



Projet Régional de Développement de l'Aquaculture en Méditerranée  
Mediterranean Regional Aquaculture Project  
UNDP/FAO/RAB/89/005/12

## **S I P A M**

### **AN INFORMATION SYSTEM FOR THE PROMOTION OF AQUACULTURE IN THE MEDITERRANEAN REGION**

#### **Conceptual Design**

prepared by

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## PREFACE

Project UNDP/FAO/RAB/89/00512 MEDRAP (Mediterranean Regional Aquaculture Project) Phase II is engaged in the promotion of aquaculture development through the establishment of a permanent mechanism for cooperation/coordination in the Mediterranean region. The Project aims at the creation of a network of regional aquaculture development institutions together with the strengthening of such institutions and the aquaculture input supply industry. Once the Project had started, the need to strengthen the network through the establishment of an information system to assist aquaculture activities at national and regional levels became evident.

This paper presents the conceptual design of an Integrated Information System to be developed and installed in the MEDRAP II Project area. This System should provide aquaculture/fishery managers, planners, producers and services with a regional desk information system fed with input from various inter-related sources.

It is a system that will produce useful and usable information through organized methods of selecting, storing, retrieving and reporting data available from national, regional and international (FAO) offices. It is emphasized that this is the revision of a working document which was discussed and approved by the delegates of thirteen MEDRAP countries. All the country representatives and MEDRAP National Coordinators actively participated in building up the conceptual design during the three-day Seminar on Information and Documentation held in Cairo (Egypt) from 11 to 13 December 1991.

This paper, a revision of the December 1991 version, is the first of a series of project documents dealing with this work; apart from the papers that will be prepared on specific subjects, the SIPAM series will contain the following three additional papers which will be completed by the end of the present phase of the Project:

- SIPAM System Design
- SIPAM Procedural Approach Design
- SIPAM User Manual

The SIPAM documentation series should also be available in more than one language.

## **ABSTRACT/RESUME**

Financed by UNDP with FAO as the executing agency, MEDRAP has strived to assemble the protagonists of aquaculture research and development in the Mediterranean basin within a flexible structure of advice, training and technical assistance. Through the MEDRAP, participating countries have demonstrated their interest in developing a network of data/information exchange between researchers, decision makers, producers and economists, and therefore the need to set up an information system respondent to the needs of these protagonists.

The objective of SIPAM is the establishment of a reliable and permanent regional aquaculture information system to facilitate the exchange of information regarding all domains (production, markets, regulations, technology, etc.) of interest to the beneficiaries with a view to increasing production and improving technology, the quality of the products and their marketing.

The SIPAM Project has been designed starting from the methodology conceived and tested under the framework of another regional project executed by FAO in Latin America (AQUILA II) and will be developed under the direct assistance of FAO/FIR (Fishery Resources and Environment Division).

From the point of view of investment of human and technological resources assigned to this Project and characterized by its unique approach, it should be emphasized that it is a low-cost financial project with a high level of coordination and backstopping.

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## 1. Introduction

The proposed Regional Information System, SIPAM, originated mainly from four factors:

- (a) the strong demand for corporate information from the many scientists and administrators involved in planning and promoting aquaculture activities and evaluating projects at the national and regional level;
- (b) an urgent need of private and public investors, producers and suppliers for regional and international information, specifically (or especially) for this sector, in order to promote the import/export of aquaculture products and equipment; training possibilities, prices, national and international rules and standards, legislation, feeding and pathology, etc., are also part of the above needs;
- (c) the conviction that both public and private institutions possess an enormous quantity of data/information useful to administrators in the sector which, for various reasons, remain unused or only partially used because they are not appropriately compiled, processed or disseminated. This makes it difficult and often impossible to integrate and/or associate this data/information with other information of a different nature and source; and
- (d) the constant requests from the public and private sectors for dedicated software to formulate and analyse research, planning and investment projects. This System will contain the instruments appropriate to this need using the databank content of the component as the comparative source of information and data.

The outcome will produce a continuous flow of information which could be used for evaluating, measuring, maintaining and controlling events and performance in aquaculture.

The current widespread availability of reasonably low-priced computers and micro-computers of great capacity makes possible a project for incorporating a large amount of such multi-disciplinary information into a **Desk Information System** which is the final target of SIPAM.

It is worth mentioning that a similar experience is under way in Latin America (SIPAL: Sistema de Información para la Planificación de la Acuicultura en América Latina) under the activities of AQUILA II Project.

## 2. System Overview : Objectives and Characteristics

This paper presents the components of the proposed Information System and explains the most qualifying elements related to them. This preparatory work, along with the field observation, will enable an appropriate system analysis to be undertaken to match identified needs (in terms of objectives and requirements) with industry standards in terms of information technology. For a better understanding of the technical terminology used in this report a glossary of computer terms is given in Appendix 2.

### 2.1. The Objectives

The primary objective of SIPAM is to provide the MEDRAP Project, and through it the countries adhering to and associated with the Project, with an instrument and methodology for rapid and targeted access to data and information of different types and from different sectors and sources. This technology will allow all users to establish their own "made-to-measure" research procedures tailored each time to suit their requirements.

A by-product of this System will be the exchange of data and information between peripherals (Countries/End-user Centres) and the Centre (FAO/MEDRAP Project) putting in motion a process of feedback. The System will be a strong boost to standardizing aquaculture terminology and contents (units and measurements) in the Region.

In order to rationalize the development and implementation of the System, enhance the possibility of its success and increase its use by and interest of all parties concerned, the System will be made up of five basic modules:

- To permit each country access to the regional data, the Project will design and implement a **Regional Sub-System** and put at the disposal of the countries available information in a readily accessible manner. This module will be fed with non-confidential data and information of regional interest which each country has put at the disposal of the project.
- The **National Sub-System** will provide SIPAL with direct access to national databases. However, this option will be available only for those countries where a national information system exists and the national coordination staff are able to develop the appropriate communication protocols. Alternatively, this module will contain the same software as the Regional Sub-System managing data at a lower level of aggregation and having all the typical functions of data entry.
- Alongside the Regional Sub-system, the Project will develop an **FAO-HQ Sub-System** containing and managing some of the FAO officially-distributed data-bases. As long as SIPAM is managed under an FAO project it will be the responsibility of that project to provide/acquire such products.

- As a complementary source of information, an **Extended SIPAM Sub-System** containing information from other data sources external to MEDRAP and FAO will be developed. In this module data from commercial and non-commercial remote networks may also be considered if found necessary and useful for the completeness of SIPAM. For the Prototype development, the Project should contact and make agreement with the FAO GLOBEFISH<sup>1</sup> to access its remote database, capture data/information related to aquaculture, then re-compile and re-distribute them throughout the SIPAM network.
- An **Analytical/Modelling Sub-System** will be added as a complementary module where several 'ad hoc' tools especially developed for SIPAM will be gathered to assist investment planning, project formulation, project analyses, etc.
- The **Data Processing Sub-System** will enable the user to process and critically analyse the information retrieved through SIPAM. In fact, one of the characteristics of the System is that it will not be dependent upon pre-determined models. This module will therefore contain all the commercial software which the user might need to carry out the analytical studies (word processor, spreadsheet, DBMS, project management tool, graphics, statistical package, etc.).
- The **System Configuration Module** will assist in configuring SIPAL according to the different hardware/software platforms where it is installed. It will also contain and manage the overall codification system based on a prefixed Reference File System.

The overall SIPAM System will work using data and information in a structured and standardized mode to allow storage, exchange and aggregation for textual, analytical and graphical manipulation.

Figure 1 presents the Sipam System Overview and Figure 2 gives an outline of a typical retrieval process around which the System will be designed.

It is worth underlining the principle that all MEDRAP and associated countries, regardless of whether they are "**data donors**" or "**information recipients**", will be provided with the same Regional Information System.

## **2.2. The Characteristics**

The first qualifying characteristic of the proposed System is the new basic role of the **end user** in its design and implementation in a regional context. It is emphasized that the

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<sup>1</sup> The GLOBEFISH Research Programme is an activity initiated by FAO's Fisheries Industry Division, Rome, Italy and financed jointly by other Institutions.

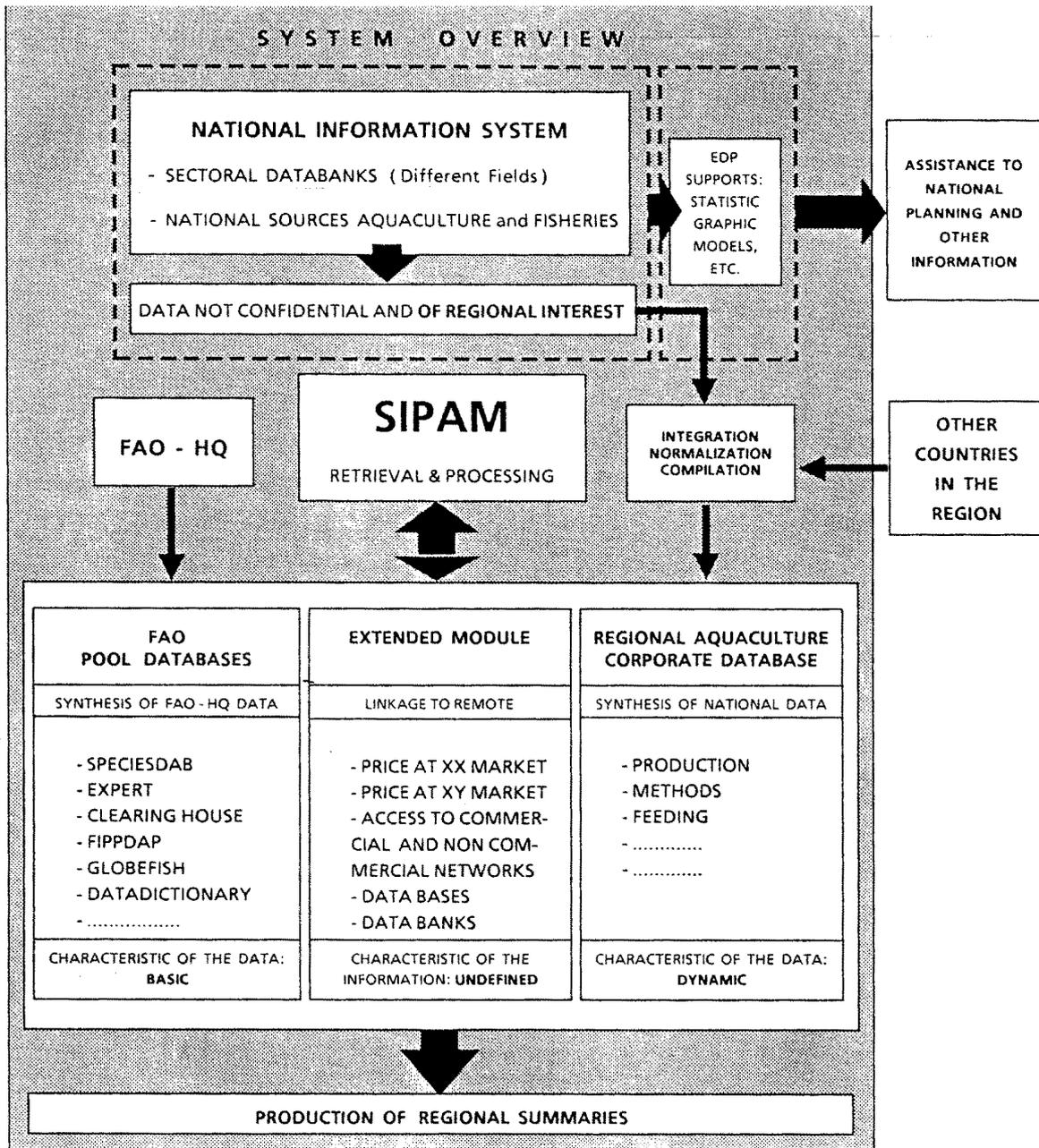
System will be mainly designed by the users themselves, based on their concrete needs, and will not follow the normal logic of data dissemination per se.

The second peculiarity is that each country will be free to accept the SIPAM Data Model or to manage its own data bases or information systems. The Project may eventually be asked to assist interested countries in developing data entry procedures, or automatic data capture interfaces, in downloading/uploading national data (manually or automatically) into the Regional Sub-System.

A third characteristic is that countries will not be burdened with requests for additional data collection operations to feed this System. However, it is clear that if a country/institution has no on-going data collection system covering items of information within a certain application, the Regional Sub-System (aggregation of national information) will not contain its data.

## INFORMATION SYSTEM FOR PROMOTING AQUACULTURE IN THE MEDITERRANEAN

Figure 1. SIPAM - System Overview

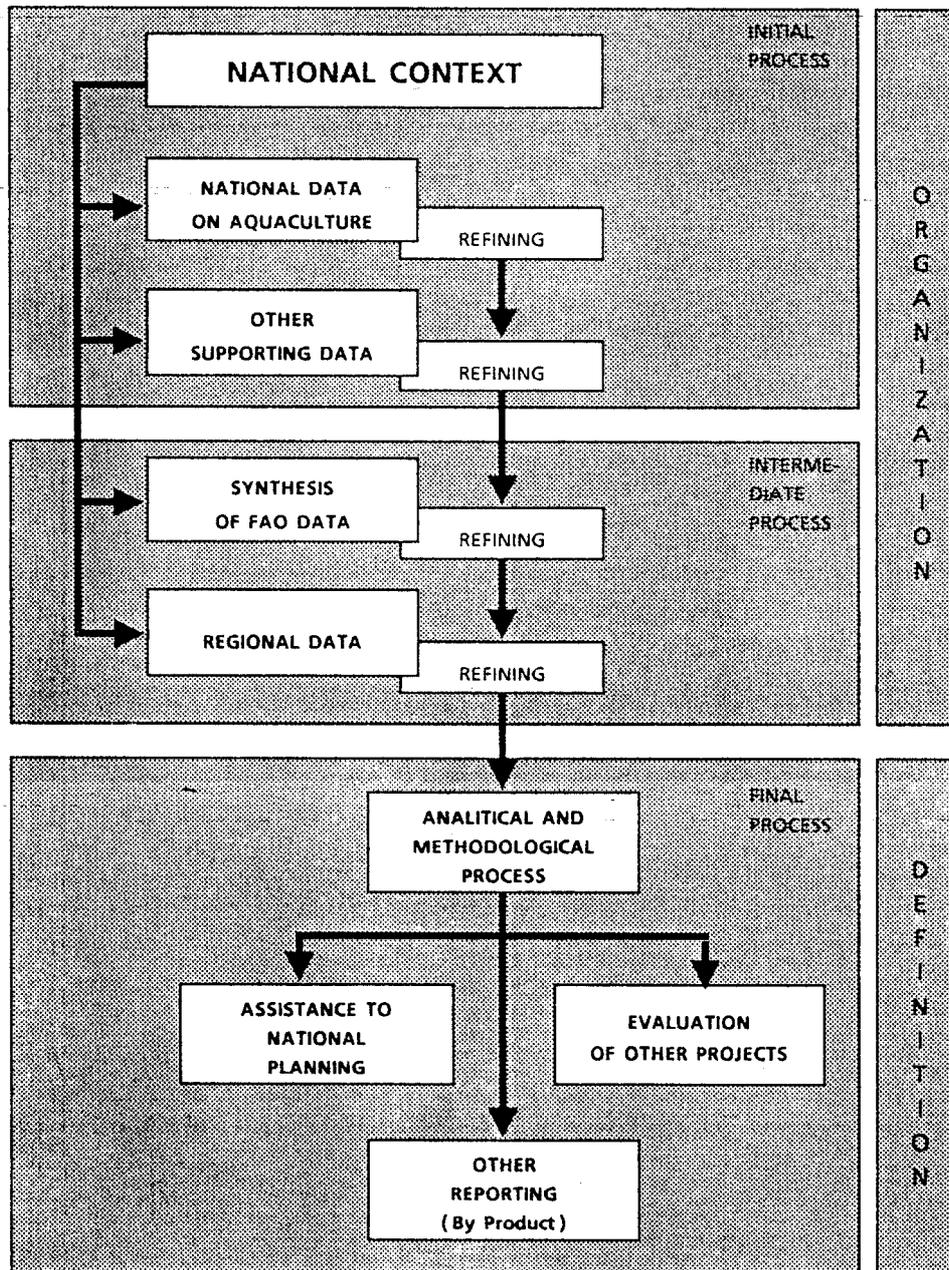


ASSISTANCE TO NATIONAL PLANNING AND OTHER INFORMATION

OTHER COUNTRIES IN THE REGION

## INFORMATION SYSTEM FOR PROMOTING AQUACULTURE IN THE MEDITERRANEAN

Figure 2. SIPAM - Decision-Making Process



### **3. The Conceptual Design**

The **Conceptual Design** phase must identify the objectives and requirements of the SIPAM Information System.

This is a delicate phase because it immediately precedes the very important one of system analysis where the objectives and justifications have to have been already defined. The system analysis phase will, in practice, define the feasibility and at what cost (in terms of resources, risks, etc.) the Project can be implemented.

Once the objectives and goals have been defined, the SIPAM Information System can be seen as being made up of the following components:

1. A predefined architecture
2. A set (assembly) of human resources
3. A set of automatic and manual instruments for the collection, aggregation, retrieval and processing of data
4. A set of procedures and techniques to meet the objective
5. A predefined data-information model.

#### **3.1. A predefined architecture**

As described in the following section, the System will be constructed using a totally open architecture, i.e., a modular architecture. SIPAM will be composed of "blocks", each defined by its area of application. The blocks will not be bound to interact to specific external specifications (hard/software); instead, it will be possible to tailor each block to different external formats as necessary according to the interfacing systems (hardware/software platforms) all converted to the same format.

This approach has the advantage of enabling the System to be developed stepwise with the possibility of adding to and expanding the elementary modules. It also enables more than one building team to work on different parts of the System independently and simultaneously. In fact, in the development of the overall System, different tasks will be assigned to different units.

The SIPAM Structural Hierarchy will be as follows:

SIPAM Information System : A Relational Data Base Management System (RDBMS) to manage a collection of four Base Sub-Systems as well as two Accessory Modules, one for Data processing operations and one reserved for System maintenance and utilities. The data processing will contain the most widely used basic software on the market for word processing, spreadsheets, DBMS, graphics,

statistics, etc., as well as software for piloting functions and standard routines (automatized analysis of particular events, automatic production of bulletins, press releases, profiles, etc.). The system management and utilities accessory module will contain all the procedures necessary to manage the data system both locally and remotely.

The Five Sub-Systems are the following :

REGIONAL SUB-SYSTEM  
NATIONAL SUB-SYSTEM  
FAO-HQ SUB-SYSTEM  
EXTENDED SUB-SYSTEM  
ANALYTICAL/MODELLING SUB-SYSTEM  
SYSTEM MANAGEMENT MODULE

Each Sub-System is a collection of many modules each representing one stand-alone application of various types:

Numerical Application  
Bibliographic Application  
Descriptive Retrieval  
Graphical Application  
Data Communication  
Data Base Management Application  
Analytical and Modelling Software  
Access to Commercial Analytical/Graphical Tools  
Access to Specialized Analytical/Graphical Tools  
etc ..

Each module will contain at least the following three standardized functions:

Interphase to Source of Data (Manual or Automatic)  
Perform Pre-defined Retrieval/Processing Functions  
Output To Pre-defined Formats (Screen/Paper/Export)

The Data Flow will be the following :

From/To	MEDRAP National Coordinators with SIPAM HQ
From/To	FAO-HQ with SIPAM HQ
From/To	MEDRAP National Coordinators with End-Users
From	Remote DataBases To SIPAM HQ
From	External Networks To SIPAM HQ
From/To	Remote SIPAM Work-Stations with SIPAM HQ
From	KeyBoard To SIPAM

Import/Export Data will also follow a pre-established time pattern. Data should be captured, compiled, normalized and distributed for three different time schedules:

Yearly/Monthly	For static and little dynamic data
Weekly/Daily	For dynamic data
Occasionally	For permanent data (Reference Files), Occasional data, etc.

and constitute three different up-loading/down-loading procedures. Data up-loading and down-loading must be made according to type, frequency and use of the information, regardless of whether it is aquaculture data, fishery data or complementary data.

### **3.2. Human Resources**

Three major components will be involved in the design and implementation of any Information System.

DESIGN UNIT      DEVELOPING UNIT      END USERS

In the **SIPAM** concept, the above will be organized as follows:

#### **(a) The Design Unit**

Each of the applications to be developed (elements) will be considered as stand-alone applications with certain INPUT/OUTPUT or LINKAGE constraints to be fitted into each of the modules.

The design unit is composed of the following:

1. The SIPAM System Manager
2. National MEDRAP Coordinators from member countries
3. National MEDRAP Coordinators from associated countries
4. Selected representatives from the Public Sector
5. Selected representatives of Producers
6. Selected representatives of Suppliers
7. Any other qualified end-users.

#### **The Tasks of the Design Unit**

This group of experts, coordinated by the SIPAM System Manager, will decide which applications should be developed and the priorities, as and when required.

This task must be considered of vital importance for the life of SIPAM.

Decision about the form in which the data are to be produced and submitted, their frequency of production, and how they are to be processed and analysed need to be discussed and agreed at interest group level. One of the vehicles that should be used and supported to organize the application proposals is the participation at selected workshops which the Regional Project organizes on various subjects. The basic aim of such an exercise is to ensure that workshop participants (interest group) are requested to contribute, that the appropriate list of variables needed is identified, regularly collect through an agreed methodology, and delivered to SIPAM at regular intervals, and finally that this procedure is maintained.

It should be stressed, however, that the underlying concept of a regional data bank is that all data and information produced should be of proven usefulness both to national and regional users involved in research/ management/planning.

Once an application is identified, the design unit will prepare in detail the application specifications which should contain inter alia:

**Objective:** Stating why that item was considered to be of particular interest.

**Variables to be considered:** Type of data, units, collection methods, etc.

**Possible Source of Data:** Identify reliable and secondary source of data

**Users of Particular Interest:** List all expected interested end-users, and try to obtain their involvement in the data and function definition exercise.

**Data Entry Format:** Design by hand (or computer assisted) the data entry forms, including instructions, notations, keywords, reference codes, etc.

**Data Manipulation:** List all the manipulations and computer treatments to achieve the expected results.

**Data Retrieval Functions:** List all possible and interesting retrieval functions that the software must allow.

**Data Output Format:** Design by hand (or computer assisted) the layout that the output format must have to presents the results

**Suggestions:** List any suggestions that may help the database development

**Constraints:**

The developers should inform the end-users of any constraints that may exist and help on how to solve or bypass the problem whenever possible.

The SIPAM System Designer should assist this unit at the beginning in order to establish a consistent working method. It is not important that a data processing expert assist the unit at the outset of the work.

To be successful, the design unit should foresee the optimum that can be obtained from a certain type of data/information, and design the INPUT/OUTPUT requirements as if they were to be carried out manually. It is also recommended to always bear in mind the scope, type and nature of the data to be entered into the system.

**(b) The Developing Unit**

Once the application has been conceived, the Analyst and/or Programmer will translate the requests into a software tool. At this moment modifications or suggestions may be incorporated into the original design.

For the successful implementation of this work it is imperative that the Project provides the services of a full-time Data Manager. This person, who must have informatics and possibly aquaculture qualifications, will ensure the correct and timely execution of all the phases of the programme for the development and implementation of this System. The terms of reference of this officer are given in Appendix 3.

In addition to the Data Manager, the Project has to foresee the following personnel inputs:

- Top-level analyst/computer programmer consultant for the development of the Regional Module (based in Rome, FAO HQ or MEDRAP HQ).
- Contract for a computer programmer to assist in assembling the FAO module into SIPAM (based in Rome FAO HQ).
- Programmer to ensure the system development and maintenance, undertake data downloading/uploading, train regional and national experts in the use of SIPAM, participate in the development, improvement and maintenance of the

national based systems (based in MEDRAP HQ).

- consultants to prepare reports and technical material.

Each country participating in this activity should involve national aquaculture planning and computer programming experts in this exercise as required.

**(c) The End-Users**

The end-users can be classified by group according to the position they occupy and the field of their interest. The major end-user group is the staff of the fisheries and aquaculture services in the various national offices in the Region who will be using SIPAM mainly for reporting and planning purposes, but also to answer queries from their private sector. This group is also the most important for data supply. Among a second group of end-users are aquaculturists, economists, fishery specialists, investors and traders in the industry, trade, and educational institutions, in both the public and private sectors. The SIPAM National Coordinator should organize his/her own national end-user group.

**3.3 Automatic and Manual Instruments**

This System will be designed as an integrated information system, i.e., a homogeneous system in which the end-user is not aware that it is built of different basic elements. It is important to note that in designing this System the end-user and his needs, and not the wish to produce one more instrument of data dissemination without a pre-established target, are the main consideration.

For reasons of compatibility with FAO standards, and for other technical and operative reasons, the networking hardware is configured around a platform based on the INTEL 80386 micro-processor family. The elements that need to be integrated to constitute the network through non-rigid connections are of a different nature and effort.

- At the system architecture level national, international and FAO environments used have to be made colloquiable.
- At the structure level different connecting protocols (interphases) to manage products coming from different environments need to be developed both for the input/output procedure and for the format and structure of the data.
- At the function/service level data format interchange with applicative software (standard commercial software) and connection to different

peripherals such as printers, scanners, modems, as well as electronic mail, must be foreseen.

At this level the different national working languages to be used in the system must also be taken into account. Therefore, the system will be provided with a multi-language data dictionary to allow quick and standardized user interfacing.

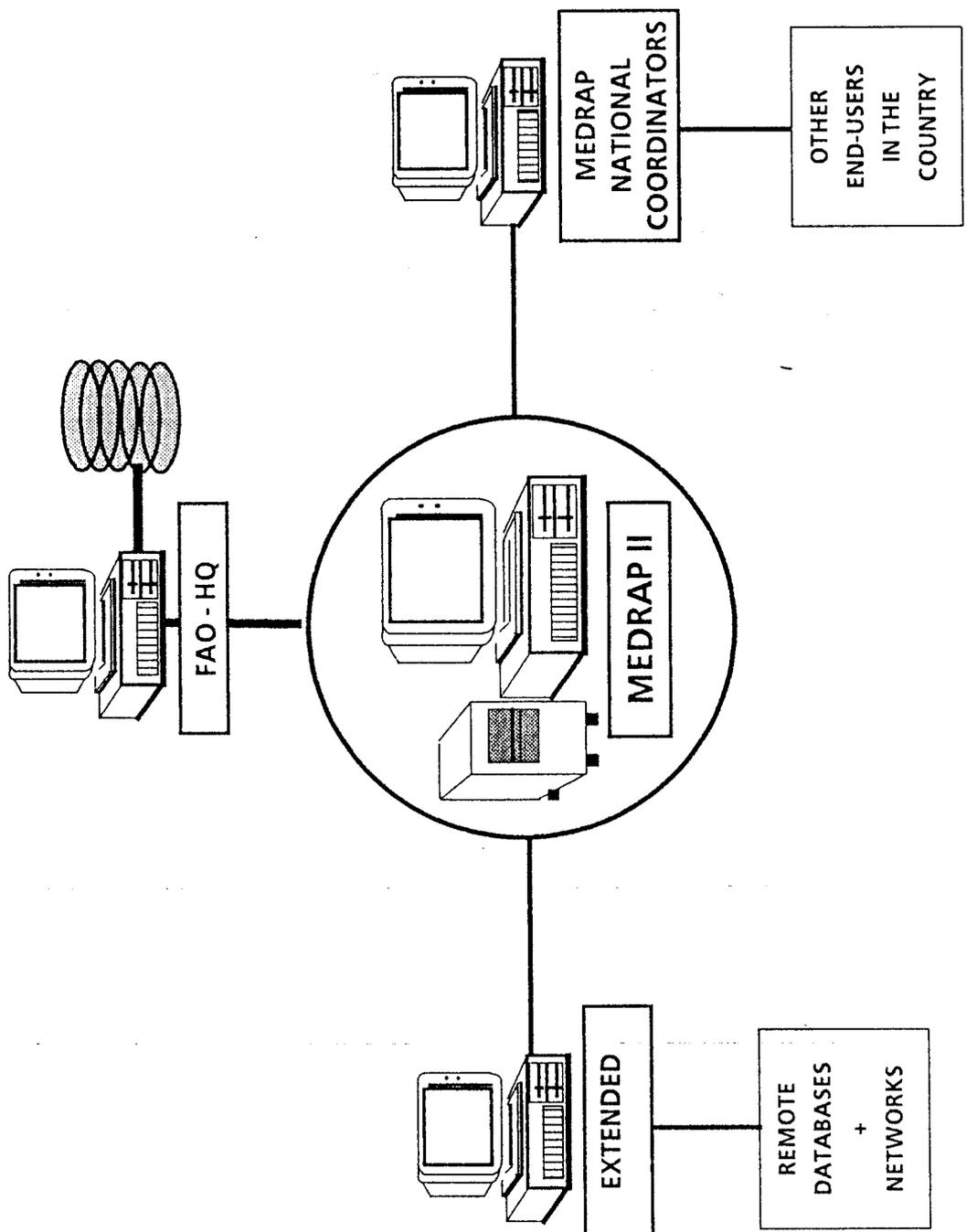
The System will be developed, both at the Centre and at the periphery, on identical hardware in order to optimize the products and ensure the network performance. The configurations described in Appendix 1 do not necessarily need to be completed at the beginning of the project since they have been designed to be expanded as necessary although they all have to be completed and fully operative by the third phase of the working plan (see Work Plan and Schedule of Work).

The System architecture will be designed on a "STAR" pattern with non-rigid connection in which the centre of the STAR represents the manager/server and the points represent the users. The System will have two operational levels, one at the Centre and one at the periphery. For an easier understanding of the above pattern a chart follows (Fig.3). In this particular case the System is developed around a network in which the centre of the STAR is represented by the MEDRAP Project headquarters where the System Manager/Server pilots all the applications at regional level. At the edges of this STAR are the countries and other end-users in the region. The network is complete with two more connections, one representing the link to the FAO Fisheries Department SIPAM back-stopping team as Data/Information Supplier/Receiver, and a second one to an ideal node to connect remote databases and networks.

The typical hardware configurations of the work-stations forming the Project network are given in Appendix 1. It should be finalized later and in any case be constantly revised according to industry standards.

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Figure 3. SIPAM - Regional Desk Information Network



### 3.4 A Set of Procedures

The development of the software is strongly influenced by the structural design of this network (**STAR**) which has been conceived to allow the integrated system to be developed in a modular way independently from the two levels of implementation. To make full use of the above structure a slightly unconventional approach has been chosen in the development of the System. The first level network which covers the Project headquarters, FAO-HQ and the remote centres applies a so-called "**TOP-DOWN**" strategy. This strategy is typical of a vertical initiative in which, without taking too much account of the final characteristics of the user, the application is developed and imposed. For the application of this strategy the initial components (FAO databases with their 'known' specifications and environments) of the System are known beforehand. The FAO information module will be developed and implemented using this strategy and will be distributed by the Project headquarters to the end-user centres.

The national centres will manage the flow of the data between the various national sources of data and themselves and will be responsible for the interfacing procedures (installation, training, setting-up, etc.) to the Regional Module. This module, to be developed in the SIPAM Headquarters (Regional Information Module), will have the dual task of interacting with the Project headquarters and with the country. Since this module is strongly dependent on the various national contexts, a "**BOTTOM-UP**" strategy is applied. For this, a methodology which permits the identification of many simple problems and their solution independently is applied. This module will therefore be developed by consolidating and expanding the System, both in dimension and application, as new blocks are added from the bottom upwards. This is a strategy where the analyst does not need to know initially all the situations he will be faced with (different national contexts).

Regional standardisation: in order to facilitate exchange of data within and between countries, the Regional Sub-System, in addition to the automatic data transfer from national databanks to SIPAM, will provide the data entry and management procedures for each of the application data bases. These data bases will be structured according to a standardised regional format. For each data base, the characteristics, definition, units, directories, etc., will be documented.

One of the most interesting features of this programme of work at the cooperation level is the direct involvement of national personnel and the end-users in the development and system enhancement of the Interfacing Modules. This approach (using national staff) is considered a basic condition for the success of the programme of work during and after Project implementation.

The software to be developed is limited to that for the management of the

FAO and Regional Information Modules and the input/output protocols for uploading/downloading FAO and regional databases, maintenance systems and the interphases with the various and different national systems. Towards the end of the project procedures for tele-maintenance and tele-updating via modem through a "carbon copy" approach, both from Rome FAO-HQ and from the Project headquarters in Tunis, should be in place. This approach will allow the System Manager to temporarily control the remote work station through a modem and special software.

The processing function of the System, as well as the word processing, statistical analysis, graphics, project management, etc., will be carried out in one area of the system (Data Processing Module) which will make use of commercial software possibly standard within the FAO family. This module may also contain programs and procedures developed by the Project to allow standardized and repetitive data processing, report generation, etc. The commercial software may be integrated with built-in macro-instructions to perform certain operations.

All software acquired to be incorporated into SIPAM (whether purchased, internally developed or given to SIPAM) will be developed according to specifications that will be established in the System Design, and it will be FAO/MEDRAP SIPAM property.

For the initial SIPAM software development in DOS, the xBase format is the standard for the Relational Data Base Management System, not only because it is an internationally accepted de facto standard, but also because many FAO applications, as well as national applications, have already been developed using dBase. For the supporting software the use of the following, classified as FAO (DOS) standard, is foreseen:

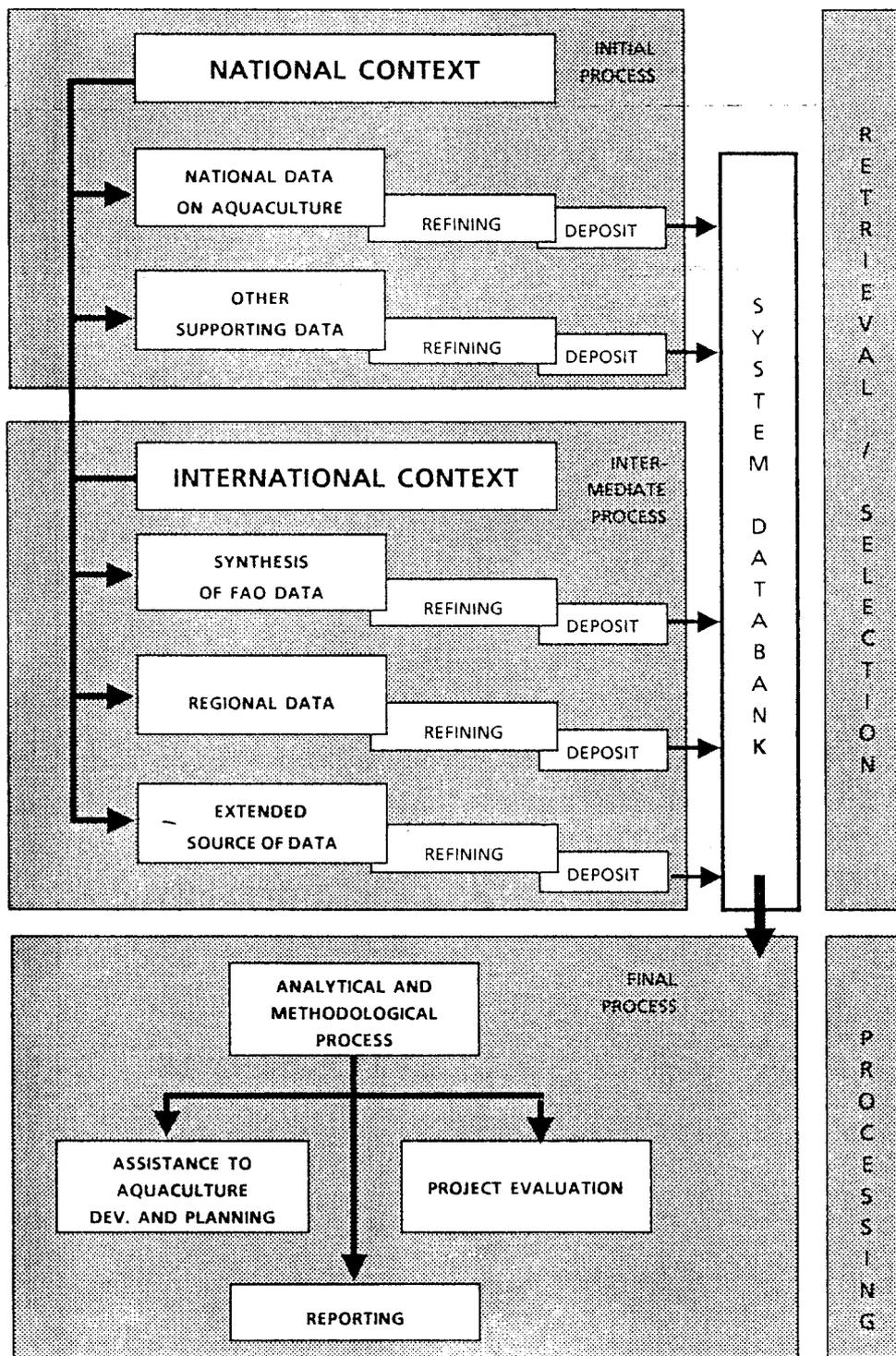
Word processing (Multi-language)	Word Perfect 5.1
Spreadsheet	LOTUS 123
Graphics	Harvard graphics
Statistical package	STATGRAPHICS
Project management tool	MS/project
High-level language (only external routines)	BASICA/PASCAL/C ...
Aquaculture Planning Tools	To be decided

The above packages are acceptable at the time of writing and, in any case, are only indicative and may be changed and/or added to at any moment.

The functional process of the System (Fig. 4) will follow the same pattern as the decision-making process shown in Figure 2.

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Figure 4. SIPAM - Operational Processing Chart





### **3.5 Pre-established Data Information Model**

The data information flow will be developed within a strategy defined by a working group composed of national, regional and project experts, which will indicate the information needed. The major concern here is the possible inadequacy of some national infrastructures to support the proposed strategy and the obligation to provide additional resources for this work. The data/information flow will grow in a selective manner without duplicating existing work already carried out by other organizations/institutions. The members of the working group will be in contact with each other to identify and disseminate information of interest from various national, regional and international sources. At this point the Project must make a big effort, both in the research of data/information and in reaching agreement with the various institutions, to obtain authorization to receive and utilize the data/information needed.

In fact, as far as the relationship with FAO is concerned, this subject is regulated by Director-General Bulletin No.90/22, and is the object of discussion by a working group set up by the Director-General to give guidelines on this matter. The Project MEDRAP will be responsible for obtaining the data/information alimenting the FAO Information Module (FAO sources).

Regarding the national data/information to be integrated in the Sub-Regional and Regional Systems (Regional Information Modules), the National Coordinators will be responsible for obtaining such authorization. However, the Project should prepare a standard draft letter of agreement between the Project and the national institution concerned or other supplier of data to be used as a basis.

**It is essential for the present and future life of this System that all data entering the SIPAM network be appropriately authorized.**

The data/information model used in this System will be of a complex type (Fig.5), i.e., data and information are linked at three levels. At the basic level the data collected through a system is processed and published according to given methodology, standards and frequency (output).

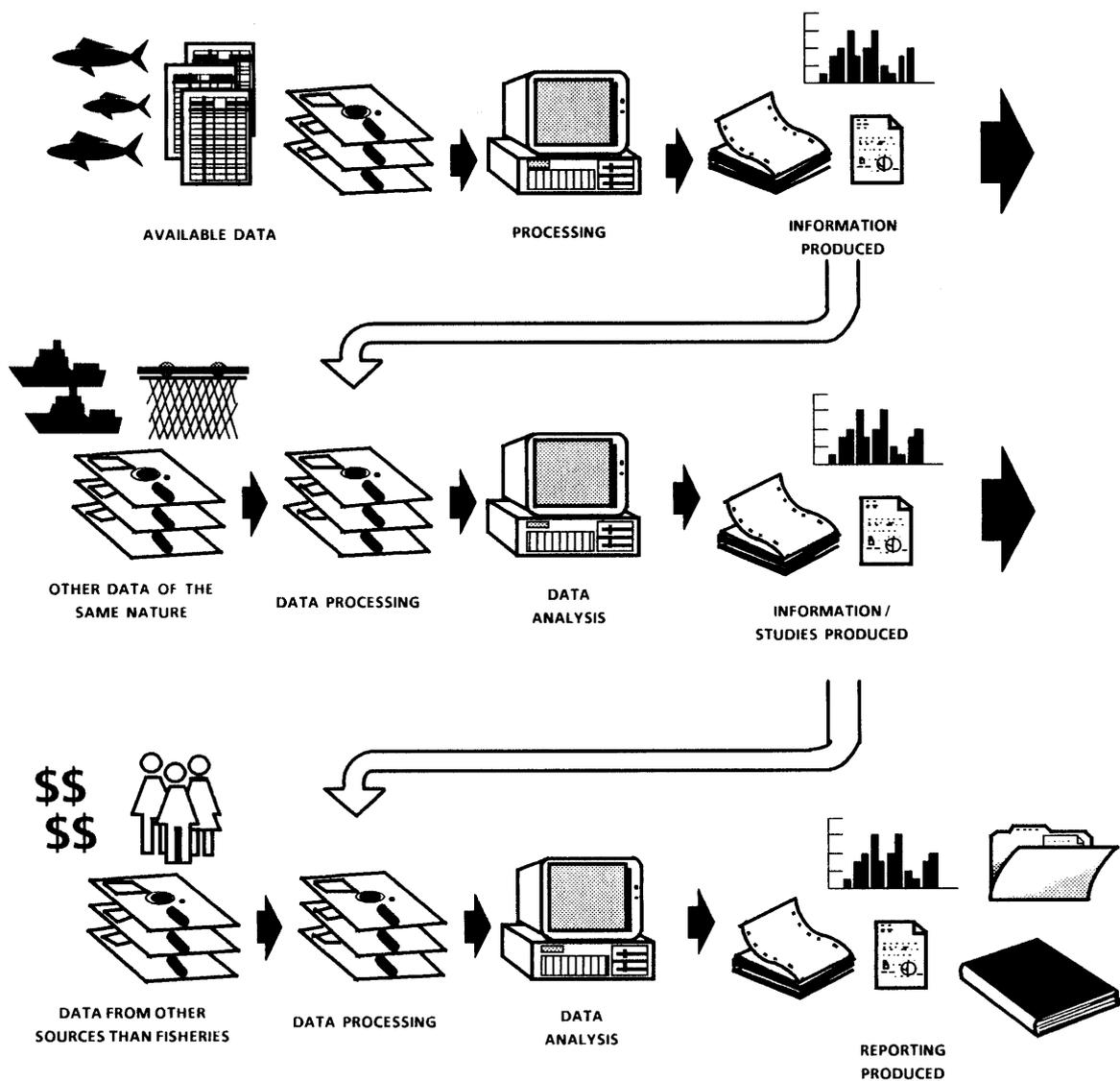
At the second level, some of the information produced at the basic level becomes data (input) to be processed and analyzed together with data and information coming from other sources within the same field.

At the third level (complex model), some of the information produced at the basic and second levels becomes data (input) to be processed and analyzed together with data and information coming from sources of a different nature.

Figure 5 shows a complex data information model which assembles all three levels.

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Figure 5. SIPAM - The Complex Data Information Model



#### **4. Work Plan and Schedule of Work**

The MEDRAP Project (through its Headquarters in Tunis), FAO-HQ backstopping and a few selected countries within the Project area, will launch a programme of work with the aim of establishing an Integrated Information System to assist national and regional operators in the field of aquaculture. This target will be accomplished by the development of a SYSTEM PROTOTYPE to be finalized within the present MEDRAP II Project life through:

- developing the methodology and providing a tool to collect and process in a systematic way information useful for aquaculture development in the region. In addition to their own compiled data, the countries will have direct access (from the same work station) to regional data and FAO data
- designing and implementing a Regional Module to put regional information at the disposal of the countries in a readable and comparable format. The Regional Information System will be alimented with non-confidential national data of regional interest which each country has put at the disposal of the Project
- designing and implementing an FAO Information Module which will incorporate all the available authorized FAO data-bases of interest to this programme of work
- designing and implementing a network linking remote sources of data and networks with the EXTENDED SIPAM Module through automatic data transmission
- assisting the selected countries in the use and maintenance of the system
- extending the network whenever possible to other countries and other selected end-users, and individuating the best network approach taking into account all various possibilities and constraints
- At the end of the primary phase (development of the DOS Prototype) an analysis and evaluation of the whole programme of work will be undertaken, and proposals for the future technical development of SIPAM will be formulated (hardware/software platform, coverage, procedures, etc.). This will initiate a second phase where SIPAM will be redesigned (maintaining the data) making use of the advanced graphical user interface (GUI) environment and network facilities to enable it to switch from a data-base system to an information system.

**Time Schedule:**

**Preparatory work :**

Discussion review and approval of the above design

Ordering of the remaining computer equipment

Identification of the few countries to be included in the pilot Regional Information System

Identification of possible source of funding

Complete delivery and installation of the remaining work-stations

Identification of a retrieval approach (Terminology, Function, Keyboard use, Logic data selection flow, etc.) most commonly used in a Desk Information System in the selected countries

Inventory of all pertinent national, regional and international data/information available for possible inclusion in SIPAM

Analysis of the immediate needs and the available national data in the selected countries

**Phase I - System Design and Development:**

Design and implementation of the pilot FAO Information Module

Design of the Regional Information Module

National coordinators of the selected countries reorganize output from national data/information systems into the SIPAM National Information Module structure (with advice from the MEDRAP Project)

Development of interfacing protocols to integrate national systems into the Regional Information Module

Revision and implementation of the Regional Information Module

Preliminary testing, evaluation and validation of the two Modules

Setting-up the pilot EXTENDED Module through arrangements and contracts with governmental and non-governmental institutions for direct access to their on-line DataBases and Networks. The information captured from these systems will be treated according to the agreed contract and processed with the same logic as in the other two Modules

Integration of the three Modules into the system

**Phase II - Evaluation/Revision/Improvement :**

Delivery to and installation of the full configuration in the selected Centres and countries (training, etc., included)

Evaluation of the delivered system

Revision and improvement of the system

Delivery of associated documentation.

An additional phase may be envisaged before delivering the System:

**Phase III - Consolidation/Expansion :**

Expansion of the coverage of the system

Installation of the system into some other centre and/or countries

Completion of the System by finalising the EXTENDED Module.

The Work-Plan will be completed with the analysis and evaluation of the whole programme of work, delivery of final documentation and finally by setting-up a SIPAM on-line accessible network (anticipated 6 months).

## 5. Expected budget

For the first year of implementation of SIPAM (Phase I) adequate resources should be allocated :

Full-time SIPAM Data Manager to coordinate all EDP and non-EDP activities  
- duty station SIPAM HQ

Full-time Computer Programmer System Development Assistant  
- duty station SIPAM HQ

Consultant/contract Computer Programmer (FAO module)  
- duty station Rome HQ

Preparation of Reference Manuals

Hardware already purchased by MEDRAP

Hardware to be completed

Purchase of special software

FAO Backstopping missions (System Design and Management)

End-Users WG Meetings (2 x 5 persons)<sup>2</sup>

The above estimates refer to a system using one working language only (English or French). Should the system be "translated" into other languages (i.e., English/French, Arabic), this component should be evaluated separately by the Project.

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<sup>2</sup>These two meetings may be carried out concurrently with other programmed activity meetings, if possible.

## APPENDIX 1

### Hardware Configuration for the DOS Work-stations forming the Project Network

#### A. Server/Manager Work-station, 1st level (Project HQ)

IBM PC or 100% compatible with the following characteristics:

- Desk top type
- CPU 80486 at 33 MHz 4MB RAM expandable
- Colour monitor 14" VGA card
- 1 M.disk drive unit 1.44 Mbytes 3.5"
- 1 F.disk drive unit 1.2 Mbytes 5.25"
- 1 H.disk drive 100 Mbytes or more - Acc.time < 30 m.sec
- International advanced keyboard 102 keys
- 2 Parallel ports
- 1 Serial port RS232C
- Bus mouse Microsoft or Microsoft compatible
- 1 back-up tape unit
- 1 Modem Hayes compatible 960/1200/2400 band rates
- 1 Advanced Arabic keyboard
- 1 Advanced French keyboard
- 1 Matrix dot printer wide carriage (136 chrs) with NLQ capability/24 pins/260 chrs/sec IBM/EPSON compatible parallel interface
- 1 Laser printer HP Laserjet III compatible parallel interface
- 1 Scanner HP SCANJET compatible

#### B. System Development, 2nd level work-stations DOS (Project HQ)

It is strongly advisable to parallel the above microcomputer with another one similar in characteristics and lower in performance (because of cost) to be used for system development, as a server back-up unit, and for other duties to be assigned.

IBM PC or 100% compatible with the following characteristics:

- Desk top type
- CPU 80386SX at 16 MHz 2 Mbytes RAM expandable
- Colour monitor 14" VGA card
- 1 M.disk drive unit 1.44 Mbytes 3.5"
- 1 H.disk drive 100 Mbytes or more - Acc.time < 30m.sec
- 1 International advanced keyboard
- 1 Parallel port
- 1 Serial port RS 232C

- 1 Bus mouse Microsoft or Microsoft compatible
- 1 Modem Hayes compatible 960/1200/2400 band rates
- 1 Matrix dot printer wide carriage (136 chrs) with NLQ capability \*24 pins \*260 chrs/sec\*IBM/EPSON compatible\* parallel interface

C. Backstopping, Training, Seminars, Demonstrations etc., 2nd level work-stations (Project HQ)

IBM PC or 100% compatible with the following characteristics:

- Portable type
- CPU 80286 at 12MHz 640 Kbytes RAM Expandable
- 1 Back lit L.C: monitor VGA compatible
- 1 M.disk drive unit 1.44 Mbytes 3.5"
- 1 H.disk drive 20 Mbytes Acc.time < 30 m.sec
- 1 Parallel port
- 1 Serial port
- Travel accessories (bag/batteries, etc.)
- 1 Diconix or Canon portable printer with travel accessories

D. 2nd level work-stations (national centres)

IBM PC or 100% compatible with the following characteristics:

- Desk top type
- CPU 80386SX at 16 MHz 2 Mbytes RAM expandable
- Colour monitor 14" VGA card
- 1 M.disk drive unit 1.44 Mbytes 3.5"
- 1 H.disk drive 100 Mbytes or more - Acc.time < 30m.sec
- 1 International advanced keyboard
- 1 Parallel port
- 1 Serial port RS 232C
- 1 Bus mouse Microsoft or Microsoft compatible
- 1 Modem Hayes compatible 960/1200/2400 band rates
- 1 Matrix dot printer wide carriage (136 chrs) with NLQ capability \*24 pins \*260 chrs/sec\*IBM/EPSON compatible\* parallel interface

E. FAO HQ Rome (for system design, data communication and feedback)

One Project 2nd level work-station temporarily located in the backstopping Division (FIR). This system will be delivered to one of the end-users on completion of the work.

NOTE. All work-stations will be provided with identical software covering:

- DOS Operative System (Rel 5.xx)
- Word Processing
- Spreadsheet
- Data Base Management System
- High level language
- Data communication software
- Tools
- Specific applications software

## APPENDIX 2

### GLOSSARY

- Application program - Computer program that performs an end-user function, rather than a system-oriented function.
- ASCII files - Files in which the individual characters are represented according to a numerical code (and its internal representation as a binary number) that conforms to the American Standard Code for Information Interchange. Such files are widely used to transfer data between different hardware and software environments. ASCII was created for this purpose.
- Backup - The process of making secondary copies of a file or files in the event that the original becomes damaged.
- Configuration - The assortment of equipment (disk, diskette, terminal, printers, etc.) in a particular system.
- Computer network - An interconnection of computer systems, terminals, and communication facilities
- Data - Known facts, numbers, letters and symbols for storage and manipulation by a computer system expressed in character form. Data can be thought of as the basic elements of information used, created or otherwise processed by an application program.
- Data communication - The movement of coded data from a sender to a receiver by means of electronically-transmitted signal.
- Data field - A group of memory or screen locations within a database that are logically linked to hold information of a given kind. Typically, the user may regard data fields as a place to store a certain kind of data.
- Database - System of arranging data in structured way in a computer system, for user access or for processing by application programs.
- Data set - A series of data elements or units of information that are logically arranged in a particular format.

Data sheet -	A printed page on which data are arranged according to a specific format.
DOS -	An acronym for Disk Operating System, the program used in the micro-computer environment to control the use of hardware and integrate the use of this hardware so that it is available for software applications.
Down-loading -	Data/Information transfer from a central level system (Organization HQ) to peripheral systems (Departments and Divisions)
Driver -	A software program that controls the action of a peripheral device not otherwise controlled by the operating system.
Export -	The transport of data out of an application. Typically, this will involve translation from the internal format of the application to a variety of alternate formats that may be used by other programs as input. (see also Import)
File -	A collection of logically related records or data treated as a single item.
Format -	The way in which data are physically arranged in a file.
Hardware -	A term used to indicate the physical part of a computer, such as the keyboard, memory, printer, monitor, as opposed to the software.
Export -	The transport of data into an application. Typically, this will involve translation from the format of the external application into the standard used by the ongoing application.
Information -	Data that are communicated
Interface (Hardware) -	An electronic assembly to enable two computer systems to communicate with each other (wired).
Interface (Software) -	Series of programs that allow the system to exchange data from one format to another.
Main Menu -	A horizontal bar that presents the user with a series of choices, one of which will be selected to perform that activity.

Menu System -	A kind of program design that uses a sequence of choices that permit the user to choose among them by pressing a key (usually the Enter Key). These choices are arranged on the screen much as a restaurant menu presents a series of selections.
Operating System -	The software program that controls the various parts of a computer (keyboard, screen, hard drive, printer, etc.) and puts them to work together to perform useful work. SIPAM will work on computers which use the PC-DOS or MS-DOS operating system.
Non-rigid Connection -	A type of manual file transfer between computer systems through removable supports (diskette, tape) occasionally carried out.
Package -	A set of computer programs tied together through a menu system.
Platform -	A computer, its peripheral devices and activities working together.
Procedure -	A specific program or task to which a computer solution can be applied
Record -	A collection of related data items.
Reference Files -	Authority files containing reference variables such as country codes, names and attributes; item codes, names, attributes etc.
Relational Database -	A file or system of files used to contain data that is structured to permit the data to be readily input and output. When constructed of multiple files, relations between individual data fields in the different files can be linked to permit data in one field of one file to act as means of retrieving information in one or more data fields in the other file or files.
Rigid connection -	Type of connection in which a group of computer systems are connected to each other by communication lines to allow automatic and controlled file transfer at regular intervals.
Software -	Computer algorithms (programs) that are written in a computer language that make the computer (hardware)

perform work (write to the screen, print, sort, etc.).

Up-loading -

Data/Information transfer from peripheral systems to a central system

### APPENDIX 3

#### TERMS OF REFERENCE FOR DATA MANAGER

Under the general supervision of the Project Director and the System Designer and the overall guidance of the SIPAM User Working Group (UWG) be responsible for all the data administration functions to build up the proposed Information System SIPAM.

In particular be responsible for:

- Nominating, coordinating and leading the SIPAM UWG
- In close collaboration with the Analyst Programmer consultant prepare the system design of SIPAM environment.
- In close collaboration with the Analyst Programmer consultant, and following the advice of the UWG, prepare the design of the various elements composing the regional module
- Organize, plan, coordinate and support all the activities related to the development of SIPAM
- Monitor the development and implementation of SIPAM
- Be responsible for requesting and receiving the necessary approval for using data/information
- Organize and distribute the appropriate documentation
- Perform other related duties as required

#### QUALIFICATIONS

University degree in statistics, computer science, economics, or mathematics

Proved professional experience in data administration

Working knowledge (level C) of English, French, Spanish or Arabic and limited knowledge of one of the other three

Knowledge of data processing and data analysis methodologies

Knowledge of micro-computer operations and RDBMS (Relational Data Base Management Systems)

## APPENDIX 4

### TERMS OF REFERENCE FOR ANALYST PROGRAMMER

Under the general supervision of the Project Director and the direct supervision of the Data Manager provide technical assistance for the development, maintenance, and distribution of the Information System SIPAM.

In particular be responsible for:

- Assisting in the design, development, tuning and maintenance of the various modules of the System
- Performing and testing developed procedures
- Assisting the end-user to assess the new System
- In close collaboration with the Data Manager, developing and maintaining the data dictionary, technical documentation and related technical and procedural manuals.
- Performing other related duties as required

### QUALIFICATIONS

Degree in computer science, electronic engineering or closely related field of specialization.

Proved professional experience in EDP.

Working knowledge (level C) of English, French, Spanish or Arabic and limited knowledge of one of the other three.

Good knowledge of data processing methodologies and techniques.

Ability to use micro-computers and basic software products such as WP, Spreadsheet, dBase and some high-level language.

Ability to write clear and concise technical documents and reports.

