2 *Land Evaluation and land-use potential systems specifically adapted for the Jamahiriya conditions in the priority areas.*

Activity 5.2.1 On the basis of the available soil, climatic and other natural resources data design suitable land evaluation and AEZ Systems.

Output 5.3 *Digital Soil maps at reconnaissance scale 1:50 000 covering the entire western zone , and other priority areas as possible within time and financial constraints for the eastern and central coastal zone using standardized legend and methodology.*

Activity 5.3.1 Compile existing soil maps at standardized formats with revised legend and identify needs for additional mapping (re: also output 1.1).

Activity 5.3.2 Design a standard mapping methodology and with the aid of remote sensing techniques, digitise existing products prepare survey and mapping of new areas.

Activity 5.3.3 Execute soil surveys as required, store data in the database (re: output 1) and produce standardized maps and reports setting out the findings.

Output 5.4 *Maps and reports showing the Agro-ecological Zoning of the Jamahiriya and the agricultural potential of land for selected land-use types, for defined areas at required scales.*

Activity 5.4.1 Apply the developed Land Evaluation/AEZ systems and model to selected areas and for relevant land utilization types.

Activity 5.4.2 Prepare land resources and land suitability maps in digital form.

E. INPUTS

(1) In Kind

The Inputs in kind to be provided by the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) will include:

1.1 Personnel

a) Assignment of a National Project Co-ordinator (NPC).

The National Project Co-ordinator is a Government Senior Official and expected to allocate part of his time to support the project implementation and will perform the Duties detailed in Annex II. The NPC will be the Chairman of the Project Steering Committee, which is an advisory and co-ordinatory body in support of the project management.

The National Project Co-ordinator/ Chairman of the PSC will nominate suitable candidate to be recruited by the project as a full time National Project Director (NPD) and who will work in close co-ordination with the CTA to oversee the activities of the project during the full period of the project.

b) Full time national counterparts to work with the project international and national experts as follows:

i) Professional Staff:

On behalf of the Government, the General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) will provide the required national personnel to work with the project as described above. Those personnel will serve on variable time basis as described in project requirements which include:

- 2 Soil Surveyors
- 2 Information Management -D/B specialists
- 1 Irrigation/Hydrology
- 1 Range Ecologist
- 1 Forestry Specialist
- 2 Land cover specialists
- 4 Programmers/Data Processing
- 1 Climatologist

ii) Administrative/Technicians:

The General Authority for Agriculture, Animal and Marine Wealth (GAAAMW) will also provide technical and administrative personnel required to assist the project. This includes personnel for field data collection, laboratory assistance, and computer operating assistance and others as might be required for the operation of the project.

- 4 Computer Operators/Data Entry
- 2 Digitisers/D. Base Specialists
- 2 Typists/Secretaries
- 1 Administrative Officer
- 1 Expediter/Administrative Assistant
- 2 Drivers
- 1 Office Clerk

The GAAAMW will also provide services of necessary support personnel for secretarial services, translation and interpretation but where necessary they may be recruited by the project.

The national staff in close co-operation with the International project staff will be responsible for the collection, standardization and digitizing of all existing data in their respective fields. They will also take part in collection of new data, development of new methods and mapping.

1.2 Premises, equipment and other facilities:

- 1.2.1 The GAAAMW shall make available and/or accessible for the project operations enough and suitable office accommodation for the project staff, adequate working space for the various activities, including air conditioned, dust proofed, humidity controlled, UPS equipped accommodation for the equipment requiring such conditions. And make necessary provision for maintenance; water and electricity supply to the premises.
- 1.2.2 The GAAAMW will fully prepare the environmentally controlled rooms where computer equipment is to be installed. The GAAAMW will provide a standby generator, and if necessary, an uninterrupted power supply, to ensure continuous power supply within proper margins. The GAAAMW will also properly maintain these premises and the uninterrupted power supply.
- 1.2.3 The GAAAMW will provide all existing maps, aerial photography, and statistics and other supporting data that are considered useful for the operation of the project.
- 1.2.4 The GAAAMW will provide access through contracts to their digital image processing, GIS, digitising and interpretation facilities at the Libyan Centre for Remote Sensing and Space Sciences, Biruni Centre for Remote Sensing for the analysis of remote sensing and geographic information system data required for use in this project (e.g. for assistance in training or in data base development, data analysis, or methodology development). The cost of image processing and map sheet generation of all photo map products processed under the project from the national contribution in Dinars

The GAAAMW will provide its printing facilities, funding will come from the project budgets for the printing of reports and of the following selected maps produced by this project: - photo map series, land cover maps, land system maps at all scales.

- 1.2.5 The GAAAMW will assist the project management in expediting procedures for custom clearance of imported equipment and supplies.
- 1.2.6 The GAAAMW shall provide car insurance, custom exemptions; transport, loading and unloading charges for all projects financed equipment and materials from the port or airport to the operational sites.

The GAAAMW shall also provide.

(2) Government Cost Cash Contribution:

This is a local currency budget for the total of Libyan Dinar 1,132,560 as detailed in Appendix I. This budget will be subject to adjustments through BR as required for the project implementation and managed by FAO to cover expenditures incurred locally as follows :

- a) Administrative support, L.D. 130,000 to cover allowances for administrative, non
- b) Duty Travel, LD. 130,000 to cover internal transport of national and international staff and field crews to collect field data. It will also bear the cost for aerial surveys and helicopter flights as required.
- c) National Project Director, 21,000 to cover cost of its recruitment on full time basis over 36 mm.
- d) National experts, LD 128,000 to cover cost of recruitment of national experts and consultants including:
 - Rain-fed Agriculture,
 - Irrigation/Water Requirements,
 - Farming System,
 - Agricultural economics
 - Information Systems and others to be identified
 - Other part time national professionals.

This budget line will also be used for payment of allowances/ salary supplement to National Counterparts assigned by the GAAAMW to the project including NPC .

- e) Sub-contracts, LD. 400,000 to pay for local contracts for services required by the project such as data capture (digitizing), additional interpretation staff/facilities - under sub-contract with local/national institutions. Tasks to be covered by the sub-contracts are to be endorsed by the PSC.
- f) In-country training, LD. 130,000 to cover cost of all in-country training , seminars and workshop including allowances, accommodation and local travel of participants and fees for national trainers and interpreters involved in the training.

The major part of the training is taking place through in-service training. For that reason, long-term international staff is recruited. In addition, consultants will provide on the job training to national counterparts. Local Workshops and group training will also be organised once or twice a year for 2-4 weeks in selected places.

- g) Supplies/expendables, LD. 60,000 for the procurement of locally available expendable equipment and supplies.

- h) Operation and Maintenance, LD. 90,000 to cover cost operation and maintenance of the equipment provided by the project. It will also expedite all local

import and clearance formalities and other miscellaneous expenditures.

(3) Foreign Currency Budget

This is a foreign currency budget in US Dollar as detailed in Appendix II. This budget will be subject to adjustments through Budget Revision as required for project implementation and will be managed by FAO to cover expenditures incurred by the project as follows

(a)	International Personnel: To cover cost of the recruitment of the FAO International experts and consultants and Technical co-ordination and evaluation,		mm
	1. CTA first 18 mths -Information Management, D/B	36	
	2 nd 18mths Land Evaluator/Land Resources		
	2. Soil Resources/Soil Survey Specialist	10	
	3. Remote Sensing /Land Cover Mapping Expert - LCCS	8	
	4. Database Specialist	3	
	5. Irrigation Consultant	2	
	6. Agro-climatologist	2	
	7. System Architect	3	
	8. GIS consultant/trainer	3	
	9. Communications consultant	2	
	10.SOTER Consultant	2	
	11.ALES Consultant	3	
	12.Rangeland Consultant	3	
		Total	<u>77 mm</u>
(b)	Administrative support: To cover recruitment of full time admin/finance national assistant and other administrative costs , \$ 90,000		
(c)	Duty Travel: To cover International and internal travel of national and international staff, \$25,000		
(d)	Mission Cost: To cover the cost of the travel of the FAO Technical Backstopping mission, 30,000		
(e)	Sub-Contracts /LOA's : This is to cover cost of contracts abroad , \$ 250,000		
	(i) Data Clean up	USD	60,000
	(ii) Information Management System	USD	<u>190,000</u>
		Total	250,000

Note: Tasks to be covered under these contracts are to be discussed and endorsed in the PSC. Annex III provides tentative list of tasks to be performed by sub-contractors.

- (f) Training: Total for training abroad is \$ 200,000
- Medium-term fellowships: To cover cost of fellowships abroad, \$155,000
- | | |
|----------------------------------------------|------------|
| Remote sensing-LCCS/database management/GIS | |
| 3 x 6 m/m fellowships for key officers) | USD 50,000 |
| Land Evaluation/LUP | |
| 3 x 6m/m fellowships (for key officers) | USD 35,000 |
| Other training abroad to be identified later | USD 50,000 |
- Study tours
- | | |
|---------------------------------------------------------------------------------|------------|
| Tours for selected senior staff to facilities in Canada, Europe, and Australia. | USD 45,000 |
|---------------------------------------------------------------------------------|------------|
- (g) Local Procurement:
- | | |
|--------------------------------------------------------------------------------|-----------------|
| To cover cost of procuring equipment and supplies from local market, \$ 40,000 | |
| Service contracts for computers etc | <u>\$25,000</u> |
| total | \$65,000 |
- (h) International Procurement > \$70,000: To cover cost of importing equipment and supplies from abroad, \$ 138,000.
- | | | |
|----------------------------------------------|--|-------------------|
| Vehicles and cars | | 44 x 3 lightduty |
| (e.g. Hilux double capin) at USD 18,000 each | | 44 x 3 heavy duty |
| (e.g. Landcruiser) atUSD 28,000 each | | |
| Total | | USD 138,000 |
- (i) International Procurement < \$70,000: To cover cost of importing equipment and supplies from abroad, \$ 455,000.
- Additional Satellite imagery

- Satellite TM /IRS data on CD-ROM	USD	80,000
- Selected products	USD	10,000
 - Cartographic and photographic expendables USD 15,000
 - Other supplies USD 90,000
 - 4 Microcomputers (PC) with accessories USD 25,000
 - Geographic information system (using part of the accessories of (ii) and (iii) (for specifications see Annex I) USD 60,000
 - Cartographic and photographic equipment, Partly to supplement (iii) and (iv), incl. plan variograph minor stereoscopes, LCD projector, light tables drawing tables and equipment camera USD 25,000

▪ Office equipment/Photocopier & other office equipment	USD	25,000
▪ Survey equipment incl. camping equipment, compasses, clinometers, tape measures, soil augers, spades/shovels, geological hammers, Munsell colour charts, pH and salinity field kits, double ring infiltrometer sets, etc.	USD	15,000
▪ Laboratory and other equipment	USD	110,000
Total	USD	455,000

NOTE: Details of all equipment and supplies to be decided later by National Team Leader and CTA in consultation with the national experts in the various sections.

(j) Miscellaneous

Reporting		30,000
Sundries		<u>65,000</u>
Total		95,000

Note: Budget Revisions proposed could be prepared by the project management and submitted to FAO/UNDP for finalization after being approved by NPC.

F. RISKS

The project requires continuity of funding beyond the first instalment in order to achieve its objectives.

Lack of counterpart staff are critical in terms of ensuring the establishment of a core critical mass of trained support staff for the project to be sustainable.

Inadequate/lack of appropriate co-ordination/ co-operation between different relevant institutions specially the providers of information and or services.

Project timely accessibility to services expected from the Libyan Centre for Remote Sensing and Space Sciences should be highlighted

G. PRIOR OBLIGATIONS AND PREREQUISITES

Obligations

The GAAAMW shall take all the necessary measures to facilitate the execution of the project and to assist the FAO/UNDP staff in obtaining such services and facilities as they may

require to fulfil their tasks. The GAAAMW shall apply to FAO/UNDP, their property, funds and assets, their officials and to other persons performing services on their behalf in connection with the project, the provisions of the Convention on Privileges and Immunities of the Specialized Agencies.

The GAAAMW shall deal with any claims brought by third parties against FAO/UNDP, their personnel or other persons performing services on their behalf in connection with the project, except when it is agreed by FAO/UNDP and the GAAAMW that such claims arise from gross negligence or wilful misconduct of such persons.

The GAAAMW shall grant to the staff of FAO/UNDP and to persons acting on their behalf, access to the project site and to any material or documentation relating to the project and shall provide any relevant information to such staff of persons.

The project document will be signed by UNDP and FAO and UNDP/FAO assistance to the project will be provided only if the prior obligations have been met to UNDP and FAO's satisfaction.

Prerequisites

The GAAAMW shall provide the facilities, manpower and supplies shown under E (a) of the Project Document. The GAAAMW shall be responsible for the timely recruitment of national staff or transfer to the project of existing national staff and for their salaries and social security measures.

The UNDP and FAO assistance to the project will be provided, subject to UNDP/FAO receiving satisfaction that the prerequisites listed above have been fulfilled or are likely to be fulfilled. When anticipated fulfilment of one or more prerequisites fails to materialize, UNDP/FAO may, at their discretion, either suspend or terminate their assistance.

H. PROJECT MONITORING, REPORTING AND EVALUATION

The project will be subject to tripartite review (joint review by representatives of GAAAMW, the executing agency and UNDP) at least once every twelve months. The first such meeting is to be held within the first twelve months of the start of full implementation. The national project co-ordinator and/or international senior field project officer of the UN executing agency shall prepare and submit to each tripartite review meeting a Project Performance Evaluation Report (PPER). Additional PPERs may be requested, if necessary, during the project.

Towards the end of the project, the project management shall prepare the draft terminal report for review and technical clearance by the executing agency four months prior to the terminal tripartite review meeting.

* Annual evaluation is to be conducted by a team of an external International Consultant and a National Consultant.

I. LEGAL CONTEXT

This project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement between the People's Authority of the Great Socialist People's Libyan Arab Jamahiriya, the United Nations Development Programme and The Food and Agriculture Organization of the United Nations.

The following types of revisions may be made to this project document with the signature of the UNDP Resident Representative only acting on behalf of/representing FAO , provided he or she is assured that the other signatories of the project document have no objections to the proposed changes: -

- revisions which do not involve significant changes in the immediate objectives, outputs or activities of the project, but are caused by the re-arrangement of inputs already agreed to or by cost increases due to inflation:
- mandatory annual revisions which rephrase the delivery of agreed project inputs or increased experts or other costs due to inflation or take into account agency expenditure flexibility.

J. WORKPLAN

The CTA in consultation with the Committee Chairman and FAO H.Q.'s technical divisions will prepare a detailed Work Plan for the implementation of the project. This is to be done at the start of the project. The agreed upon work plan will be attached to the Project as an Annex and will be considered as part of that document. It will be revised and updated as and when required.

Annex IV provides tentative time frame for the project implementation.

GCCC Budget (Libyan Dinars)

B.L.	Description	Total	2000	2001	2002	2003
1300	Admin. Support	130,000	25,000	40,000	40,000	25,000
1500	Duty Travel	130,000	30,000	40,000	40,000	20,000
1701	National Project Dir.	21,000	3,500	7,000	7,000	3,500
1702	National Exp. & Cons.	128,000	26,000	40,000	40,000	22,000
2000	Sub-contracts	400,000	150,000	150,000	100,000	
3000	In-country training	130,000	30,000	50,000	30,000	20,000
4000	Supplied expendables	60,000	15000	20000	20000	5000
5000	Non-expendables	0				
6000	Operation and Maintena	90,000	20000	30000	30000	10000
	Total	1,089,000	299,500	377,000	307,000	105,500
	Overhead cost 4%	43560	11980	15080	12280	4220
	Grand Total	1,132,560	311,480	392,080	319,280	109,720

Project Budget covering UNDP Contributions (US Dollars)												
The Great Socialist People's Libyan Arab Jamahiriya Project												
LIB/-----												
Project Title: Mapping of natural resources for agricultural land-use planning agricultural use and planning												
Code Des.												
	PROJECT PERSONNEL											
	International Experts											
		Total m/m	Total Years	2000 m/m	2001 m/m	2002 m/m	2003 m/m					
11.01	Information Management / Land Resources Specialist (CTA) 18 mt ea.36	36	611,000	6	100,000	12	204,000	12	207,000	6	100,000	
11.51	Remote Sensing Specialist LCCS - 3 mission	8	112,000	2	28,000	3	42,000	2	28,000	1	14,000	
11.52	Data Base Specialist - 3 missions	3	42,000	1	14,000	1	14,000	1	14,000	1	14,000	
11.53	Soil resources/Soil Survey Consultant - 4 missions	10	140,000	2	28,000	3	42,000	3	42,000	2	28,000	
11.54	Irrigation Consultant -2 missions	2	28,000	0	-	1	14,000	1	14,000			
11.55	SOTER Consultant -2 missions	2	28,000	1	14,000	1	14,000	0	-			
11.56	Systems architect- 2 missions	3	42,000	2	28,000	1	14,000	0	-			
11.57	GIS trainer 3 missions	3	42,000	1	14,000	1	14,000	1	14,000			
11.58	Communications Cons - 2 missions	2	28,000	1	14,000	1	14,000	0	-			
11.59	ALES Cons -2 missions	3	42,000	0	-	2	28,000	1	14,000			
11.60	Agro-climatology - 2missions	2	28,000	1	14,000	1	14,000	0	-			
11.61	Rangeland Cons. - 3 missions	3	42,000	1	14,000	1	14,000	1	14,000			
11.62	Tech. Coordination	9	90,000	2	20,000	3	30,000	3	30,000	1	10,000	
11.7	Evaluation	3	30,000	0.5	5,000	1	10,000	1	10,000	0.5	5,000	
11.99	Sub-total1	86	1,275,000	20	288,000	31	458,000	25	377,000	10	152,000	
13	Admin. Support	0	90,000	0	15,000	0	30,000	0	30,000		15,000	
15	Travel	0	25,000	0	5,000	0	10,000	0	5,000		5,000	
16	Mission Costs	0	30,000	0	5,000	0	10,000	0	10,000		5,000	
17	Sub-total2	0	145,000	0	25,000	0	50,000	0	45,000	0	25,000	
19	Component Total	86	1,420,000	20	313,000	31	508,000	25	422,000	10	177,000	
20	SUB-CONTRACTS	0	250,000	0	50,000	0	100,000	0	50,000		50,000	
30	TRAINING	0	-	0	-	0	-	0	-		-	
31	Fellowships	0	155,000	0	35,000	0	70,000	0	50,000		50,000	
32	Study tours	0	45,000	0	15,000	0	20,000	0	10,000		10,000	
39	Component Total	0	450,000	0	100,000	0	190,000	0	110,000	0	50,000	
40	EQUIPMENT	0	-	0	-	0	-	0	-		-	
45	Local Procurement	0	40,000	0	10,000	0	10,000	0	10,000		10,000	
46	International Procurement > 70,000	0	138,000	0	138,000	0	-	0	-		-	
47	International Procurement < 70,000	0	455,000	0	170,000	0	150,000	0	85,000		50,000	
49	Component Total	0	633,000	0	318,000	0	160,000	0	95,000	0	60,000	
50	MISCELLANEOUS	0	-	0	-	0	-	0	-		-	
51	Oper. / Maint. Equip.	0	65,000	0	10,000	0	20,000	0	20,000		15,000	
52	Reporting costs	0	30,000	0	5,000	0	10,000	0	15,000		5,000	
53	Sundries	0	25,000	0	5,000	0	10,000	0	5,000		5,000	
59	Component Total	0	120,000	0	20,000	0	40,000	0	40,000	0	20,000	
60	Component grand Total	86	2,623,000	20	751,000	31	898,000	25	667,000	10	307,000	
94	AOS 10%	0	262,300		75,100		89,800		66,700		30,700	
999	UNDP TOTAL	86	2,885,300	20	826,100	31	987,800	25	733,700	10	337,700	