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NICARAGUA
NATURAL RESOURCES
INVENTORY AND DEVELOPMENT
PROGRAM

Prepared For
Oficina de Planificacion de Nicaragua
and
USAID Mission to Nicaragua
April 1966

U.S. ARMY
INTER AMERICAN GEODETIC SURVEY
NATURAL RESOURCES DIVISION
FORT CLAYTON, CANAL ZONE

27 May 1966

Dr. Ralph J. Burton
Director, U. S. AID to Nicaragua
c/o U. S. Embassy
Managua, Nicaragua

Dear Dr. Burton:

Dr. Leon Laitman, Chief, Economic Geography Branch, Natural Resources Division, has prepared the inclosed summary report entitled "Nicaragua Natural Resources Inventory and Development Program," in which an attempt has been made to visualize the Natural Resources-Cadastral Inventory Project in the broad framework of development planning for Nicaragua. We feel that consideration of both the existing circumstances within the country and the plan outlook for the future should help prepare as good a Project as is possible. We hope that our contribution will help move the Project along lines that will assure the success of the country's planning efforts.

We should like you to feel, at the same time, that you can always count on our assistance, particularly in such areas as:

1. Review and advice on the work plan for the Inventory.
2. Periodic review of the Inventory - of field procedures, quantity and quality of data, evaluation of data and its use.
3. The early utilization of Inventory products, as in the case of a regional study to be completed in a given time.
4. Advising the National Planning Office or other responsible Government Agency in the establishment of a center for natural resources collection and storage leading to use in project development.

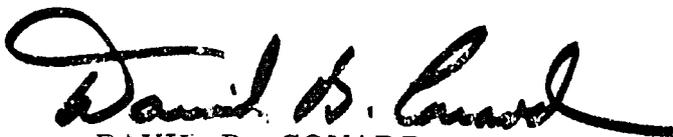
Dr. Ralph J. Burton

27 May 1966

5. Instituting user-agency and social and economic data studies.

We shall, as always, be at your disposal for any matter which you feel pertinent.

Sincerely,

A handwritten signature in black ink, reading "David B. Conard". The signature is written in a cursive style with a large, looping initial "D".

DAVID B. CONARD
Colonel, CE
Director

1 Incl
as

NICARAGUA
NATURAL RESOURCES INVENTORY
AND
DEVELOPMENT PROGRAM

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Nicaragua Natural Resources Inventory and Development Program

A. Introduction

Nicaragua seeks to improve its present National Plan so as to achieve sustained economic development. One of the principal weaknesses in the Plan formulation has been a lack of reliable data, but a major program has been underway that should relieve the critical shortage of information and support the country's total planning effort.

The present status of the program is explained in the USAID/N CAP Book as follows:

1. Preliminary census data on population, agriculture, and housing are currently available.
2. Enumeration for industry, business, mining, and services will be available in 1966.
3. Preliminary reports on manpower and human resources (completed). Full census data to be available in 1966.
4. Natural resources data survey will soon be initiated.
5. Cadastral (property ownership) survey will be initiated soon.
6. Analysis of sources of financing development plan (not completed).

This report is concerned primarily with the Natural Resources-Cadastral Inventory Project designed for the most part to collect, quantitatively and qualitatively, physical environment data. IAGS/NRD has been asked to assist in the elaboration of a ten year country program designed to bolster inadequate existing data so as to help plan the fullest development of the country's resources and realize national goals. (See Appendix C) For the first three years, AID financing will make it possible to provide expert technical assistance and advice, whereby latest techniques and methods can be used most efficiently to collect, record and analyze essential data in approximately 35,000 Km² of Pacific territory. The contractor's staff will also train Nicaraguan personnel and establish a more permanent data

collection capability required for a period of expanded development planning and project implementation.

The physical environment data inventory will be the work of earth scientists who will work closely with other professionals in order to make the data available for engineering projects and general and specific economic analysis. (See Chart II(A)) Concurrent with the physical data studies, there will be established socio-economic surveys designed to provide complementary data that should help assess economic growth, changes in living conditions as well as resources for furthering development. (Appendix B)

The physical resources data can be used to improve the quality of economic data, as for example, in the case of the land capability classifications (Chart II (B)) where projections of agricultural production are facilitated by knowledge of land-use potential. The land capability studies for agricultural uses present a standardized classification of land based on the physical characteristics incorporating all soils and other characteristics as they affect the use for cultivation of suitable crops. It sets a basis for determining land value, land use, economic size farm unit, for farm management, projections on agricultural production, colonization and agrarian reform. It becomes the element that is quantifiable for economic analysis purposes in the setting of development goals, project elaboration and the appraisal process.

Thus physical data, that will provide engineering data and when supplemented economic data and combined with social and economic data, will provide the base for program and project formulation. (Chart II (C) and (D)).

B. The Natural Resources Data Development And Use Cycle

A natural resources inventory project can be visualized as one phase in a total data collection and use process wherein short and long term objectives are identified and provision made toward their eventual achievement. The activities are brought to a focus in a single "cycle" that is described (Chart I) beginning with (1) the determination of the need for data - their type, form, and location based on the nature of the program and the needs of the user agencies. The data needs are determined for the central planning process for the formulation of

NATURAL RESOURCES DATA DEVELOPMENT CYCLE

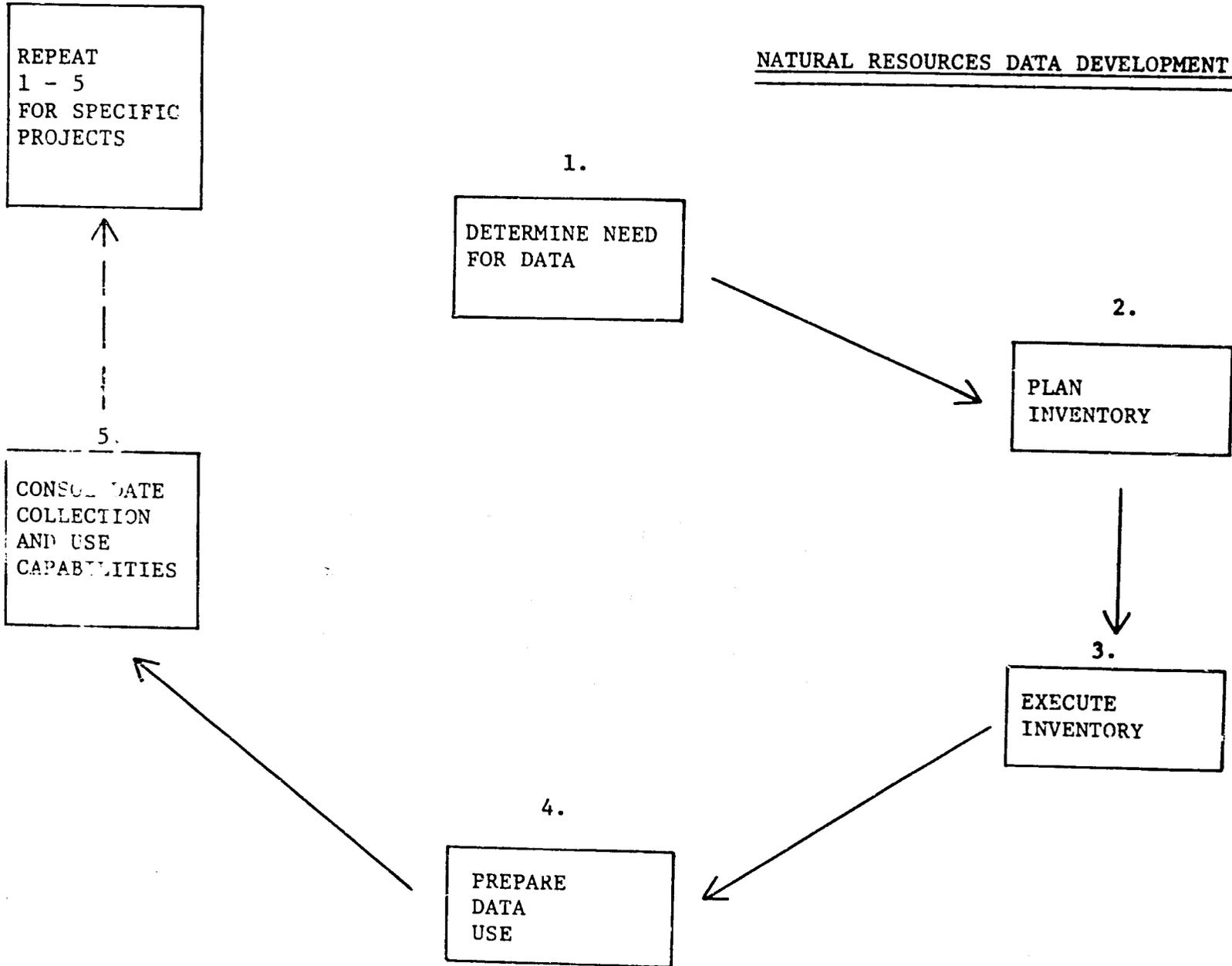


CHART I

development goals, the evaluation of resources, and the initiation and review of programs and sector projects.

Step two, is the preparation of the specifications for the Natural Resources Inventory, a detailed work plan and local personnel selection and training program. In other words, the survey proper is being planned.

Step three is the implementation of the project consisting of the collection of data in the several disciplines, the production of maps, tables, charts with supporting reports describing methodology of collection and significance of data. During this phase, there should be an integrated evaluation of the data, resulting the determination of problem areas and areas of potential improvement.

Step four concerns the preparation for the most efficient use of data, including user agency reorganization, staff selection and training. A study of present data utilization and corrective measures would be undertaken at the earliest opportunity so that the first maps and charts may be ready for use.

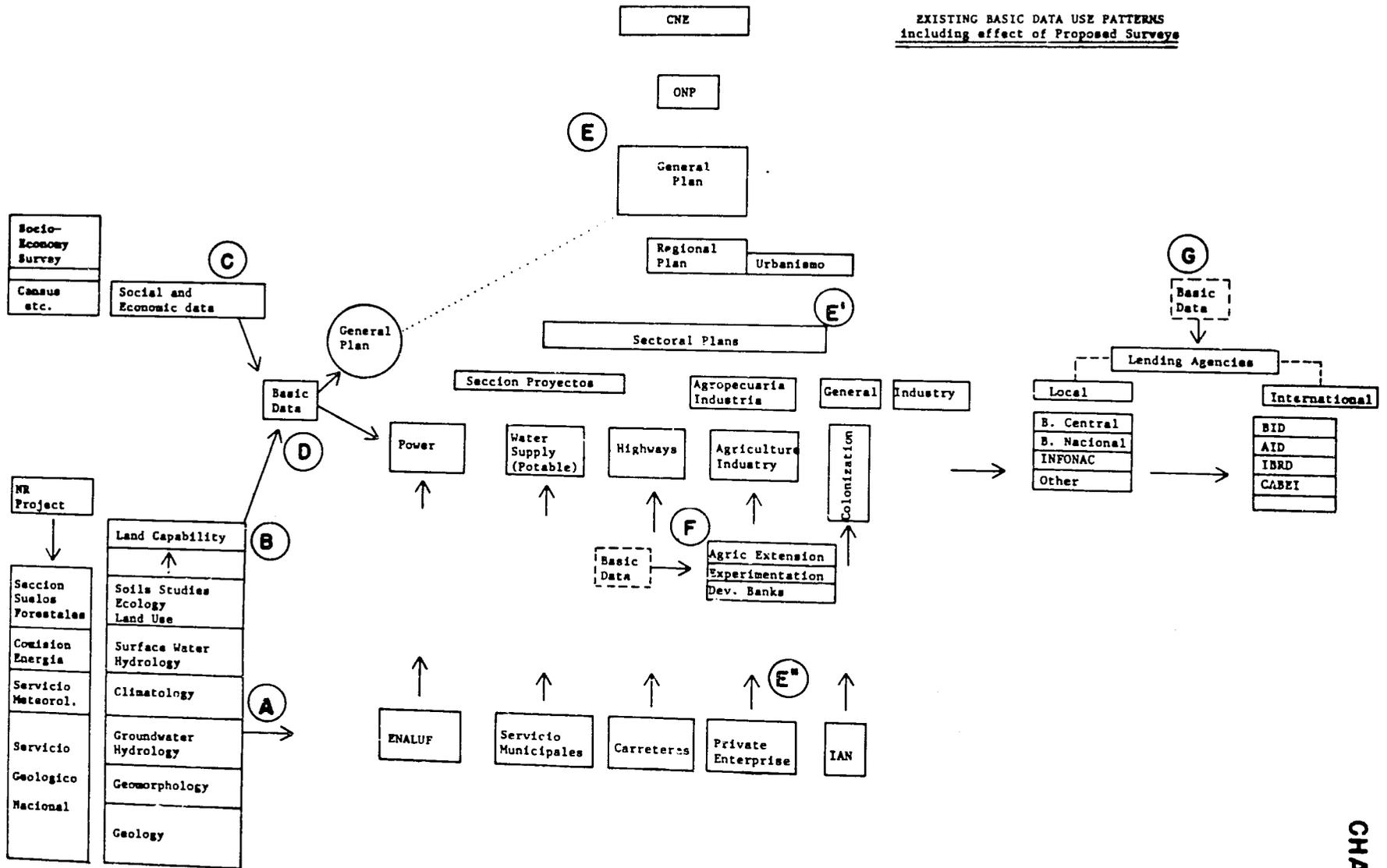
In a final step, as the Inventory products become available for use, preparations are underway to meet short and long term objectives. The preliminary data as it is completed is prepared for use and organizationally, the beginnings of a Natural Resources or broader basic data unit, possibly in the Planning Office, is created. The establishment of a resources planning and implementation capability should provide for the continuation of the three year effort financed, in part by an AID Loan, beyond presently fixed geographical limits as well as for more detailed investigations in the Pacific Cadastral Area.

1. Determination of the Need for Data

In order to provide central planning with the data that would be directly useful to the responsible agencies, a careful determination of their data needs was undertaken. The survey first sought to identify user sources.

Chart II provides an overview of the basic data use pattern where the central planning organization can be seen to consist of the National Planning Office operating under the National Economic Council along with the operating agencies of the government responsible for specific

6.



activities. The Highway, Power and Electricity, Water Supply plans and programs for specific areas are prepared by Carreteras, ENALUF, Energia, and Municipal Services. They are in close touch with the operating realities, problems and needs and contribute significantly to the planning process.

The governmental ministries, departments and other agencies are also sorted out in groups according to functions they have in common such as, project initiation, (E¹¹), technical assistance, (F), review (E¹) and appraisal (G). The chart has served as a guide in the preparation of the visits to the agencies for purposes of determining need and will also assist in the study of the organization of data use, where emphasis will be placed on agency structure and staffing as a means of improving development planning. (See Chart I step 4)

Initial visits were made to each Agency in order to review directly their programs and projects (Appendix A). Key personnel responsible for development planning and implementation activities were questioned as to the nature of the data products that could be developed and which was required for their programs. It was apparent, however, from the negative responses that another means had to be found to elicit the required information. A questionnaire was prepared, therefore, to be supplemented by personal visits, where all potentially necessary data were listed and from which the respondent was asked to make his choice.

The questionnaires were distributed personally to the supervisory personnel of the agencies and at that time, both short and long term programs and projects were discussed. A number of the agencies located their areas of interest on base maps provided for that purpose. (Reference 2). The stage of preparation of their projects was noted--reconnaissance, feasibility, final or not as yet formulated and still in the "thinking" stage. Thus, the information obtained orally and on the maps represent more advanced ideas than that used to formulate the original National Plan documents.

As a final step, answers to completed questionnaires were reviewed with each respondent so as to help him make a better choice of answers on the basis of his agency's plans. The answers were checked for consistency with the total program and, wherever errors were found, changes were effected.

Considering the lack of information originally available concerning

individual agency data needs, the survey can be considered to have fulfilled a preliminary aim of obtaining a direct indication of these needs in support of the Nicaraguan planning process and served as a guide to the data required from the Cadastral and Natural Resources Inventory. The personal or group interview resulted in a final summary tabulation where indications are given as to type, form, purpose and desired geographic location of the data. (Reference 2).

2. Plan Inventory

There is available a total list of natural resource data requirements that can be considered in planning the survey project. Nicaraguan agencies have registered certain preferences from among the list for data based on specific program and project needs. (Reference 2 and Appendix A). The final job specifications, that are to be prepared by the Project administrator and his consultants, will take these requirements into consideration. This would involve selecting data from the list, as well as deciding on the order in which the data will be sought, in the light of local circumstances and needs. All will take into account the priority needs of the data sought and the magnitude of the funding and difficulties involved in the collection of analysis.

Considering the multiplicity of data requirements and the limited technical resources available, an effort was made to review also the data collection capability of the various participating agencies (Chart II A), to facilitate the most efficient selection and utilization of personnel.

This process was initiated by a survey of the data-collection agencies, the tentative selection of key personnel based in part on reconnaissance studies carried out mutually in the field. The results were utilized in the preparation of the AID loan paper in evaluating personnel needs for data gathering. Over a three month period Nicaraguan personnel were oriented in the Panama Cadastral Project in collaboration with the Panama Director, U.S. Consultants and IAGS. A pilot program was subsequently organized in order to further prepare the geologists, hydrologists, climatologists and soils scientists for the integrated survey approach. (Reference 3). Close collaboration is required between the technicians from different agencies and different disciplines; this must be established prior to the beginning of the main Natural Resources-Cadastral Project. The period of orientation identified key personnel and evaluated their competency so that the contractor can prepare more

realistic plans. (Reference 4).

A full understanding of the data needs for development planning and of the available local technical and professional personnel should furnish invaluable information for the preparation of the detailed work plan for the Cadastral-NR Project. A critical path program would represent the sequence of different activities with time limits (minimum and maximum) for the most part, for purposes of identifying natural resources. Close coordination between the Survey Project and the user agencies would allow for the earliest use of the data for priority programs and projects in a given region. The coordination could be effected by the nucleus of what might later develop into a natural resources unit of the Central Planning function.

The selection of priority areas would be most essential for the Survey Project. The preparations that have been begun by the Oficina Nacional de Urbanismo should be intensified with help from the Planning Office and other agencies. A preliminary regional delimitation of the Pacific Cadastral Areas would then allow for the organization of Inventory operations on a region to region basis until the entire area is completed. Priorities among the regions can be established so that more urgent problems can be studied first. The completed studies can be made for individual areas in order of importance and data assembled for the earliest use.

The survey preparation would therefore take into consideration the data needs as expressed by the planning agencies, the financial and personnel availabilities, regional priority needs and the earliest they can be met. The final specifications and detailed work plan would be drawn up so as to satisfy both short and long term requirements. For example, knowing the country's program and project plans, survey operations can be described as to type and form for specified areas, in context of the time and personnel and equipment available. Although much of the demand for data may not now be met in the form required, the on-the-job training will provide the basis for later detailed studies, as well as for the continuation of the inventory in the remainder of the country.

3. Execute Inventory

The collection agencies, (Chart II A) with the assistance of contract consultants in each field, will closely coordinate all operations

using the specifications and detailed work plan as a guide. The time sequence of planning the operations may possibly be described using PERT or critical path programming methods, where particular attention will be given to the data needs of individual disciplines in order to carry on different assignments, e.g., geomorphology maps for soils works. Functions and ideas will be related very often in the application of work techniques, in the organization of field work and in the intermediate and final analyses. In the interest of economy and the most effective operation, the Inventory will not merely draw from among the best resources of all agencies but will seek to develop the most effective grouping of all technicians and functions. For example, the geomorphologist operating as a member of a team can point out notable features of land form and materials and considerably shorten the normally time-consuming work of the soil survey. Similar examples can be cited where the cooperation of the groundwater hydrologist, geomorphologist and geologist are required in groundwater studies.

While work on data collection and analysis is moving ahead, a number of operations could be taking place concurrently that would move the development "cycle" on the way toward achieving its objectives. A special effort would have to be made to intensify training programs perhaps beyond the on-the-job training planned for in the Project. The work of the administrative and operational personnel would be closely supervised from within the Project, especially with the aid of contractors assistants to the Executive Director of the Planning Office. This type of monitoring that could be performed by the Planning Office might be required in order to make possible the establishment of the ultimate capability (Chart I step 5). A continuous study of the data collection and analysis process as well would provide a base for improving future surveys and for recommendations concerning the further training of present staff and technical education in general. The "feed back" of information to the prior steps of the "cycle" could help check problems that might recur, could recommend needed research in certain areas and generally provide the needed continuity with on-going projects - in planning or operational stages.

The most important function of the Planning Office would be to formulate procedures which would promote the earliest use of data. The regional delimitation and establishment of priority areas would provide the framework within which work could be completed for use in the shortest possible time in given areas.

4. Prepare Data Use

The manner in which data will be used is a primary consideration, since the production of data alone will not assure successful program and project development. Then, too, as we have already seen (Chart II step 1) the determination of data needs requires an analysis of the data use process. Much will depend, therefore, on the manner in which agencies are organized individually or in groups and on the personnel skills and training. The most rational organization and proper staffing would strengthen both data collection and use.

a. The Central Planning Process

A survey of basic data needs, therefore, should be accompanied by an analysis of its use in Nicaragua. Chart II was prepared to provide an overview of the organizational structure involved in the central planning process and related activities, leading to project and program development. Chart II focuses on the process that encompasses the establishment of development goals, evaluation of resources, initiation, review and appraisal of projects. Included also are the agencies and sections of ministries that guide and stimulate the flow of activities by the servicing of public agencies, private groups and individuals, e.g., technical assistance in agricultural activities, and data development.

Organizationally, in Chart II (E), the central planning function is the responsibility of the Consejo Nacional Economico (CNE) whose permanent members are the Ministers of Economy, Finance, Public Works, Agriculture and the Director of INFONAC. The National Planning Office (ONP) is the technical secretariat of the Consejo, though under the jurisdiction of the Minister of Economy. The programming office (Programacion Global) is responsible for establishing development goals. Sectoral plans can be initiated by ONP, but usually they are reviewed by the sectoral planning offices of ONP - proyectos, agropecuaria, industria (Chart II (E)). The effective project planning is not done by the planning office sections; it is undertaken by the operating agencies of government (E¹¹) responsible for specific activities such as power, water, supply, highways, agriculture (Reference 2 for list of Agency Sections directly concerned with data use). It is found, generally, that projects are initiated by the operating agencies (E¹¹) and the plans and program proposals, including their financial, specialized manpower and other requirements, are submitted to the sector plan section of ONP (E¹). The latter reviews, appraises and coordinates

the several sector plans and programs in terms of their internal efficiency and consistency, their relation to one another and to total goals.

The agencies that plan, develop and implement public projects are identified along with the private enterprises (E¹¹) that perform similar functions relating to individual projects and business investments in the private sector. The private agencies will either utilize data developed by means of the survey project in summary form or after it has been analyzed further for specific uses by government or autonomous agencies. Servicing agencies (F) will use data primarily to provide technical assistance primarily to the private sector. In order to meet the needs of individual farmers, the Ministry of Agriculture, through the Servicio de Extension, utilizing fully the Experimental Station recommendations assigns technicians on a local level to improve present practices. The National Bank and INFONAC, although they are ostensibly both credit and financing institutions, help introduce new methods and techniques that foster new enterprises. In order to successfully carry on these activities the institutions mentioned require the most reliable basic data obtainable.

Finally, the basic data whose collection is presently being prepared will need to take into consideration the needs of the strict screening process of the key lending agencies. (G)

This process including the preliminary project phase study, expert appraisal, institutional review and ultimate decision determines the value of the project to the economy; emphasizes the validity of the conclusions drawn in the light of the reliability of data and material incorporated in the proposal.

b. Study of Agency Organization and Staffing

A study of the agencies and responsible sections (Reference 2 and Chart II for the entire list) should now be initiated so as to clearly determine functions, present personnel and tables of organization. An evaluation should be made of the duplication, lack of internal organization, etc. that exists, and recommendations made for necessary improvements. However, the reorganization of agencies and departments in themselves do not provide the desired solution, since the coordination of untrained and unskilled personnel would merely turn out to be perfunctory, non-analytic "descriptive" type of jobs. What would be more likely to stimulate better organization would be a trained staff with a good

knowledge of the tools of analysis. The study of agency and planning organization must go hand in hand with an evaluation of key personnel involved in project development.

The totality of efforts directed at determining data collection and use including the questionnaire survey and related office and field visits has brought the attention of the responsible agencies to program and project development problems. In the process they have responded well and begun an appraisal of their functions and activities. The thorough institutional study could be continued at this stage and would encompass the organization and staff surveys.

5. Consolidate Collection and Use Capabilities

At the completion of the first "cycle" of approximately three years duration, Nicaragua should possess an increased capability to collect and analyze the basic natural resources data. Beginning with the preliminary review of data needs, the collection and use processes were brought together by means of a questionnaire survey. The data in question was listed by collection specialists and user agencies who were asked to choose that which they required. The cooperation would be continued prior to the preparation of the specifications in the planning of the Survey and in the implementation stage where early use of preliminary data could be prepared. By this time, the National Planning Office (ONP) should be recognized as the primary unit for data collection and planning; there could be created the core of a permanent unit.

Functionally, the unit would be located close to the planning process; its major underlying effort would be the collection, recording and analysis of data. The ONP, acting in close cooperation with the operating agencies, would maintain the coordination already effected between the data collection and data use, extending it still further to incorporate into one unit the function of determining data needs and the overall responsibility for data collection and storage, as well as broad planning. It would thus provide for on-going processes of data collection, collation, analysis and distribution that would stimulate the timely revision of the major elements of the National Plan.

The Planning Office through a continuous review of the Country's programs can identify areas for study and the nature of the data required. The collection agencies, working closely with ONP, could take advantage of new techniques and methods learned in order to support

National planning on a continuing basis. Photo interpretation and new field techniques, including the integrated natural resources survey approach, should bring about changes in present organization, including consolidation of many functions. This could lead to an integrated survey group as part of a data collection section in the Planning Office.

The Natural Resources unit of the plan would provide the opportunity where the collector and user agencies could mutually interpret data for the benefit of the other. For example, an important shortcoming in economic analysis has been undercalculation of exploitable land. Rural lands are declared to be underpopulated or overpopulated with little accurate basis for assessing density figures. The assessment by soils scientists, geomorphologists, economists, etc. of the final land capability classifications in terms of a physical, psychological and cultural evaluation based on existing and past experiences should provide more valuable agricultural production projections.

The recognition of ONP as the primary unit could be justified by the natural resources inventories that will be required during the next decade or longer for the approximately 100,000 Km² of additional area in the country, as well as for more detailed studies in the present Pacific Cadastral area itself. This central unit will be necessary to provide for the storage of inventory data that can be readily retrieved for use by the government ministries, other public and private institutions, groups and individuals utilizing automatic data processing. The statistical division of ONP presently serves in that capacity with regard to social and economic data, and it could be expanded to include physical environment data as well. With the increased needs for the socio-economic information for development programs and the importance of relating it to natural resources data, it might be well to consider the present statistical unit as an eventual center for all information. This will involve collaboration with Estadísticas y Censos Division (Ministry of Economy) and allow the NR data generating agencies gain access to practically the total development data collection capability.

C. Summary and Recommendations

1. The Nicaragua Program for the development and use of natural resources data brings into focus the process that is involved in program and project development. The planning for data generation requires the determination of data needs and how they can best be collected. The

decision on data required is mainly the responsibility of the eventual user. Much depends on the individual abilities of the technicians and professionals involved as well as on the organizational structure and leadership. The present Cadastral-NR inventory project must be considered in this context, if there is to be achieved the maximum of efficiency in its execution and the most benefit to development planning. Concurrently, therefore, with the present survey preparation, a full study should be undertaken of the user agencies and how they can best be organized to meet the new planning demands. (Step 4 Development Cycle).

2. It appears, as a result of contacts made with the Nicaraguan central planning and operational agencies, that more detailed studies than can be provided under the present inventory project, will be necessary. The creation of the natural resources unit such as has been described under step 5 Development Cycle, could efficiently meet these future needs. All will be contingent, however, on how surveys in the other areas of Nicaragua can be scheduled and on the allocation of staff and functions in the newly-formed unit, which in turn will depend on policy decisions made by higher authorities based on the country's primary requirements.

3. Although the inventory is regarded strictly as a long term project, earlier results can be achieved, if adequate preparations are made. In this respect a regional delimitation of the Cadastral area would be helpful since none presently exists. The agency priority programs and projects can then be studied in this framework with the idea of establishing basic interrelationships between the different economic and social entities. (Steps 2 and 3 Development Cycle).

4. What we refer to as natural resources data can effectively supplement economic information. Development projects must consider social and economic aspects as well as that of the physical environment. It would be advisable to support the ODEGA efforts to build the economic and social data inventory for development planning in Nicaragua. (Appendix C).

5. In order to make more definite determinations of data needs a follow-up to the user agency survey (Reference 2) could be undertaken wherein the data collection agencies could plan to contact the operational agencies and further discuss individual projects. The data needs indicated might be too detailed to be included in the present Cadastral-NR

Inventory but the information could be useful in the future when such surveys become possible.

D. References (IAGS/NRD Publications)

1. "Nicaragua - Tax Improvement And Natural Resources Inventory Loan" Supplementary Document - Natural Resources Aspects.
2. "Survey of Data Need of User Agencies" (Prepared for the National Planning Office, Nicaragua)
3. "Natural Resources - Cadastral Inventory Nicaraguan Pilot Project."
4. "Organization and Operations Evaluation of Natural Resources - Cadastral Inventory -- Nicaraguan Pilot Project."

APPENDIX A

The agencies concerned with the central planning process have identified the following programs and areas of interest:

National Planning Office

General programming in order to establish development goals is the responsibility of the National Planning Office (ONP) which, in December 1965 completed work on the 1st Country Plan. The general method used was to project the amount of investment necessary to obtain the desired rate of economic growth through increased agriculture and industrial production and estimating the amount of savings available.

The Plan seeks to achieve a 7% annual growth rate during the period 1964-1969 during which time total investment should rise from 641 million Cordobas in 1966 to 836.0 million Cordobas in 1969. By the end of 1974 it is expected to attain 1,329.7 million Cordobas. The heaviest public investment is expected to be in Highway Construction (33% of total public expenditures for the Plan Period), Power (14% same period) and Agriculture (14%). Public Infra-structure investments are expected to increase so that whereas they constituted 31% of the total in 1963 they should by 1964 exceed 48%. Private capital will be primarily invested in economic activities such as construction, transportation, energy, commerce and services (total 65.1% in 1965 to 66.3% in 1969), agriculture (17% average for Plan Period), industry (20% Plan Period).

The growth rate and investment figures are based on a potential increase in agricultural production. However, the data source used to project production increases over the Five Year Period has been a small scale 1:500,000 scale land capability map. It is obvious, therefore, that the large scale maps to be produced will provide much more detail on the study area so as to influence important changes in the original projections of growth rate and investment. Domestic consumption, export and import figures will be subject, in turn, to modification as will balance of payments projections and estimated foreign exchange available for investment.

Data generation could be geared to meet the needs of the programming exercise now in its review stage. Figures that are to be projected for agricultural production should become increasingly realistic with

the input of new data - in particular land capability classification on large scale maps.

This present review phase of the Nicaraguan planning cycle also calls for the evaluation of proposed sectoral projects (pre-investment, feasibility - preliminary and final) while new areas for development must be continually identified. There are as yet relatively few public projects and appropriate data is most necessary to develop an inventory of investment projects including specific projects worked out in sufficient detail to allow prompt action, once financing has been arranged. In addition to reviewing the collateral agency programs, which are to be discussed, the ONP is trying to initiate its own. In the questionnaire for example the Projects division lists a Geothermal study program for the Leon region and requests data for its formulation. The Agropecuaria section supports the agricultural and livestock program now dispersed in a number of agencies including the Ministry of Agriculture, INFONAC, Banco Nacional, etc.

Oficina Nacional de Urbanismo - (ONU)

This office has expanded its normal function of urban planning to include that of regional development. It is presently interested in the physical delimitation of areas within which inter relationships can be established between population economic activities and physical features as a useful step in establishing more realistic sectoral programs and projects. There are numerous agencies which would benefit from a geographical regional breakdown considered in context of potential development possibilities. Highway construction, establishment of electrical distribution lines, planning an agricultural experimental stations network, as well as new school and health center locations, could all be undertaken more efficiently in a carefully delimited regional framework.

ONU has presently prepared, as a first step, an Atlas of Regional Planning (a graphic collection of Natural Resources data). The scale used is 1:1,000,000 and includes maps on topography, hydrography, rainfall, population, economic activity, etc. This office has expressed its needs in the questionnaire for data necessary to more adequately establish regional levels for the development program. Data needs have also been described for Urban Planning activities. The geology, geomorphology, etc. data it describes would also be useful in its normal

function of urban planning of engineering structures as well as estimation of mineral and other resources.

Carreteras

The level of investment in roads and highways is the highest of all Plan sectors. They are integral elements in the design of an overall regional and national Plan and take into consideration alternative location of markets and industries and levels and methods of production in all sectors. As of the end of 1964, however, Nicaragua with an area of 130,000 Km² has only 3,715 Kms of roads and most are main highways and all weather roads. The greatest emphasis thus far has been on international commerce but appears to be shifting now to make internal, perhaps regional accommodations.

The NR data needs of the Departamento de Carreteras were expressed in relation to the Agency approximate 900 Km road and highway program necessary to meet projected requirements in the various sectors on a national and regional basis. Plan documents (a) Public Works Program, August 1965, (b) Revised for October 1965, (c) enclosed base map - list the various projects in which Carreteras is now involved and their purpose. They can be summarized as follows:

<u>Project</u>	<u>General Purpose</u>	<u>Specific Purpose</u>
Nandiame Rivas	To reach agricultural areas	Irrigation-Cash crop area
Moyogalpa-Altigracia	(also tourism)	Tobacco
Esperanza-Ciudad Rama	(also colonization)	open new lands
El Viejo-Cosiguina		crop diversification
Prolacsa Project	To reach cattle raising areas	dairy farming
Telica-San Isidro	To reach export areas (including Central America Market-also tourism)	(cotton production - sugar production)

present system of generation including the planta Centro America has an installed capacity of 96,000 Kw and may be increased to 115,000 Kw in 1969 if Planta Larreynaga comes into existence. Current demand studies have shown that this will not be adequate and more surveys are recommended to establish the need more accurately. Further examination would be made of the 3rd stage of TMV system: Gran Viejo Project.

It is estimated that market potential studies and analysis of demand must be made for a longer period of 20-25 years. These studies, including an evaluation of existing facilities for generating, transmission and distribution, should result in an evaluation of production of electrical energy, identification of projects and selection of priorities from among the various alternatives. Investment levels would then be established to guide the long range program development.

The magnitude of the investments necessary - the ratio of investment to sales is 3.7 to one - make it essential that the power problems be studied in great detail. The replies to the questionnaires prepared by ENALUF and CNE personnel express the Agencies' requirements for data to meet the needs of the large program.

As far as areas of interest are concerned their markets are largely in the heavily populated Pacific Coast, and currently proposed transmission lines include Tipitapa to Granada, Managua to Puerto Somoza, Puerto Somoza to Leon, Chinandega to Corinto or Leon to Corinto, Leon to Sebaco, and Tipitapa to a proposed hydro project near Santa Barbara. While it is readily apparent that the power markets are in populated and industrial areas, primarily the Pacific coast in the case of Nicaragua, it may not be so obvious that the hydro resources in Nicaragua are more to the east where the terrain and rainfall are more conducive to hydropower development. Considering this and the fact that transmission lines would be required leads ENALUF to concentrate its hydropower studies in the Central region closest to the markets, particularly the Tuma-Matagalpa-Viejo river complex. The need for more resources data, the time required for feasibility studies, and the initial cost of hydropower make thermal and diesel plants initially attractive. There is no doubt, however, that well-selected hydro sites have a long-term economic advantage, inherent operational advantages such as flexibility of operation, and incidental benefits such as fisheries and stream regulation. Hydro projects can also be more economically made part of multiple purpose projects if they are found to be feasible.

Ministry of Agriculture

Three sections of the Ministry utilize natural resources data in the accomplishment of varied tasks. Agricultural experimentation includes a soils study group that is engaged in data collection while it carries on research in crop and livestock improvement. The adaptation of crops and livestock to different soils, climates, topography, etc. requires a detailed knowledge of these elements. The soils section is itself a "user" of the geology and geomorphology climate data in making certain determinations. A knowledge of land capability is basic to work with crops and livestock. In fact, experimentation with land capability classification will help determine agricultural uses. While this section is presently carrying out its own land capability interpretations it requires geomorphology, climatology, surface hydrology, etc.

The agricultural extension section develops programs in 17 departments (political divisions) throughout the country. Agents and their assistants in each one of the offices are provided with physical and socio economic information and are instructed as to proper agricultural practices necessary in each area. In order that each agent and, in turn, the local farm group be best informed about the existing physical conditions and possibilities of overcoming limitations, proper basic data must be made available. The extension section has indicated the type, form and extent of data needed to meet the needs. Land capability classifications, at certain scales are a prime need. The extension agents, in turn, avail themselves of the services of the experimental section and other technical assistance provided by banks and international organizations. The extension program is developed on the basis of information provided by various services such as meteorological division, Geologic Institute, Soils Division, etc. Each one of the services prepares a digest of information concerning: topography, hydrography, rainfall, temperature, humidity, winds, etc. and socio economic data. Presently this information is considered inadequate to best plan for the total country and individual provinces. However, in most cases, the Extension Section cannot indicate the "crude" data that would be necessary to satisfy their needs. They can indicate what information they find necessary to best meet program requirements in more general terms, in most cases, than would be suggested by various parts of the questionnaire. One example would be the inability to specify the location of stream gauging and meteor-

ological stations even though rainfall and stream flow information are in themselves of great importance in all field operations. The degree to which "crude" or "raw" data can be analyzed to eventually provide the information needed depends, to a certain extent, on the skills of the engineer agronomo or field technician.

The renewable natural resources section is responsible for forests and fisheries. It is itself involved in data collection - forestry, ecology and land use and utilizes all other data in the process. Its needs likewise reflect what is necessary to survey and exploit forests and fishing.

Areas of interest for renewable NR section are the Pacific, primarily the Matagalpa, Jinotega and Esteli areas. The Extension service maintains operations in 17 different Departamentos and thus is interested in obtaining data over the entire area. The experimental station "La Calera" has been located in the outskirts of Managua, but has now begun a new station in Chinandega. There is a project being prepared that seeks to establish stations throughout the country. The banks are studying its feasibility and if it is accepted for financing should concentrate principal work in the Pacific Area - the coast and central part.

INFONAC

INFONAC's interest in the NR Survey project stems from the nature of its present and future activities. It is basically a development financing institution involved in both public and private programs and projects. It works in collaboration with government agencies in planning, advising and financing. It participates in equity financing and techno-economic analysis is undertaken by its technical studies staff.

In agriculture its interest in public projects is in pilot experimental stations to determine possibilities for diversification. It has located a tobacco station in the Esteli area, a banana station in Chinandega (to study its possibilities in the Pacific). It has provided technical assistance in seed improvement work and participated in the location and construction of storage silos. Much of its efforts have been in development of irrigation and it has played a major role in the Rivas project. New irrigation areas are to be surveyed in the following areas:

1. The north east area of Lake Nicaragua, including Rio Malacatoya and Manares.

2. Tuma-Rio Viejo area.

3. Rio Ochomogo area.

INFONAC carries on work in livestock raising and is at present concerned with various aspects of the Pro Lacsá project. It is interested in improvement of pastures through irrigation and other means, in animal breeding and model slaughter houses.

While the major share of credit is for industrial projects most of them bear a close relation to agriculture. Canning plants, slaughter houses, etc. are some examples.

The basic data, both physical resources and socio-economic, are to support the program and project development that would attract foreign financing (private and public institutions) as well as domestic investors.

Banco Nacional

The credit division of the Banco Nacional will be financing a major portion of private enterprise investments during the Five Year Plan period. Its share of the total financing of 425.8 million Cordobas is estimated at 39% and will include the purchase of tractors, harvesters, cattle, seed, new pastures, machines, etc. It is expected that areas to be mechanized will be increased from 224,979 Manzanas in 1965 up to 409,185 in 1969 not including mechanized cattle pastures.

The technical division has indicated its NR data requirements so that it can evaluate farmer loan applications from the point of view of proper choice of land use. Based on its present methods of credit investigation, including land use evaluation, this division indicated the need for certain types and forms of data in the questionnaire. The data required could likewise lend itself to analysis for purposes of elaborating farm projects comprising improvement of crops, livestock raising, etc.

APPENDIX B

The Statistics and Census Division of the Ministry of Economy is considering participating together with the Planning Office and other key agencies in an ODECA (Central America Organization) sponsored project. It will concern itself with basic data of those aspects of economic and social conditions which are of major concern in development effort, e.g., the character and level of living conditions and of production, labor supply and employment, effective and potential demand for goods and services, the sources of internal and external finance and the role of government.

This social and economic data is gathered mainly for use in development programs but is equally applicable in the study of the totality of national economic conditions. As far as methods of gathering data are concerned, emphasis will be on the use of sampling. The use of probability sampling will result in considerable economy in funds required and time involved.

The socio-economic data will have their application in establishing economic base studies for rural development areas or broader regions within which individual agricultural, industrial infrastructure and social (schools, health centers, etc.) can be evaluated. For individual projects, data on productivity and adaptability to change, yields, size of land holdings, standard of living, etc., are most essential alongside of the physical resources data in order to elaborate project or check feasibility. Particularly germane to central planning is the link of the land capability classification and socio-economic data in their influence on the location of structures and their design for land improvement.

Economic Base Studies

One of the evident needs of the Central Planning process are economic base studies that identify key economic activities of area, zone or region. Agencies such as Carreteras, ENALUF, IAN, INFONAC, ONP, ONU, etc. are interested in special projects serving entire areas where an economic feasibility study is necessary. Each has attempted to set up its own economic studies section thus over extending its capability and adversely affecting the quality of the final product. There is duplication in that similar areas are the subject of study by a number of

agencies. The centralization of the full economic analysis capacity would yield more effective results.

The economic base study group could be formed centrally by the above named agencies involved in total country planning and with the technical assistance of the Central American Advisory project (ODECA) undertake the surveys relative to income, employment, prospects for economic growth, and relationship of land use to growth. The resources survey will in itself provide data that will broaden the information base. The programming and sectoral project sections of the ONP can use the base study in order to develop plan projections determining governmental capital expenditure needs and expected revenues.

The economic base studies can presently utilize the results of the recently completed census. These can be supplemented by surveys that require original data obtained on a more frequent basis than the already published data. The Banco Central, Banco de Nicaragua, Ministry of Agriculture (Economic Studies Section) are all ready to carry out a study in cooperation with ODECA. The coordination of the "thin" capability of practically all planning groups will allow for the planning of the necessary studies, collection of data, its analysis and preparation of technical and general reports support program and project studies.

For social and economic data, as in the case of the natural resources, it would be well for the country to provide much more specific and detailed orders of priority for the development of the statistical work. It should consider from the list of statistical series in developing basic data for use in efforts to expand economic activity and levels of living. With the cooperation of Estadísticas y Censos Division and the National Planning Office and the approval of ODECA a questionnaire was circulated in various agencies using this information. For each of the statistical series listed by the PIEB (Programa Interamericano de Estadísticas Básicas) key personnel (statisticians and economists) were asked to indicate the items of data they required, the frequency with which they might be sought, the area for which it is needed and methods of collection and compilation preferred. The results of the questionnaire will then be studied closely, tabulated and utilized in the elaboration of the ODECA project.

APPENDIX C

The effort to determine exact data needs was stimulated by the CABEI loan study in 1963 then resumed during its evaluation during the course of the AID loan proposal preparation. At the time of the orientation of the Nicaraguans in Panama, the Cadastral-NR Project specifications in that country were reviewed and compared to the first quarterly report of work in progress. They were then checked by visits with the responsible personnel and in field trips to various parts of Panama: Chiriqui, Azuero Peninsula, and Cocle where surveys were in progress. Physical resources and socio-economic data generation and use were studied by Nicaraguan geologists, hydrologists, soils scientists, and economists with key personnel in Panamanian agencies and U.S. consultants. The study of data and uses was reviewed in Nicaragua with the project director, and continued within each agency and institution involved particularly in the generation of data. They were field tested and further discussed during the Leon Pilot Project.

The accompanying chart indicates the three objectives that Nicaragua would seek to achieve in the total resources development program. They were identified by NRD and the number of steps taken to implement them are indicated as follows:

1. Preparation of AID Loan Paper.
2. Panama Survey Orientation Program.
3. Nicaragua Pilot Area Study.
4. User Agency Survey Questionnaire.

NICARAGUA NATURAL RESOURCES INVENTORY AND DEVELOPMENT PROGRAM

