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Major Design Elements, Linkages and Schedules for the IBSNAT Project

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IBSNAT PROJECT

Major Design Elements, Linkages and Schedules

DEVELOPMENT GOAL

A. Background: Scarce resources and manpower are used in the developing countries for agricultural research and experimentation which is often redundant with that already performed in similar locations elsewhere. A system is needed for the transfer of agroproduction technology that will: (a) accelerate the flow of agrotechnology from its site of origin to new locations; (b) maximize the successes and minimize the failures in the transfer of agricultural technology in the tropics and subtropics; and (c) assess the long-term effects of agricultural practices on the soil resource.

B. Statement: A succinct statement of the development goal or higher level objective to which the IBSNAT Project is intended to contribute may be expressed as follows:

> To accelerate the rate of agrotechnology transfer to and between the developing countries on a cost-effecti, and scientific basis which will improve understanding of cropping systems, provide decision-makers with means to predict crop yields for evaluation of potential alternative management practices, and to use crop simulations to develop management strategies and tactics at all levels.

C. Hypothesis or Justification: the Benchmark Soils Project has shown that the U.S. system of soil classification, Soil Taxonomy, can be used to identify similar agroenvironments in which crops and agricultural technologies respond and perform in similar ways. Researchers are thus able to predict the performance of new agroproduction technologies at locations where they have not been tested if the agroproduction tecnnology has been previously tested in a similar agroenvironment.

This transfer by analogy is most useful in the "horizontal transfer" of technology among research centers. The process of agrotechnology transfer is not complete, however, without "vertical transfer", or diffusion of technology to farmers' fields, requiring the unique matching of technology to the specific combination of the agroenvironmental conditions of the farm and resource characteristics of the farmer.

Recent advances in artificial intelligence and data management allow computers to synthesize large amounts of data and reduce the uncertainties in decision making in areas from weapons system development to medical diagnosis. Likewise, recent advances in the simulation of agricultural processes make it possible to synthesize climate, soil, crop and management data in new and useful ways. By using simulation models, scientists can quickly, easily and cheaply predict the effects of different packages of agricultural technology on both crop production and the soil resource, and can estimate soil water content, soil erosion, nutrient availability, and crop growth on

a daily basis throughout the year. They can predict the effects of soil characteristics on water and nutrient movement, erosion, plant nutrition, fertilizer requirements, and crop growth. Thus, agricultural simulation models can be used to predict many of the consequences of agricultural technology transferred to new locations. These models, however, have been developed only for a few crops, e.g. wheat and maize, and like any model, can be used only with confidence within the range of conditions for which they have been tested. To date, most agricultural simulation models have been developed for temperate environments. They now must be tested, modified and validated--and new crop models developed--using data from experiments conducted over a critical range of tropical and subtropical conditions. This requires an extensive and collaborative effort on the part of experimenters, modelers, crop and other specialists--a systematic, interdisciplinary and international approach.

II. PROJECT OBJECTIVE

A. Statement. A succinct description of the purpose or objective of the IBSNAT Project is:

> To demonstrate, through a network approach, the use of systems analysis and crop simulation for predicting crop performance[1/] and management requirements[2/] for decision-making at regional, national, intermediate and on-farm levels.

1/ How a crop will perform under specific soil and climate conditions.

2/ Predicting additional inputs such as nutrients, water, growth regulators, pest control, etc. to optimize production

B. Project Approach or Hypothesis: IBSNAT has been created to establish a prototype network of collaborating national, regional and international research centers whose stations represent the dominant agroecological zones and major kinds of soils of the tropics and subtropics. They will serve as both sources and recipients of agrotechnology.

Ten crops representing cereals, grain legumes and root crops, have been selected by IBSNAT collaborators for model development or modification, testing and validation. When this has been accomplished, as shown just below in the statement of outputs or intended results, training in the use of crop models and other measures will be taken to facilitate the dissemination and utilization of project results.

The crop models will be used to predict crop performance in locations where the crop has never been grown. This will enable the user country to assess the suitability of lands for the crops in question, estimate the productivity of the land and prescribe management of soil and crop to obtain optimum production for specific conditions.

The data to develop and/or validate crop models for the tropics and subtropics must be collected in the countries of the tropics and subtropics. These data will be stored for retrieval in a central data base management system. This data base management system will make the combined data set available to collaborators and modelers. In addition, the data base will be used for training collaborating

scientists to use crop models in their own countries using data collected from that country.

It is expected that a prototype network of collaborating research centers, sharing a common information and data base system will be fully operational by 1989.

It is also envisioned that ARS scientists in Temple, Texas and IBSNAT will develop a general agricultural management model capable of simulating the effects of many soil, weather, crop, and management parameters on the biological and economic performance of the agricultural system by 1988.

C. Project Management. The AID contract is directly with the University of Hawaii to provide leadership and support for IBSNAT, including subcontracts with the University of Puerto Rico and the Grassland, Soil and Water Research Laboratory at Temple, Texas (ARS). Through USAID support, agreements have also been entered into with the Soil Management Support Services and the SCS National Soil Survey Laboratory, and Utah State University. Informal agreements have also been negotiated with the IFDC and INRA, national collaborators in Australia (CSIRO), New Zealand (DSIR), and nine developing countries with many more expected shortly (approximately 30).

The contractor has little, if any, direct control over most of the network collaborators and must rely on leadership, the prospect of mutual benefits to the participants, persuasion and support activities

to exercise management and quality control and to assure the necessary cooperation and coordination to produce the output on schedule and successfully achieve the project objective by 1991. Therefore, innovative and indirect measures such as special-purpose working groups, field visitations, collaborative progress reviews, etc., must be installed to obtain a reasonable amount of "management control" at IBSNAT headquarters. Among these measures will be the early establishment of a Management Advisory Council (MAC) to the Principal Investigator with full collaborator representation. A mid-term review of the AID-IBSNAT contract is also planned for the fall of 1985.

D. End-of-Project-Status Indicators

The objective of this project will be considered successfully achieved when the following conditions exist:

(1) Acceptance and use of IBSNAT methodology for agrotechnology transfer by user agencies such as AID, FAO, the CGIAR system, and national and regional agricultural development organizations

(2) Actual/potential donor interest/funding demonstrated for additional work on systems analysis for agrotechnology transfer (e.g., CGIAR, FAO, AID, CIDA)

(3) User-oriented models being developed for new (non-IBSNAT) crops and other important agricultural processes such as erosion, drainage, salinity, and forestry

(4) Plant breeders collect genotype characteristics for agrotechnology (cultivar) transfer

(5) University curriculum changes reflecting importance of systems analysis and modeling for agriculture

(6) At least one operating regional network using IBSNAT methodology

(7) Ten developing country collaborators with capability to collect minimum data sets for at least two crops and using crop models for simulation and prediction

III. PROJECT OUTPUTS/RESULTS

A. Introduction: The project results, planned for production during the life of the project (1982-1991), are described below both as general statements and, subsequently, in the detail possible at this time and based on decisions made at the August 1984 symposium in Maui. A list of activities or work required to produce these results is also included. Major events or milestones are also suggested for scheduling and monitoring purposes. The workplan will be reviewed at least annually for any necessary modifications or remedial actions.

B. Statements of Major Outputs:

1. Simulation models developed and tested for ten cereal, grain legume and root crops by 1987.
2. Operational agronomic data base management system established by March 1985.
3. Capability established for using crop models for predicting purposes in developing country network collaborators by 1987.
4. Prototype, fully functional network of international regional and national research centers and development agencies for agrotechnology transfer created by 1989.
5. An operational general agricultural management model combining crop models for mono- and mixed-cropping systems with soil

erosion, pest management, economics and other factors for tropical and subtropical conditions for use in agro-production policy planning and decision-making at the farm level by 1991.

C. Critical Assumptions:

1. Crops models already created for temperate zone conditions will work, or can be modified to work, in the tropics and sub-tropics.
2. Developing country collaborators and crop-oriented international research centers will use and/or adopt the "agronomic data base management system" on the basis of their involvement in crop modeling, training and other activities.
3. Data can be satisfactorily handled on micro-computers which will become increasingly inexpensive and available to collaborators.
4. Collaborators will cooperate with IBSNAT principal investigator in planning, coordinating and support of activities required to produce the project outputs, including the establishment of regional sub-nets.

IV. WORK PLAN AND MILESTONES[1/]

Output #1 - Simulation models validated for ten cereal, grain legume and root crops by 1987.

Results to Date:

Ten crops were selected at the first IBSNAT symposium at Hyderabad, India, in 1983 and the preliminary draft of the minimum data set (MDS) for soil,

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[1/] Activities marked with an asterisk interface with activities in other outputs.

crop weather and management inputs for each crop was developed. The crops recommended for study were:

Cereals	Grain Legumes	Root
wheat	soybean	aroids
maize	groundnut	cassava
rice	bean	potato
sorghum		

At the second IBSNAT symposium at Maui in 1984, the MDSs were refined and approved and experimental activity has already started. The number of activities and the time it takes to validate each crop model will depend on the existing state-of-the-art ranging from models already fully developed, e.g., wheat, to those partially developed or relatively easy to adapt from existing models, e.g., groundnut, to those starting almost from scratch, e.g., aroid. Therefore, the work plan described below will differ by crop and work already accomplished, but the approach is consistent.

A. Methodology and Procedure

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Establish mininimum data set		- completed -	
(2) Identify collaborators and experimental sites		1982	12/84
(3) Negotiate memoranda of agreement	X	1982	1/85
(4) ARS (Temple) develop sample experimental designs and data collection input forms in		9/84	10/84

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
manual form for IBSNAT headquarters			
(5) Manuals distributed to collaborators by IBSNAT	X	10/84	1/85

B. Site Experiments (by each network collaborator)

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Site characterization	X	1983	1985
(2) Install/update weather station		1984	1985
(3) Install and collect field experiments to measure and record MDS on "first" experiment	X	11/84	8/85
(4) Optional visitation and consultation by IBSNAT during first experiment		11/84	6/85
(5) Completed MDS for first experiment submitted to IBSNAT headquarters	X	4/84	11/85
(6) Process and store first MDS in agronomic data base management system (ADBMS)*		12/84	2/85
(7) Return processed data with statistical analysis to collaborator	X	3/85	4/85

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(8) Include list of completed experiments in next (quarterly) issue of "Benchmark Sites News"		9/85	9/87
(9) Repeat steps 3, 5, 6, 7, 8 for each subsequent experiment (minimum of 3 on each site)		9/85	6/87
(10) Last MDS processed for specific crops	X	6/86	6/87

C. Model Development (select for each crop as appropriate)

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
For Crop Models That Already Exist			
(1) Establish MDS		- completed -	
(2) Identify model collaborators (modeler, crop specialist)	X	9/82	10/84
(3) Revise mainframe program for execution with microcomputer		3/84	6/85
(4) IBSNAT/TAC review		3/84	10/85
For Crop Models that are Partially Developed			
(1) Establish MDS		- completed -	
(2) Identify model collaborators (modeler, crop specialist)	X	1982	10/84
(3) Identify analogous models and modify to meet specific requirements of new crop		10/84	10/86

Activities/Tasks	Selected Milestones	Target Dates Starting	Ending
(4) IBSNAT/TAC review	X	10/86	11/86
For Crops with no Model			
(1) Establish MDS		- completed -	
(2) Identify model collaborators (modeler, crop specialist)	X	1984	1/85
(3) Conceptualization of model		1/85	6/85
(4) Quantification of model coefficients		6/85	12/85
(5) Establish design criteria for computer model		12/85	3/86
(6) Write computer model program		3/85	6/86
(7) Test model against design criteria		6/85	10/86
(8) IBSNAT/TAC review	X	10/86	12/86

D. Model Validation (all models)

Activities/Tasks	Selected Milestones	Target Dates Starting	Ending
Model Already Developed (For All Crops)			
(1) First MDS data stored and processed by ADBMS*		3/85	6/85
(2) Process data sent to modeler for prediction		6/85	8/87
(3) Modeler compares actual with predicted results and adjusts model as/if necessary		8/85	9/87

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(4) Above steps repeated for subsequent MDS inputs		8/85	9/87
(5) Model statistically validated for all useable data		6/86	9/87
(6) IBSNAT/TAC review and user acceptance (subjective)		6/86	9/88

E. Model Utilization/Acceptance

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Conduct workshops to train scientists from developing countries in systems analysis and crop modeling using data from their own experiments:			
Latin America (Venezuela)*		4/84	12/84
Asia*		10/84	10/85
South America*		1/85	3/86
Pacific*		1/86	1/87
(2) Application of model for problem-solving demonstrated on specific crops at request of developing countries		8/84	9/91
(3) Publication and dissemination tailored for different		7/84	9/91

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
audiences outside network, e.g., policy makers, management and technical specialists and scientific disciplines, etc.			

Output #2 - Operational agronomic data management system established by December 1985

Results to Date:

- selection of commercially available data base management system
- preliminary logical structure developed
- input forms designed for MDS
- primary output of DBMS will be processed MDS including basic statistics and comments/interpretations by IBSNAT staff*

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Input forms finalized on basis of Symposium II (Maui)		8/84	10/84
(2) Logical structure modified accordingly		10/84	3/85
(3) Develop physical structure (programming)	X	1/85	3/85

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(4) Develop system for timely and adequate distribution of ADBMS products to network users (collaborators) and others, including semi-annual directory of current data base content*		3/85	9/87
(5) Review experience, changes in state-of-the-art, user suggestions, etc., and adjust ADBMS accordingly	X	12/85	9/91

Output #3 - Capability established for using crop models for predictive purposes by developing country network collaborators by September 1987

Results to date:

- potential developing country collaborators participated in design of MDSs through participation in Hyderabad IBSNAT meeting
- collaborators observed maize, soybean and wheat models executed on microcomputers in Maui IBSNAT meeting

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Conduct a 2 week course by IBSNAT modelers at Caracas, Venezuela in systems analysis		4/84	12/84

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
and crop simulation for agrotechnology transfer for model-users from Latin America, Africa, Middle East, Southeast Asia, India sub-continent and Pacific*			
(2) Based on cereal crops, conduct clinic for developing country collaborators involving (a) principles of modeling, (b) orientation on agronomic data base management system, (c) running their own data through the model with instructional assistance and (d) demonstrating the importance of collecting quality data (tentatively planned for IRRI and to be conducted by IBSNAT modelers)		10/84	6/85
(3) Repeat above activity for grain legumes at CIAT*		1/85	3/86
(4) Repeat same for root crops in Australia or Fiji*		1/86	1/87

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(5) Based on targets-of-opportunity (e.g., request from specific developing country collaborators), apply system analysis on country-specific problem in collaboration with IBSNAT and national staff, e.g., simulate wheat production in selected locations in Philippine Islands for PCARRD		8/84	1991

Output #4 - Prototype fully functional network of international, regional national research centers and developing agencies for agrotechnology transfer created by 1989

Results to date:

- Benchmark Soils Project established a soils network for agrotechnology transfer which led to meetings in 1978 at ICRISAT and 1980 at FAO where concept of IBSNAT emerged
- IBSNAT headquarters staff and facilities established and functioning (1982)
- Participation of developing country and developed country organization, and international agricultural research centers (Table 1) in two symposia (1983 and 1984) resulting in consensus on systems approach for the transfer of agrotechnology, use of network approach, and agreement on minimum data sets

Table 1. Participants at the first and second symposia of IBSNAT represented by the listed agencies, institutions, and organizations.

INTERNATIONAL AGENCIES OR ORGANIZATIONS

International Agricultural Research Centers:

Country	Institute
Colombia	Centro Internacional de Agricultura Tropical (CIAT)
India	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
Italy	Food and Agricultural Organization (FAO)
Netherlands	International Soil Museum (ISM)
Nigeria	International Institute of Tropical Agriculture (IITA) (in Cameroon)
Peru	The International Potato Center (CIP) (in India and the Philippines)
Philippines	International Rice Research Institute (IRRI)
Syria	International Center for Agricultural Research in the Dry Areas (ICARDA)
United States	International Fertilizer Development Center (IFDC)

REGIONAL ORGANIZATIONS

Country	Institute
Costa Rica	Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
Republic of China	Food & Fertilizer Technology Center for the Asian & Pacific Region (FFTC/ASPAC)
Syria	Arab Center for Studies of Arid Zones and Dry Lands (ACSAD)

NATIONAL ORGANIZATIONS

Country	Institute
Australia	Commonwealth Scientific and Industrial Research Organization (CSIRO)
Brazil	Empresa Brasileira de Pesquisas Agropecuaria (EMBRAPA)
Burundi	University of Burundi
Cameroon	Institut de la Recherche Agronomique (IRA)
Canada	Direction de la Recherche, Agriculture Canada
	University of Guelph
Fiji	Ministry of Primary Industries (MPI)
France	Institut National de la Recherche Agronomique (INRA), Toulouse
India	Indian Council for Agricultural Research (ICAR)

Table 1 (continuation)

Country	Institute
Indonesia	Agency for Agricultural Research and Development (AARD),
	Center for Soil Research (CSR)
Jordan	University of Jordan
Malaysia	Malaysian Agricultural Research & Development Institute (MARDI)
Morocco	Institut National de la Recherche Agronomique (INRA)
New Zealand	Department of Scientific and Industrial Research (DSIR)
	Lincoln College
Pakistan	Pakistan Agricultural Research Council (PARC)
Panama	Instituto de Investigación Agropecuária de Panamá (IDIAP)
Philippines	Philippine Council for Agriculture & Resources Research & Development (PCARRD)
Thailand	Department of Land Development (DLD)
	Department of Agriculture (DOA)
United States	U.S. Department of Agriculture (USDA):
	Agricultural Research Service (ARS)
	Economic Research Service (ERS)
	Soil Conservation Service (SCS)
	U.S. Department of Commerce:
	National Oceanic and Atmospheric Administration (NOAA)
	U.S. Department of State:
	Agency for International Development (AID)
	U.S. Institutions:
	Cornell University
	Louisiana State University
	Rutgers University
	Texas A&M University
	University of Colorado
	University of Florida
	University of Guam
	University of Hawaii
	University of Puerto Rico
	Utah State University
Venezuela	Fondo Nacional de Investigaciones Agropecuárias (FONAIAP)
West Germany	Federal Institute for Geosciences and Natural Resources
Zambia	University of Zambia

- Established a network of collaborators consisting of:
  (a) 17 LDCs who have agreed to collect the minimum data set for the 10 IBSNAT crops
  (b) Three regional centers (CATIE, ACSAD, FFTC/ASPAC)
  (c) Three international agricultural research centers (IRRI, ICRISAT, CIAT)
  (d) Six developed country agencies (ARS Temple, Florida, Michigan State, INRA-France, DSIR-New Zealand, CSIRO-Australia) to develop and update IBSNAT crop models)
- Technical Advisory Committee established
- Proposals made for establishing (a) Oceania Benchmark Sites Network for Agrotechnology Transfer (OBSNAT) and (b) ASEAN Benchmark Sites Network for Agrotechnology Transfer (ABSNAT)
- Memorandum of Agreement signed with the following:

Country	Agency
Burundi	University of Burundi
Costa Rica	Centro Agronómico Tropical de Investigación y Enseñanza
Fiji	Ministry of Primary Industries
Guam	University of Guam
Panama	Instituto de Investigación Agropecuária de Panamá
Republic of China	Food & Fertilizer Technology Center for the Asian and Pacific Region
	Asian Vegetable Research and Development Center
Thailand	Department of Land Development
	Department of Agriculture
Venezuela	Fondo Nacional de Investigaciones Agropecuárias

Country	Agency
Zambia	University of Zambia

- Informal agreements reached with the following:

Country	Agency
Brazil	Empresa Brasileira de Pesquisas Agropecuária
Cameroon	Institut de la Recherche Agronomique
Colombia	Centro Internacional de Agricultura Tropical
India	Indian Council for Agricultural Research
	International Crops Research Institute for the Semi-Arid Tropics
Indonesia	Agency for Agricultural Research and Development
	Center for Soil Research
Malaysia	Malaysian Agricultural Research and Development Institute
Morocco	Institut National de la Recherche Agronomique
Pakistan	Pakistan Agricultural Research Council
Philippines	Philippine Council for Agriculture and Resources Research and Development
Syria	Arab Center for Studies of Arid Zones and Dry Lands
	International Center for Agricultural Research in the Dry Areas

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Meeting of IBSNAT representatives with South		9/84	11/84

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
Pacific Commission (SPC) to justify early establishment of OBSNAT and identify potential funding sources			
(2) (Proposed) Meeting of ASEAN and IBSNAT collaborators in the Philippine Islands to establish ABSNAT and identify potential funding sources		6/84	1/85
(3) Establish an IBSNAT Management Advisory Committee with strong developing country representation		10/84	5/85
(4) Distribution begins of ADBMS products to network collaborators and other users*		6/85	6/91
(5) Conduct third symposium for primary purpose of: communicating results to (a) plant breeders, pest management, agroeconomists and other related agro-disciplines (b) policy makers, and (c) international research centers; and fostering continuing networking activities		6/86	6/87

Activities/Tasks	Selected Milestones	Target Dates Starting	Ending
(6) Sponsor special purpose, problem-oriented meetings (e.g. effect of: (a) new information and communication technology on systems analysis and simulation; (b) advances in biotechnology on developing new cultivars), which will also strengthen and expand network		8/87	9/91
(7) Seek consensus on need and structure for a continuing network support nucleus and funding sources		8/89	9/91

Output #5 - An operational general agricultural management model combining crop mode's for mono- and mixed-cropping systems with soil erosion, pest management, economics and other factors for tropical and sub-tropical conditions for use in agroproduction policy planning and decision-making at the farm level by 1991

Results to date:

. Erosion Productivity Impact Calculator (EPIC) has been developed by USDA/ARS which includes many of the components of a general agricultural management model and is now being tested. The ALMANAC

general agricultural management model is under development and will be available to IBSNAT.

Activities/Tasks	Selected Milestones	Target Dates Starting	Target Dates Ending
(1) Work carried out under IBSNAT (ARS) leadership to develop and test model		1983	1991
(2) Collect and run data from existing IBSNAT sites for testing		1985	1991
(3) IBSNAT/TAC review for validation		3/91	9/91
(4) Initiate activity leading to utilization in developing countries; e.g., use of target-of-opportunities on country-specific problems		1984	9/91

(SAMPLE)

IBSNAT Planning and Scheduling Worksheet for Site Experiments*

Name and Address of Collaborator: _____

Crop: _____

Experiment No. _____

Site Location: _____

Date Prepared: _____

Activity/Task	Prior	1984 Oct	Nov	Dec	1985 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1986 Jan	Feb	Mar	Apr	May	Jun
. Site characterization and training	△																					
. Install/update weather station		△																				
. Install and collect field experiment to measure and record minimum data sets		○	——	——	△																	
. Provide quality control check on data measurements			○																			
. Submit completed MDS to IBSNAT headquarters					○	△																
. Review processed data and statistical analysis provided by IBSNAT headquarters						○	△															

Legend: ○ = estimated/actual starting date
△ = estimated/actual completion date

*Please prepare for each experiment in process and/or planned within the next 18 months

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IBSNAT Planning and Scheduling Worksl

Name and Address(es) of Model Collaborators:

Crop:
Descri
___ mo
___ mo
___ no

Activity/Task*	Prior	1984 Oct Nov Dec	1985 Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	1st 2n
. Establish model team				
. Revise mainframe programme for compatability with PC compiler				
. Identify analagous models and modify				
. Conceptualization of model				
. Quantification of model coefficients				
. Establish design criteria for computer model program				
. Write computer model program				
. Test model against design criteria				
. IBSNAT/TAC review				
. First MDS stored and processed by ADBMS				
. Predictions made				
. Comparison with actual and necessary adjustments				
. Processing and comparison of remaining MDSs				
. IBSNAT/TAC review				
. Participate in regional workshops				
. Demonstration of model on specific country problem				
. Preparation of model descriptions				

*Mark "not applicable" (NA) for unnecessary or already completed as of September 1984

Legend: ○ = estimated/actual starting date
△ = estimated/actual completion date

(SAMPLE)

ksheet for Model Development and Validation

Date Prepared: _____

.ription (check one)
model already exists
model partially developed
no model exists

Years 1986 - 1991 by quarters

1986			1987				1988				1989				1990				1991			
2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4t