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AN ECOREGIONAL APPROACH TO ENHANCING AGRICULTURAL RESEARCH IN TROPICAL AMERICA

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May 1995

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To Chairman TAC
Members of TAC
CG Secretariat
TAC Secretariat

From R.D. Havener IDG CIAT

Subject Ecoregional Proposal for Tropical America

Date May 30 1995

104875

Attached for consideration at TAC67 please find a revised proposal for ecoregional research in Tropical America that aims to respond to TAC's earlier suggestions and comments. In order that the proposal remain a coherent document on its own substantial material from earlier drafts has been conserved. However there have been substantial revisions to which I wish to call your attention.

A preface has been added that describes the consultation process that has been followed and the evolution of the proposal in response to TAC's comments. A new introductory section on the context of ecoregional research has been incorporated. The management and coordination structure of the project has been greatly simplified and the position of full time coordinator has been deleted. A new section on managing ecoregional research has also been introduced.

The interests and commitments of CGIAR centers to ecoregional research are detailed in an appendix that has been reviewed by the respective center directors. Finally a workplan and budget for 1995 are specified and an indicative budget for 1996-97 is also included. The indicative budget points out resources that are anticipated based on advanced discussions with donors.

Great efforts have been made to insure that the revised proposal reflects the valuable feedback received from TAC and our partners. We continue to look forward to your support in this endeavor which we believe can significantly contribute to improved ecoregional research in Tropical America.

We welcome your comments.

cc Directors General CIMMYT CIP ICRAF IFPRI ILRI IPGRI

PREFACE

Evolution and Consultation Process of Proposal to Enhance Ecoregional Research in Latin America

In order to design an ecoregional program that responds to the needs of stakeholders in Latin America an extensive consultation process has provided essential input to the development of this proposal. In response to the call for proposals for consideration at TAC65 CIAT convened at short notice key regional partners to a consultative meeting in San Jose Costa Rica in August 1994. Participants included CATIE CIAT CORPOICA (Colombia) IDB and IICA. Out of this meeting came a proposal focussed on the hillsides of Central America and envisioning outputs as summarized in the minutes of TAC65 that included (i) an updated map of target ecological zones (ii) simulation models embracing agriculture and natural resource processes (iii) relevant GIS data bases for the ecoregion (iv) a small cadre of professionals trained in natural resource management strategies (v) developing a capacity for convening at an ecoregional level at CIAT and (vi) establishing organizational and funding arrangements for long term ecoregional projects.

TAC 65 comments on the proposal of August 1994 were that it was an ongoing programme with a narrow geographical focus on the hillsides of Central America. TAC65 also indicated 'the committee would welcome a revised proposal which also spells out the process and timing for expanding the scheme to other ecoregions' and in particular TAC65 noted 'TAC continues to see potential synergies between CIAT's commitment to the Andean hillsides and CIP's involvement in Andean mountain development. The Committee would expect this to be covered in a revised CIAT proposal.'

Upon receiving these comments CIAT convened a second planning meeting that was held in Cali Colombia in December 1994 with the participation of CIAT CIMMYT CIP ICRAF and IICA. This meeting recommended that the ecoregional proposal to TAC should reflect the need to support various individual agroecosystems research consortia already operational in the ecoregion:

- the Global Alternatives to Slash and Burn led by ICRAF
- the CIP initiative for high mountain agriculture
- the Central America consortium of CIMMYT/IFPRI/CIAT
- the savanna consortium of PROCITROPICOS/IFDC/CIAT

In addition it was agreed to introduce an ecoregional mechanism that would provide services to the agroecosystems research consortia as well as conduct research on interactions among agroecosystems and develop a regional analytical capacity for prioritizing targeting and extrapolating research and its results

It was emphasized that the ecoregional mechanism would not be placed in a coordinating role above the agroecosystems consortia but rather it would coordinate the provision of services for which there are central economies of scale (eg some policy research continental scale data bases and models etc) It would also coordinate the development and implementation of research funded by the ecoregional program but implemented by individual consortia This research would be part of an agreed agenda dealing with methods development information exchange cross agroecosystems research and stakeholder strengthening

These concepts were embodied in the proposal submitted to TAC66 in February 1995 This proposal was reviewed and included changes introduced by CIMMYT CIP ICRAF IFPRI and IICA. Specifically this proposal aimed to complement the consortia by assisting in national program strengthening as well as in the delivery of three research outputs

- 1) Enhanced capacity for cross country prioritization and for design of natural resources research
- 2) Improved methods for site selection and extrapolation among watersheds within agroecosystems
- 3) Methods for identifying and prioritizing natural resource problems at the watershed level

In April 1995 a consultation meeting with NARS regional institutions and IARCs active in the four agroecosystems consortia was held in Cali Colombia Participants included representatives from Brazil (EMBRAPA) Colombia (CORPOICA and the University of the Andes) Honduras (National Autonomous University) Nicaragua (INTA) and Venezuela (FONIAP and PALMAVEN) Regional institutions represented included CATIE CONDESAN IICA, PROCIANDINO and PROCITROPICOS while international centers included CIAT CIMMYT ICRAF and IFPRI

At this meeting there was full consensus on the utility of an ecoregional program that would support and act with the four participating consortia It was completely clear that the four consortia would operate under their existing governance and that an ecoregional program would be an effective means of meeting common ends for methods development and information exchange especially at the watershed level but also at the agroecosystems and regional levels

In addition intensive bilateral discussions have taken place between CIAT and other international centers with active research programs in the ecoregion leading to clarification of the specific points of interest of different centers in the ecoregional program and definition of their expected involvement in it See Appendix I for the statements of interest in the Latin America humid tropics ecoregional program as approved by the Directors General of several participating centers

An Ecoregional Approach to Enhancing Agricultural Research in Tropical America

PROGRAM GOAL

To improve management of natural resources devoted to agriculture in Tropical America in order to permanently reduce poverty and hunger maintain resource quality and increase agricultural productivity

PROJECT PURPOSE

To enhance the effectiveness of agricultural and natural resources management research in Tropical America by improving the capacity to define and understand productivity problems in agriculture to develop and adapt suitable solutions to these problems and to extrapolate results among agroecosystems through the development of georeferenced information systems and analysis

BACKGROUND AND JUSTIFICATION

Context of Ecoregional Research There are a number of ongoing CGIAR affiliated research activities in Latin America that link strategic global research to effective and clear partnerships with national programs in order to address the technical and human dimensions of sustainable productivity in landscape units delineated as priority agroecosystems Among the most notable of these are the following

the CONDESAN network for the high altitude Andes in which CIP has served as the lead center for the CG system and in which CIAT and potentially CIMMYT are involved

- the Alternative to Slash and Burn Agriculture Program focussing on the margins of the lowland tropical forests in which ICRAF serves as global lead center for the CG while CIAT coordinates Latin American activities which include the participation of CIFOR IFPRI IITA, and IRRI

- the Central America Hillside Program in which CIAT is serving as lead center for the CG and includes participation of CIMMYT and IFPRI and CATIE and IICA from the region

the Savannas Consortium which operates under the umbrella of the IICA sponsored PROCITROPICOS consortium and in which ICRISAT and IFDC participate and CIAT serves as lead center for the CG

In addition new Systemwide Programs are being launched in the CGIAR that will have major activities in the region. These include for example the Systemwide Livestock Initiative being convened by ILRI and the Soil Water Nutrient Management Program which has targeted the management of acid soils in the tropical Americas as one of its priority research themes. It is anticipated that the latter would be linked in particular to the Savannas consortium via the Managing Acid Soils (MAS) consortium. Likewise ICRISAT's global sorghum research is being linked to the Savannas research consortium.

From within the region the Inter American Development Bank (IDB) is carrying out extensive consultations with countries in the Americas on the initiation of a mechanism to support agricultural research of international significance in the region. This proposed capital fund for agricultural research in the Americas would have interests in the region that would extend beyond those of the CGIAR system but nonetheless close articulation between the fund and the CGIAR would be essential both to implement research related activities of mutual interest and also because the fund would serve as a major forum for the definition of research priorities from a regional perspective.

In this context CIAT has been requested by the CGIAR to serve in an ecoregional convening role for the CGIAR. Clearly this can only be achieved by providing services that complement ongoing activities and encourage linkages among them. Given the range of important research already being carried out in the region there are major opportunities to exploit spillovers among these activities in terms of the development of common methods and data bases as well as the sharing of research sites, data and other information. Such a convening role entails a responsibility to insure the facilitation of linkages among these diverse activities without in any sense presuming to involve an overall coordination of their execution.

This proposal therefore must be understood not as the totality of an ecoregional program for Latin America and the Caribbean but rather as a program to capture and foster externalities among a variety of ongoing research activities that all have an ecoregional dimension.

Problems and Opportunities. Across the diverse agroecosystems of the Tropical Americas the natural resource base is being degraded even though overall aggregate growth in food production in the region has barely kept up with demand growth since 1980 and has lagged behind growth achieved elsewhere in the world. Land degradation associated with agriculture has been rampant in the region.

In the hillsides which cover some 90 million ha in Central America and the Andes low incomes and population pressure are driving a process of over exploitation of the resource base. Small farm size and land scarcity is leading to the rapid destruction of the small remaining reserves of the highly diverse natural vegetation as land is converted to agriculture. On agricultural land fallow periods are being reduced and fertility is declining while extensive areas are also being degraded by soil erosion. These processes not only narrow the scope for attaining sustainable livelihoods for the hillside population but also are leading to watershed degradation with serious consequences for downstream resource users. Because resource degradation in the hillsides typically occurs over landscape units that exceed the holdings of an individual farm manager and frequently involve off site costs or benefits policies for collective action and to internalize costs and benefits are essential and necessary elements in an effective resource management strategy.

The forest margins of the tropical lowlands in the Amazon basin and Central America currently cover 40 million ha out of a total of 800 million ha of lowland forest in the region. Rapid clearance of land for agriculture is expanding the area of the forest margins while putting at risk a major reservoir of biodiversity as well as contributing significantly to the accumulation of atmospheric carbon. Sustainable production systems for settled agriculture are not available for this agroecosystem due to rapid declines in soil fertility and encroachment of weeds. Insecure land tenure and poor access to markets also constrain adoption of resource conserving practices making policy a crucial dimension in improving resource management. Consequently the vast bulk of the rural population in this agroecosystem is trapped at low income levels despite a massive decapitalization of the existing natural resource stock.

In the savannas which cover some 240 million ha of the tropical lowlands of South America the agricultural frontier has been vigorously expanding. Although this agroecosystem has great potential for contributing to world food supplies sustainable production systems for these new lands are lacking. Current production systems quickly degrade the physical characteristics of the soil while failing to manage their inherently low chemical fertility. Consequently degraded pastures has become a major land use. Increasing the biomass by replacing native and degraded pasture with more productive grass legume pastures can raise overall systems productivity and also may have a potentially important role in sequestering carbon thereby contributing to the reduction of greenhouse gases in the atmosphere and helping to counteract tendencies towards global warming.

The Andean highlands is a vitally important ecoregion both in terms of the large population dwelling there that is principally dependent on agriculture but also as a source of several highly productive river basins providing life support systems for rural and urban populations located in the lowlands. The whole Amazon basin originates and depends on water sources located in the Andean ecoregion. Hence degradation of natural resources in the high Andes as is also the case in the mid altitude hillsides can have dramatic effects downstream. Economic conditions have deteriorated seriously in the Andean highlands where over 80% of the currently available agricultural land is steeply sloping with a broad range of soils and variable patterns of climate and water availability. Poverty is intense and widespread in this agroecosystem leading to massive migration both to the cities and also to the Amazon basin.

At the same time national and regional capacity for agricultural research in Tropical America has suffered due to intensifying resource constraints. Through the decade of the 1980s a heavy burden of external debt severely hampered national capacity to invest in agricultural research. Moreover the high degree of urbanization may have limited domestic constituencies to support expenditure on agricultural research. In more recent years the adoption across the region of a new economic model based on opening the economies and reducing the role of the public sector has further curtailed public investment in agricultural research in many countries. In some instances this has resulted in conserving the skilled human capital built up for agricultural research over the last decades while reducing operating budgets. In other countries however there has been major downsizing in the national research system. Consequently many national research systems especially in the smaller countries have a significantly reduced capacity to undertake traditional crop improvement research let alone embark on the new more complex research agenda associated with natural resource issues.

An Ecoregional Approach Because national research resources are so limiting and because the agroecosystems of Tropical America are so diverse development of solutions to the numerous and varied problems which degrade the resource base and depress agricultural productivity is beyond the individual capacity of all but the largest national programs. Agroecosystems diversity provides a clear need for research cooperation among nations in the region. Likewise diversity makes highly attractive the capacity to link research and technology transfer for similar but often distant agroecosystems.

At the same time there is a premium on knowing the extent of different agroecosystems and their associated constraints so that limited research resources can be concentrated where they can make the biggest difference. Thus there is a need for a regional effort to identify common problems and generalizable solutions as well as to develop technology and policy options to address prioritized widespread problems through joint actions that lead to an equitable enjoyment of benefits.

Ecoregional agricultural research addresses issues of environment-agricultural linkages through a landscape based regional perspective. It involves the improvement of the productivity of agricultural systems while ensuring their sustainability through judicious management of resource stocks and flows for example hydrological cycles nutrient fluxes biomass accumulation and agrobiodiversity.

However several factors seriously hinder efficiency of research on natural resource issues. There are major difficulties in defining the principal sustainability and productivity problems especially in assessing the pace incidence processes involved causes and consequences. There are difficulties in developing and adapting alternative solutions whether generated by researchers or farmers and whether featuring technical or policy interventions. There are difficulties in understanding the factors that shape farmer adoption of new practices or in using such understanding to foster policy or institutional changes that facilitate adoption of more sustainable practices.

Finally there are significant difficulties in the geographical delineation of problems which limits the ability to quantify the extent of constraints select representative research sites and extrapolate results widely and efficiently from a limited number of research sites. This last shortcoming is particularly severe with respect to natural resource issues. For example comprehensive reliable data on the extent degree and type of land resource degradation is lacking. Likewise comprehensive information on the continental distribution of land use systems based for example on agroforestry or cattle grazing or on systems associated with major crops such as wheat maize potatoes sweet potatoes and sorghum is not available. Moreover understanding of the relation between these land use systems and their environments is based principally on expert opinion rather than on statistical analysis of the relationships between climate soils resource degradation and crop distribution.

NARS Priorities The several agroecosystem research initiatives are each organized as consortia with a wide range of national and regional partners. While the details of governance of the various consortia are not identical all essentially take decisions through periodic formal meetings of members constituted as steering committees in which the national institutions comprise the majority of representatives. The various agroecosystem consortia in the region have developed their research priorities through processes that have involved national program leadership in setting the research agenda. Examples of such consultation are numerous and ongoing but a few instances are worth citing in particular.

In Central America guidelines for inter institutional cooperation and a research priorities were set in a project planning by objectives exercise in which DICTA (Honduras) and INTA (Nicaragua) participated along with regional institutions (CATIE and IICA) and international centers (CIAT CIMMYT and IFPRI). Understanding the relationship between land use and natural resource degradation emerged as the highest priority for research.

In the forest margins research priorities and site selection was undertaken through a joint commission in February 1992 that included three Brazilian EMBRAPA research centers (CPATU CPAF and CPAA) ISPN an NGO along with CATIE and IICA at the regional level and CIAT and ICRAF from the CG system While the mission generated agreement over a division of responsibilities over a wide range of research themes including germplasm improvement market opportunities and applied research the single research issue that was a priority for all participants was analysis of land use changes with emphasis on understanding the relations between agriculture policy and natural resource conservation Subsequently this work was merged into the Global Slash and Burn Project that includes the participation of IFPRI IFDC and TSBF in addition to those mentioned above as well as NGOs including PESACRE and IPHAE

In the high altitude Andes the CONDESAN consortium has prioritized four major research themes commodity systems land and water management policy and biodiversity The PPO participatory program planning by objectives method has been used to assure stakeholder participation in joint planning and project monitoring A series of planning workshops have been conducted including one on biodiversity in August 1992 one on land and water management in March 1993 and two planning workshops in 1994 to prioritize activities in the benchmark sites

Natural resource management research in the savannas is coordinated through the IICA sponsored PROCITROPICOS network which includes the participation of EMBRAPA of Brazil IBTA of Bolivia CORPOICA of Colombia and FONIAP of Venezuela The National University Bogota the Technological University of the Llanos and the University of Uberlandia have all joined savanna consortium activities at the site level CIAT participates in this savannas research network in which it has been asked to contribute particularly on strategic research on underlying biophysical processes that affect natural resources and also on the utilization of geographical information systems to characterize environments resource problems and orient the design of research strategy

Research priorities across agroecosystems were analyzed in detail in the process of preparation of the CIAT Strategic Plan This has continued to be a topic of concern to IDB and IICA, which have recently joined with IFPRI and CIAT to look more closely at this issue

The success of these initiatives in reaching the goals of sustaining the resource base and increasing agricultural productivity is critically dependent on the understanding of their target agroecosystems Targeting of the development of natural resource management systems needs to be sharpened because these agroecosystems typically extend over large areas and are not fully contiguous Thus the development of problem solving research processes featuring more precise georeferenced information systems at the agroecosystems level is needed to better define problems identify

solutions accelerate adoption improve the generalizability of research and facilitate the exchange of results Addressing these issues requires among other tools spatial models and information systems on the environment agriculture and the socio-economic context

PROJECT OUTPUTS AND ACTIVITIES

Based on the above analysis of problems and the priorities as they have emerged from the NARS participating in the agroecosystem consortia a set of proposed outputs and activities have been derived for this Project to Enhance Research Effectiveness for Agricultural Sustainability Through an Ecoregional Approach in Tropical America (See Table 1 Work Breakdown Structure) This project aims to fully exploit and encourage externalities among existing agroecosystems research consortia with an ecoregional dimension as well as provide vital high payoff services for which there are economies in scale in their delivery to the agroecosystems consortia and other regional stakeholders

Overview. The central outputs of this proposed ecoregional project all focus on enhancing the capacity to prioritize plan target and extrapolate research on natural resource management and agricultural productivity in Tropical America Achieving agricultural and resource sustainability in an ecoregion as diverse and complex as Tropical America can best be attained by combining the efforts of diverse actors at the national regional and local level while taking advantage of inputs from the international agricultural research system.

The problems and opportunities of agricultural and natural resource sustainability need to be visualized and dealt with at an international level in order to achieve economies of scale in strategic research and transfer of results This is done both through coordination among NARS in the region as well as through their effective linkage with the CGIAR system Recurring patterns in land use the bio-physical environment and the socio-economic context give rise to agroecosystems as useful units of analysis for the definition of common problems the design of technological and policy options and the interchange of research results for adaptation at the local level Ultimately new technologies and practices are implemented at the local or watershed level and natural resource degradation processes and limits to agricultural productivity emerge from specific conditions at the watershed level

Thus methods are needed to design solutions and prioritize problems at these three levels international agroecosystem and watershed At the same time methods are needed to enable information to be meaningfully exchanged across these different levels Specific observations in particular sites in watersheds aggregate into common findings across agroecosystems while agroecosystems recur over international boundaries giving scope for economies in the assembly of information and in the implementation of problem solving research

The outputs of this project therefore are improved methods for research planning and implementation at different levels. These methods will vary with the scale of the analysis but can be made intercommunicable across scales of analysis and across countries by linking data and analysis to georeferenced information systems and models. Strengthening national and local capacity to use such an approach is also a key output expected of this project. Specific project outputs are now discussed in turn.

Output 1 Enhanced Cross Country Analysis The objective of this output is to improve the capacity for cross country prioritization, targeting, and extrapolation of research results through the development of comprehensive environmental and agricultural land use data bases and associated models for Tropical America. Analysis at the continental scale can facilitate the capture of important cross country synergies and economies of scale in research that can not be achieved except by working at the international level. Similar environments, resource degradation problems, and potential solutions recur across space among countries. By identifying such homologies, the most widespread common problems can be prioritized and efficient paths for exchange of results mapped.

While information systems including climate models, soils data, and selected agricultural land uses have already been developed at CIAT for Tropical America, major gaps in these systems limit their usefulness. Land use data for production systems based on rice, beans, and cassava have been developed but information systems for the spatial distribution of production systems based on maize, wheat, potatoes, sweet potatoes, sorghum, agroforestry, and cattle grazing are lacking. Likewise, a comprehensive information system on land degradation is also lacking. This project would develop the above needed information systems and models.

These models and data bases would have two major uses. First, it would enable countries in the region to access a common and comprehensive information system that would greatly enhance their ability to quantitatively identify themes of common concern and their extent across borders. Similarly, it would facilitate CGIAR system wide planning and implementation of agricultural and natural resource management research. Second, these information systems and climate models can be linked to physiological models of crop growth or cultivar performance data in order to improve site selection, targeting, technology design, and results extrapolation in the course of the ongoing technology development research of the international centers and national programs. Models based on factor analysis or principal components would be used to reveal interrelations between environmental variables and land use. Likewise, relations would be explored between land use in different crops and resource degradation processes. Thus, CIFOR, CIP, CIMMYT, ICRAF, ICRISAT, and ILRI would all gain access to information systems that would assist them both in planning and in conducting their research.

Furthermore models and data bases at this level of aggregation can be usefully linked to policy analysis. Many policies such as trade exchange rates interest rates and other macro and sectoral instruments exert their influence not at the agroecosystems or watershed level but across agroecosystems and even national boundaries. Integration of socioeconomic perspectives and approaches to the analysis of data and the development of models at this level could therefore be highly fruitful and reason for a strong component of social sciences in the planning and implementation of the workplan for this output. Thus this output is of potential significance both to IFPRI and other institutions interested in examining the linkages between policy land use and resource degradation.

For 1995 full funding to CIAT and IFPRI for work on this output is anticipated from IDB.

Output 2 Improved Methods for Agroecosystems Research As noted above research consortia involving NARS and several IARCs are already operating at the agroecosystem level for the high Andes the slash and burn forest margins the Central American hillsides and the South American savannas. This research will increasingly be linked to global CGIAR initiatives such as the Systemwide Livestock Initiative and the Soil Water Nutrient Management Program. The latter for example would work closely with the Savannas consortium through the managing acid soils (MAS) consortium.

In order to efficiently generate improved systems of natural resource management for these agroecosystems improved research methods are needed to address a number of key issues:

To assess the incidence of and rates of change in resource degradation and agricultural productivity at the agroecosystem level georeferenced temporal models that aggregate across watersheds in an agroecosystem will be constructed.

To improve site selection and extrapability of results at the agroecosystem level statistical analysis and simulation models will be utilized to identify homologous natural/socio-economic environments.

To enhance collective decision making on land use practices and policy georeferenced multiple stakeholder decision models need to be developed. Such methods will permit ex ante analysis of the on and off site and near and long term effects of alternative land uses and policies.

To conserve agrobiodiversity models will be developed to analyze georeferenced genetic resources data in priority agroecosystems This will assist in identifying criteria for selecting candidate sites for in situ conservation of maize potatoes common beans cassava and arachis sps

In 1995 funding from DANIDA is being used to support this activity

Output 3 Research Methods for Watershed Level Research More effective methods for identifying and prioritizing research at the watershed level can enhance research being currently carried out by international centers and NARS in the four priority agroecosystem consortia in Tropical America Moreover these methods could be extended to other agroecosystems not only in Tropical America but potentially world wide Efficient low cost methods to identify natural resource problems and their socio-economic correlates are still needed Such methods are likely to consist of a suite of strategic field trials process models and participatory appraisals Likewise quick, low cost methods for assessing the long term projected consequences of natural resource degradation processes are needed Again this is likely to require a variety of approaches including chronosequence studies long term trials and farmer monitoring Lastly to improve the generalizability of results methods for adapting existing crop and process models in order to improve the accuracy of aggregation from the farm or field level to entire watersheds is critically needed

Overall the development of these methods information and analyses would have three main uses First they could be utilized within a specific watershed for defining and solving major productivity and sustainability problems Second they can be transferred for application in other watersheds reflecting the need for more efficient and effective methods at the watershed level across watersheds within an agroecosystem Third the information generated at this level can be fed into analysis at higher levels of aggregation feeding for example models and data bases used to produce Output 2 above

While the detailed workplans at the watershed level would be developed in the implementation phase of the project certain priority activities can be anticipated For example research in the high Andes in the CONDESAN consortium site of Carchi Ecuador would be extended to incorporate work at lower elevations in order to create a transect that brings together interconnected resource issues that cross agroecosystem boundaries Input from the CIAT Hillsides Program and CIMMYT would be sought for the lower end of the transect

Existing research consortia linked to Systemwide Initiatives such as the Alternatives to Slash and Burn provide a highly cost efficient mechanism for generating data and testing models essential for producing the outputs envisioned in this project At the same time much of this information is of direct utility to the existing agroecosystem consortia even though these activities are not currently included in their funding

requests and workplans Thus linking this Ecoregional Initiative to the agroecosystem consortia both provides an especially economic means of producing the outputs of this proposal while at the same time providing to priority agroecosystem consortia the capacity to usefully expand their activities to generate relevant and useful outputs that otherwise could not have been produced

For 1995-96 partial funding for the delivery of this output by CIP and CIAT for the high Andes agroecosystem is anticipated from BMZ. In addition partial funding for the delivery of this output by ICRAF and CIAT is anticipated through GEF

Output 4 Strengthened NARS Capacity The development of methods models information systems and data sets will be fruitful largely to the degree that NARS are empowered to utilize them A four pronged approach to this issue will be taken

Workshops will be held at the international level through fora that enable NARS to develop compatible data bases and analytical methods for coordinated planning at the sub-regional level This could be carried out through IICA sponsored sub-regional networks such as PROCIANDINO or PROCITROPICOS

- Training on an individualized basis or through courses will be conducted at the national level in order to increase capacity to use georeferenced data and models for research planning

Training on the use of models and data at the watershed level will be offered through the existing agroecosystem consortia

In order to test the utility of methods data and models developed in this project pilot projects will be implemented by NARS scientists to adapt general models decision tools and data bases to specific actual problems and conditions faced by NARS

Bibliographic and information services will be provided on regional literature related to land use and resource degradation

In 1995 partial funding for this output will come from IDB

EXPECTED IMPACT

CGIAR Systemwide Implications. This project lays the foundation for more effective integration of global core systemwide research with the problems and opportunities in the ecoregions of Tropical America This project complements rather than substitutes

for ongoing core and global research on technology development Through the development of models methods and georeferenced data bases the outputs of Systemwide research can be more effectively targeted to and extrapolated within the ecoregions of Tropical America Several concrete outputs are envisaged that will enhance the work of several centers

Continental scale georeferenced databases for maize wheat sorghum potatoes sweet potatoes pastures livestock and agroforestry land use systems will directly assist CIFOR CIMMYT CIP ICRAF ICRISAT and ILRI in prioritizing and targeting their research for the agroecosystems of Tropical America The intercommunicable data bases will be compatible with data already developed by CIAT on soils and climate in the region It will be possible for the Centers to link their models and information on crop performance and physiology with the georeferenced data as a tool for the various Centers to aid them in the design and targeting of their technology improvement efforts

- Comprehensive agricultural systems and land use data and models will facilitate the assessment of natural resource degradation processes at the continental and ecoregional scales This will provide vital orientation to research on the improvement or resource management and policy
- Methods and models will be developed for assessing the incidence and patterns of change in agricultural and resource problems as well as for appraising their consequences over time in priority agroecosystems This will enhance the effectiveness of ongoing research in the Global Alternatives to Slash and Burn and Mountain Agriculture Initiatives involving CIAT CIFOR CIP ICRAF and IFPRI in Tropical America as well as ongoing agroecosystem consortia for the hillsides and savannas in the region involving CIAT CIMMYT and IFPRI along with regional institutions such as CATIE and IICA.

Georeferencing of genetic resource data for maize potatoes arachis sps beans cassava and multi purpose tree species in priority agroecosystems will be of use to CIFOR CIMMYT CIP ICRAF ICRISAT ILRI IPGRI and CIAT Methods will be developed to relate patterns of genetic variability to soil climate and land use data both to target potential candidates for priority in situ conservation and also as a potential tool for evolutionary and genetic studies

Emerging new CGIAR initiatives such as the Global Livestock Initiative or the Managing Acid Soils research theme within the Systemwide Soil Water and Nutrient Management Program would along with other such initiatives benefit from the outputs of this project The research outputs of this project would provide tools that they could use for prioritization site selection and

extrapolation Moreover the creation of the Ecoregional Steering Committee that forms an umbrella linking the four major CGIAR associated agroecosystems consortia in the region would provide a natural channel through which to these new initiatives could be introduced into the region without needing to proliferate new institutional modalities or duplicate contacts with the NARDS

Expected Impact: Implications for NARS

- Utilizing comprehensive international agricultural and land use data will assist NARS in identifying priorities and commonalities in regional agricultural research planning and coordinating fora such as the IICA sponsored PROCIANDINO and PROCITROPICOS networks
- Methods and models developed in the project will assist NARS in their own work in site selection targeting technology design and extrapolation of results by agroecosystems at a national level Training will be provided in the use of these methods and models at the national level
- Research on development of methods and models in priority agroecosystems will contribute directly to the generation of new technology and policy options appropriate for the specific problems encountered at these sites Not only will these components be available for adaptation and use by NARS but also training will be provided and the agroecosystem or watershed level in the use of suitable methods for problem diagnosis technology design and testing and evaluation and extrapolation of results

In combination these above outputs will enable NARS to increase their effectiveness in generating and adapting technology and policy options at the international national and local (regional) levels

- More coordinated interaction and less duplication of effort in interfacing with international centers

Expected Impact: Implications for Farmers

Enhanced effectiveness in international national and local research on agricultural and resource management research will accelerate the availability to farmers of technology and policy options to increase productivity incomes and the sustainability of their resources However farmers are not direct users of most of the outputs of this project which does not attempt to substitute for or add more of the same to ongoing national and international agricultural and resource management research Rather the information systems methods models analysis and data derived from this project will be used by the national

and international research systems to enable them to better meet farmers needs

MANAGING ECOREGIONAL RESEARCH

By its nature ecoregional research is complex. It is concerned not just with individual commodities but with production systems in landscape units. It aims to increase system sustainability as well as productivity. It links global research to specific circumstances. It addresses both technical and human dimensions of problems. It involves the efforts of a variety of national, regional, and international partners in a collaborative framework.

Due to this complexity, ecoregional research can not be truly implemented by a single institution nor can it be effectively masterminded or centrally controlled by a single institution. Success in ecoregional research requires the exercise of responsibility and initiative of a range of autonomous partners acting together in different combinations in the face of various problems. Thus, there needs to be a significant degree of decentralization in the operationalization of ecoregional research.

Important opportunities exist though for adding value through the provision of some centralized services in a decentralized system. Economies of scale can be reaped through the generation of key common information and data bases as well as methods. Furthermore, there will be important spillovers or externalities to be captured and distributed, including for example, methods, data, or other information developed in a particular circumstance but which have broader applicability. Likewise, in a fully decentralized system, duplication of efforts can occur, or important gaps may appear.

Significant value can thus be added by an ecoregional mechanism that facilitates the achievement of economies of scale where possible, that captures and distributes spillovers, and helps assure an efficient division of labor.

The Process of Ecoregional Research. Table 2 depicts a flow diagram illustrating how ecoregional research could work. The process initiates with the expression of demand in terms of a prioritized agenda of problems and opportunities identified by national agricultural and natural resource systems, broadly defined to include, among others, national agricultural and natural resource research institutes, farmer organizations, extension and rural development agencies, non-governmental organizations, universities, and the private sector. Fora are needed for this diverse set of actors to reach common agenda both at the national and international levels.

Some such fora for identifying common agenda exist, for example, the IICA sponsored regional PROCI networks, the above discussed agroecosystems consortia, and research networks such as those for germplasm exchange. Nevertheless, formal and

accepted mechanisms for attaining regional or sub-regional consensus on a common agenda are not yet fully in place. The CGIAR might have a role in assisting in the emergence of such critically needed fora, but it is a challenge that is ultimately the responsibility of actors from the region.

The CGIAR has opted for a strategy of designating ecoregional convening centers to facilitate the articulation of such regional agenda with the global research system. It must be emphasized that there is no question of the CGIAR or individual centers arrogating to themselves the function of convening the NARS to reach their regional agenda. Again, that must be the responsibility of the NARS themselves. Rather, the CGIAR wishes to effectively link a complex and varied ecoregional agenda to a complex and varied global system. CIAT has been designated to undertake this responsibility for the CGIAR system, being both an active member of the global system and also a widely accepted peer in the Latin America and Caribbean region.

This role can include a number of activities. First, as a clearing house of information between regional and global systems. Second, serving as a facilitator to reach consensus on the elements of common agenda and on the sharing of responsibilities to implement agenda that embrace both regional and global systems. Third, in providing in collaboration with other partners a few key information and data services. This current proposal principally seeks resources to enable the fulfillment of this third function. For the moment, CIAT will continue to attempt to rely principally on existing core resources to fill the first two functions, though if these imply further significant commitment of resources for transactions costs, it may be necessary to seek additional new funds to play the roles of coordination.

While the ecoregional mechanism can be useful in facilitating strategic linkages between regional agenda and the varied set of interested parties including the International Centers, CGIAR Systemwide Programs, NARS, and advanced research organizations, a rich set of linkages will provide ongoing and operational coordination directly among these partners rather than always through the ecoregional mechanism.

Experience suggests that formation of agroecosystem consortia which bring national and global research together around selected benchmark sites that represent wider common agroecosystems is a particularly effective strategy for research on sustainable production systems. However, there are several essential conditions for the success of such an approach. Agroecosystems must be defined consistently and rigorously across countries to capture economies of scale in working on a common set of issues. Second, benchmark sites need to be selected that are truly representative. Third, the outputs of research at these sites must be extrapolated out to and targeted at multiple sites where there is a high probability of their usefulness. The provision of these services to an overall ecoregional program is the kernel of the specific content of this proposal.

Due to its past extensive work in information systems and methods for these tasks including extensive use of georeferenced data and the accumulation of uniquely detailed and complete data sets for Latin America and the Caribbean CIAT has a strong comparative advantage for the delivery of these outputs

Overall project execution including coordination of activities and technical and financial reporting would be the responsibility of the implementing agency for the Project CIAT Management and execution of the project would be overseen by the Ecoregional Steering Committee composed of one national representative selected by each agroecosystems consortium one representative of participating regional institutions the implementing agency and one representative of other participating IAR institutes The Steering Committee would meet at least annually to review technical and financial progress reports and to approve the workplan and budget for the upcoming year The Steering Committee would elect its own chair While the specific activities to be executed by each consortium to deliver outputs 3 and 4 would be decided by the steering committees of the respective agroecosystem consortia the Ecoregional Steering committee would exercise the right of review to ensure that individual consortia implemented activities supported by this project would be consistent with the objectives and strategies of the project

WORKPLAN 1995

Funding is being sought through this proposal to support a consultation process that would lead to the full development of a scheme for ecoregional research In 1995 this process would commence with an initial consultation meeting between representatives of the agroecosystem consortia and interested regional and international parties This would be followed by intensive high level bilateral discussions with senior NARS leaders throughout the region This would involve an intensive round of travel to insure that they are fully informed about the development of an ecoregional research approach and have the opportunity to express their views These initial bilateral meetings would be followed up by a high level meeting of NARS leaders late in 1995 where there would be a forum for open exchange of views and the opportunity for approaching an agreed upon consensus among them and approval of a 1996 workplan

Preparatory to this high level meeting contacts would also be made through the regional PROCi networks and the steering committees of the existing agroecosystem consortia Attendance would be made at their normal meetings in order to formally brief them and obtain their views about and commitment to a joint approach to ecoregional research At these meetings the 1996 workplan for output 3 would be drafted Representatives of the agroecosystem consortia would also attend the high level meeting as would staff from participating IARCs Due to the heavy travel burden imposed by these consultations consultants would be contracted to carry out a major part of this work The high level meeting would be followed up with a technical

meeting presumably at the level of a nascent steering committee for ecoregional research. This committee would interact with consultants and the implementing agency to oversee the preparation of a proposal for future activities.

PROJECT BUDGET

Resource requirements to implement the 1995 workplan discussed above are specified in Table 3. In addition an indicative budget of what the overall project might look like over the period 1995-97 is included in Table 4 which is organized by the outputs discussed in this proposal. It also distinguishes between support which has already been to some extent identified and the further support that would be requested through TAC.

Appendix I

Statements on Center Links in Ecoregional Research in Latin America

CIMMYT Endorses the elements in the Latin America ecoregional proposal that provide support to methods development and institutional strengthening relevant to NARS research at the watershed level or below on issues that include defining problems setting priorities understanding targeting and adapting new technologies accelerating adoption through policies and assessing impacts on productivity and sustainability

CIMMYT is currently actively collaborating in such research with CIAT and IFPRI as well as regional and national partners in the Central America Hillside consortium which is linked to the Ecoregional Program CIMMYT and CIAT co-fund a shared position of a regional agronomist who works in Central America

CIP Endorses the elements in the Latin America Ecoregional proposal that enhance studies at the agroecosystem level especially for the Andean region The Director Generals of CIP and CIAT have signed a memorandum of understanding to implement a joint research activity to use GIS and remote sensing for resource assessment in the high Andes

Moreover CIP endorses the elements in the Latin America ecoregional proposal that provide support to methods development and institutional strengthening relevant to NARS research at the watershed level CIP and CIAT are both members of the CONDESAN agroecosystem consortium for the Andes for which CIP serves as consortium coordinator CIP is keen to increase inter-center collaboration in Latin America through the use of a benchmark site as a transect activity linking CIP's work in the high Andes with that of CIAT and CIMMYT in the hillsides

ICRAF Endorses the elements in the Latin American ecoregional proposal that develop improved methods and data bases for prioritizing natural resources policy and agricultural research at the agroecosystems level and across countries In particular ICRAF would benefit from spatial data sets on the distribution of agroforestry systems and genetic resources of cultivated and multi-purpose tree species

Moreover ICRAF endorses the elements in the Latin America ecoregional proposal that provide support to methods development and institutional strengthening relevant to NARS research at the watershed level on issues that include defining problems setting priorities understanding targeting and adapting new technologies accelerating adoption through policies and assessing impacts on productivity and sustainability ICRAF is an active participant with IFPRI and CIAT as well as regional and national partners in the Alternatives to Slash and Burn consortium, which is linked to the Latin American Ecoregional Program

IFPRI Endorses the elements in the Latin America ecoregional proposal that develop improved methods and data bases for prioritizing and targeting natural resources policy and agricultural research at the agroecosystems level and across countries IFPRI and CIAT are participating in a co-funded project that is addressing these issues at a continental scale

Moreover IFPRI endorses the elements in the Latin America ecoregional proposal that provide support to methods development and institutional strengthening relevant to NARS research at the watershed level on issues that include defining problems setting priorities understanding targeting and adapting new technologies accelerating adoption through policies and assessing impacts on productivity and sustainability In particular IFPRI is an active participant with CIAT and CIMMYT as well as regional and national partners in the Central American consortium and is an active participant with ICRAF and CIAT as well as regional and national partners in the Alternatives to Slash and Burn consortium Both these consortia are linked to the Latin American Ecoregional Program

ILRI Endorses the elements of the Latin American ecoregional proposal that develop improved methods and data bases for prioritizing natural resources policy and agricultural research at the agroecosystems level and across countries In particular ILRI would benefit from spatial data sets on the distribution of livestock and livestock systems to assist in the planning and targeting of its livestock research in Latin America Moreover the System Wide Livestock initiative is in principle considering livestock research in the hillsides in Central America and forest margin Alternatives to Slash and Burn research consortia that are linked to the Ecoregional Program

IPGRI Endorses the elements in the Latin America ecoregional proposal that georeference genetic resources data and develop models to identify candidate sites for in situ conservation Such activities can serve as a highly complementary link between the Systemwide Genetic Resources Program and the Latin America Ecoregional Program This research should be done both at the continental and agroecosystems levels

ACRONYMS

BMZ	Bundesministerium für Wirtschaftliche Zusammenarbeit Germany
CATIE	Centro Agronomico Tropical de Investigación y Enseñanza
CGIAR	Consultive Group on International Agricultural Research
CIAT	Centro Internacional de Agricultura(International Center for Tropical Agriculture) Colombia
CIFOR	Center for International Forestry Research
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo(International Center for Maize and Wheat Improvement) Mexico
CIP	Centro Internacional de la Papa(International Potato Center Peru
CONDENSAN	Consortio para el Desarrollo Sostenible de la Ecoregion Andina(Consortium for the Sustainable Development of the Andean Ecoregion) coordinated by CIP
CORPOICA	Corporacion Colombiana de Investigacion Agropecuaria
CPAA	Centro de Pesquisa Agroforestal da Amazonia da Amazonia Occidental
CPAF	Centro de Pesquisa Agroforestal(Rondonia Acre)
CPATU	Centro de Pesquisa Agroforestal da Amazonia Oriental
DANIDA	Ministry of Foreign Affairs Department of Evaluation Research and Documentation Denmark
DICTA	Direccion de Ciencias y Tecnologia Agricola(Honduras)
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
FONAIAP	Fondo Nacional de Investigaciones Agropecuarias
GEF	Global Environmet Fund

IARC	International Agricultural Research Center
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International Crops Research Institute for the Semi Arid Tropics
IDB	Interamerican Development Bank
IFDC	International Fertilizer Development Center
IFPRI	International Food Policy Research Institute
IICA	Instituto Interamericano de Cooperacion para la Agricultura
IIMI	International Irrigation management Institute
IITA	International Institute of Tropical Agriculture
ILRI	International Livestock Research Institute
INTA	Instituto Nacional de Tecnologia Agropecuaria(National Institute for Crops and Livestock Technology)
IPGRI	International Plant Genetic Resources Institute
IPHAE	Instituto para o Homem Agricultura e Ecologia(Institute for Man Agriculture and Ecology) Porto Velho Brazil
IRRI	International Rice Research Institute
ISPAN	Instituto Sociedade Populacao e Natureza
NARS	National Agricultural Research System
NGO	Non Governmental Organization
PALMAVEN	Filial de Petroleos de Venezuela
PESACRE	Pesquisa e extensao em sistemas agroflorestais do Acre
PROCITROPICOS	Programa Cooperativo de Investigacion y transferencia de Tecnologia para los Trópicos Suramericanos
PROCIANDINO	Programa Cooperativo de Investigacion Agricola para la Subregion Andina

SWNM Soil Water and Nutrient Management

TAC Technical Advisory Committee

TSBF Tropical Soils Biology and Fertility Programme

TABLE 1

Work Breakdown Structure of Project to Enhance Effectiveness of Research for Agricultural Sustainability through Ecoregional Research in Tropical America

<p>Goal Improve management of natural resources devoted to agriculture in Tropical America in order to permanently reduce poverty and hunger maintain resource quality and increase agricultural productivity</p>			
<p>Objective Enhance effectiveness of agricultural and natural resources management research in Tropical America by improving the capacity to define and understand productivity problems in agriculture and extrapolate results among agroecosystems</p>			
<p>Output Enhanced capacity for cross country prioritization targeting and extrapolation through development of comprehensive environmental and agricultural land use data bases and associated models</p>	<p>Output Improved methods for research on technology development and policy at agroecosystems level through better targeting and extrapolation</p>	<p>Output More effective methods for identifying and prioritizing agricultural and natural resource problems in priority watersheds in agroecosystem consortia</p>	<p>Output Strengthened national capacity to manage and use georeferenced models and data for prioritizing and conducting resource management and agricultural research</p>
<p>Activities</p>			
<p>Develop digitized continental scale distribution information for systems based on maize wheat potatoes sweet potatoes sorghum agroforestry and grazing in Tropical America</p> <p>Analyze system environmental interactions through modelling and statistical analysis of land use distribution soils and climate data</p> <p>Determine homologies among key technology testing sites and production environments in order to improve germplasm and management targeting</p> <p>Appraise patterns of resource degradation through georeferenced analysis of trends in land use and resource productivity</p>	<p>Construct georeferenced temporal models to assess incidence and rates of changes in resource degradation and agricultural productivity aggregating across watersheds in agroecosystems</p> <p>Develop methods and more precise data to improve site selection and extrapolability of results in priority agroecosystems</p> <p>Develop georeferenced multiple stakeholder decision models for ex ante analysis of on and off site near and long term effects of alternative land uses and policies</p> <p>Prioritize agrobiodiversity conservation in target agroecosystems by georeferencing genetic resource data and develop models to identify candidate sites for <i>in situ</i> conservation for maize potatoes common beans cassava and <i>arachis</i> spp.</p>	<p>Develop efficient methods to identify problems and their biophysical and socio economic correlates (strategic field trials participatory appraisals process models)</p> <p>Improve methods for low cost assessment of long term consequences of problems (chronosequence studies long term trials farmer monitoring)</p> <p>Adapt existing crop and process models to develop methods for aggregation from field or farm to watershed in tropical conditions</p>	<p>Workshops at international level through IICA sponsored fora to enable NARDS to develop compatible data bases and planning models at sub regional level (eg PROCIANDINO)</p> <p>Individualized training and courses at national level to strengthen national capacity for using georeferenced models for research planning</p> <p>Training on utilization of models and data at watershed level for collective decision making and research management for institutions participating in agroecosystems consortia</p> <p>Bibliographic and information services on natural resource management research</p>

Table 2 Flow Diagram of Ecoregional Research

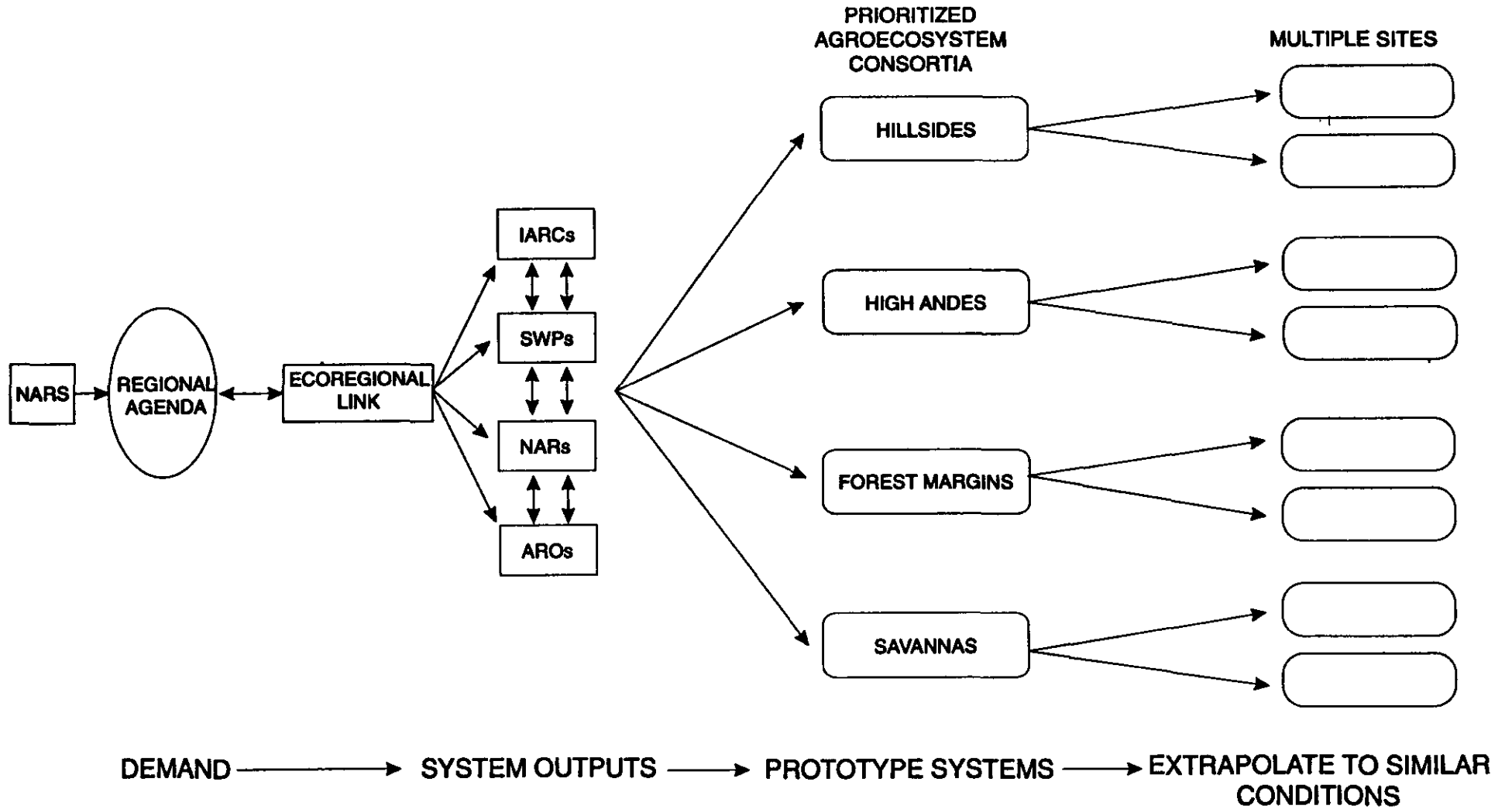


Table 3 Budget for 1995 Workplan to support Ecoregional Research in Latin America and Caribbean

Consultation meeting with agroecosystem consortia	25 000
Travel for bilateral meetings with senior NARS leaders	15 000
Travel for attendance to meetings of steering committees of agroecosystem consortia and PROCITROPICOS and PROCIANDINO	12 000
Consultants	50 000
High level workshop with NARS Leaders	28 000
Technical workshop	15 000
Communications and supplies	5 000
TOTAL	150 000

Table 4 Indicative Budget for Project to Enhance Research on Sustainable Agriculture for Ecoregions of Tropical America

Item		1995	1996	1997
<i>Total Program Requirements</i>				
Output 1	Enhanced capacity for cross country analysis prioritization and targeting	161	302	222
Output 2	Improved methods for research on technology and policy agroecosystems level	250	276	276
Output 3	More effective methods for prioritizing and extrapolating in selected agroecoregion watersheds sites	143	450	475
Output 4	Strengthened national capacity for resource management research	50	246	223
Output 5	Coordination and Information Exchange Linkages	150	80	80
Total		754	1354	1276
<i>Currently Identified Funding</i>				
Output 1	Enhanced capacity for cross country analysis prioritization and targeting	161	302	222
Output 2	Improved methods for research on technology and policy agroecosystems level	250	0	0
Output 3	More effective methods for prioritizing and extrapolating in selected agroecoregion watersheds sites	143	198	97
Output 4	Strengthened national capacity for resource management research	50	50	0
Output 5	Coordination and Information Exchange Linkages	0	0	0
Total		604	550	319
<i>Request to TAC</i>				
Output 1	Enhanced capacity for cross country analysis prioritization and targeting	0	0	0
Output 2	Improved methods for research on technology and policy agroecosystems level	0	276	276
Output 3	More effective methods for prioritizing and extrapolating in selected agroecoregion watersheds sites	0	253	378
Output 4	Strengthened national capacity for resource management research	0	196	223
Output 5	Coordination and Information Exchange Linkages	150	80	80
Total		150	805	957