SUMMARY ANNUAL REPORT 2003

PROJECT IP-06

Tropical Fruits, a Delicious Way to Improve Well-being

CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

SUMMARY ANNUAL REPORT 2003

IP-06 PROJECT

Title Tropical Fruits, A Delicious Way to Improve Well-being

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2 *Cooperators*

Within CIAT Integrated Pest and Disease Management (PE 01) Land Use in America (PE 04) Rural Agroenterprises SN 1 Participatory Research SN 3 use of Genetic Resources SB 2

Outside CIAT National Programs Colombia (CORPOICA SENA Corporacion Colombia Internacional) IPGRI Missouri Botanical Garden University of Queensland (Australia) PROTA University of Wageningen (Holland) ICRAF GFAR University of California Berkeley University of Florida

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[1] Many of the research and non research staff of CIAT have been involved in the discussions that have been revitalized in the strategies and operational plan of the Tropical Fruits Program They are not listed here but their input is hereby acknowledged and gratefully appreciated

3 *Budget*

Source	Amount (US$)	Proportion (%)
Unrestricted core	56 465	18 %
Restricted core (Colombia Agreement)	122 770	39 %
Carry over from 2003	28 790	9 %
Sub-total	**208 025**	66 %
Special projects	105 964	34 %
Totals	**313 989**	**100 %**

4 *Highlights in 2003*

The Centre s efforts in tropical fruit research and development in 2003 concentrated on (a) consolidating the basic strategies developed during the previous year and developing and implementing an operational plan and (b) setting up a more solid and stable funding base

The program has suffered from extremely limited and uncertain funding during the year and future funding is extremely uncertain this situation evidently makes coherent long term planning difficult The assured resources of essentially one internationally recruited staff member (75 %) and support are being used to (i) to search for financing (ii) to initiate research based on the long term strategies that will help attract funds and (iii) to continue with research to resolve problems identified by the Ministry of Agriculture and Rural Development of Colombia and (iv) to continue with the Sour Sop project funded by Spain (confirmed in the second semester of 2003)

In this report we present the funding situation modifications to the overall strategies and research and development activities

4 1 Funding

The program is financed principally by a small amount of core part of the Colombian contribution and the Spanish Government. The present financial tatus is not sufficient to implement the trategic plan, and hence an increased funding base is required The possible sources of future funding are an increase in the allocation of core resource a seed capital to set up the programme special project funding to implement specific components of the strategic plan and contract research At present the Centre has assigned less than 1 % of its projected unrestricted core budget to the fruit Fruit Program for 2004 (restricted core 1 all from the Convenic Colombia and 1 more akin to special project funding than core) This not only places the Fruit Program in a difficult situation due to the low level of core funds themselves but it also severely restricts the programs capacity to obtain special project or contract research funds Most CIAT special projects or contract research projects are heavily subsidized by core normally in the form payment of a large proportion of the salaries and

administrative costs directly from core Those programs that have a small core assignment are not able to use core as leverage to subsidise special projects and make them lower cost and hence more attractive to donors The fruit program lost the opportunity to carry out an interesting contract research project on Integrated Pest Control of Cape Gooseberry (*Physalis peruviana*) that was highly rated from a technical point of view due to the high cost of the project the project was eventually assigned to a university which had very low charges for scientists time The situation of the Fruit Program is further complicated by the fact that many donors are looking for projects which will have a direct impact on poverty in a short period of time this is difficult to achieve in a new program that is working with largely perennial crops and is starting from an extremely narrow knowledge base with few research results in the pipeline A consequence of this situation is that the future directions of the program are likely to be more dependent on the whims of specific donors than on the lines laid out in the strategic plan

The program is at a crucial point where it requires seed capital to build up a reputation so that it can present itself to donors as a viable unit that has an established research capacity Once the program is functioning and has reached critical mass it should obtain special projects that build on the demonstrated knowledge and expertise developed within the program That is to say the financial dilemna of the Fruit Program is that without a reasonable assignation of seed capital to generate knowledge and expertise the program will not be able to attract funding and yet without funding there is not the seed capital required

The solutions to this conundrum are not clear at present The possibilities all of which are being actively sought, are

- To increase substantially the core budget assigned to the Fruits Program either directly or through collaboration with core financed units within CIAT
- To attract a major donor interested in providing long term support for the development of an International Fruit Program
- Package the components of the proposed Fruit Program into individual projects and search for fiancing of the individual packages
- Incorporporate components of the Fruit Program into project proposals jointly presented by the Fruit Program and other projects

During the year a large number of concept notes and project proposals were prepared, often in collaboration with other entities within and outside of CIAT for presentation to several potential donors under the strategies outlined above These included ***The development of Homologue and CropIdent to determine what to grow where Better informed decisions through the integration of local and scientific knowledge Selection and Propagation of Proven Perennial Fruit Trees Bringing information symmetry in small holder coffee systems for intelligent production and transparent marketing of high value products Rapid selection of Sour Sop (Annona muricata L) suitable for specific agro ecological conditions*** (presented to Colciencias by Corporaracion Biotech with participation of CIAT) ***Integrated pest management for Cape Gooseberry (Physalis peruviana)*** presented with the National University Bogota Colombia ***Genetic resources of native and exotic fruit species in the Brazilian semi-arid region improved livelihoods through consolidated agribusiness in the irrigated areas of the Sao Francisco basin*** presented to the Water Challenge Program by EMBRAPA ***Zonas Aptas Para Produccion De Frutas Y Hortalizas Especificas What to Grow Where Technical Assistance to Strengthen the Production of Alternative Agricultural Commodities in Colombia and other Andean Countries*** and ***Flowers in the Park*** Colciencias approved the project on rapid selection of Soursop with the financial support destined to Corporacion Biotec and CIAT providing counterpart support from the final year of the Sour Sop project financed by Spain The project What to Grow Where was approved for funding at a reduced level by the USAID linkage grants scheme

4 2 Strategies

The mission of the Tropical Fruits program continues to be *'to use science technology and modern information technology to provide information and support to partners in the public and private sector that promote production processing and marketing of tropical fruits by rural communities which leads to increased wealth and improved welfare for present and future generations in the countryside*

The strategy continues to be to provide support for the development of Tropical Fruits in general without concentrating on any one particular fruit species At the same time we recognize that to develop general principles we will need to carry out research on specific fruits In general in these cases we try to ally ourselves with over agencies such as the development of techniques for rapid selection of perennial species in which Sour Sop is the model species and we work closely with Corporacion Biotech

The strategic research areas have been reviewed in the light of the possible donor interest and the expertise that we have in house It is difficult to develop coherent project proposals in fields in which we do not have in house expertise

The program is emphasing the following areas

- Targeting which crops or cultivars will grow well in particular conditions
- Generic research of general applicability to many fruit crops
- Agro-enterprise development
- Contract research

Market intelligence which was considered last year as one of the strategic initiatives has been place on hold as we do not have a great deal of in house expertise in this area and furthermore several other agencies are active in this particular field In the area of generic research of general applicability to many fruit crops we have not been able to obtain financial support for the flowering and post harvest deterioration initiatives On the other hand there has been limited donor response in the area of developing technologies for rapid selection of improved genotypes of perennial fruits and we have moved ahead in this area

4 3 What can be grown where

In last years annual report we noted that in agriculture one of the foremost questions is 'What can be grown in a specific site Furthermore the development of specialized software (CropIdent™ & Homologue™) was suggested as the first step in the development of a system to target what crops or cultivars will grow well in particular conditions CropIdent requires to be supported by databases on the individual plant species or cultivars and work commenced on the establishment of a working inventory of Neo Tropical Fruits

4 3 1 Homologue™ and CropIdent™

The tropical fruit program is deploying two major software tools to reach its goal of long range transfer of tropical fruit germplasm CropIdent™ will use a large database of information on crop characteristics to match fruit crops to potential environments This database and will be built up as financing becomes available to obtain and input new information as it becomes available Homologue will provide a complementary function and assist in the production of the CropIdent™ database The basic concept is that a farmer s field (target area) will be described The description will then be used to identify homologues elsewhere in the tropics Once these are known the local crops in these areas can be investigated with the view to introduction in the target area In this process information will be gathered that will provide input to the CropIdent™ database We also envisage Homologue being used to extrapolate from a small number of characteristic sites where fruit crops

are known to do well By combining Homologue™ probability estimates from these sites into a cloud of estimates we hope to overcome the minimum accession set restrictions of FloraMap™ and to be able to take a site description and use that to determine which crops or cultivars are likely to be successful under those particular conditions

A major potential restriction on the development of homologue was the search time that would be required to analyze and compare every variate of each pixel in the climatic databases to determine the degree of homology between pixels Attempts to obtain a generalized model that would fit climate into clusters or climate types based on individual eigenvectors of the climate variates only accounted for 70 / of the variance and this was not considered acceptable To obviate this problem we took information generated from real data on the distribution of species in FloraMap™ and used that define climate types based on mean temperature and variance of temperature that are reflected in real species distribution This approach makes it possible to eliminate from searches a large number of pixels that have a minimal probability of being homologous with the pixel(s) to which they are being compared

The algorithms have been developed to compare to determine the degree of homology of different sites An interesting feature is the ability to vary the degree of homology thus if one is dealing with a species that is believed to have a limited range of adaptation or if one wishes to be sure that two areas are highly homologous the variances can be modified to reduce the acceptable degree of variation This characteristic is expected to be extremely useful when expert opinion is linked in with homologue and CropIdent

We are also progressing on the development of the user interface for the software In addition arrangements have been made with the University of California Berkeley (USAID linkage funding) to develop methodologies for combining local knowledge scientific knowledge and expert opinion related to which crop succeed under which biophysical socio economic and management conditions These methodologies will then be incorporated into software modules to provide appropriate user friendly tools for each situation along with farmer or farmer group accessible outputs

If a particular site is georeference the climatic conditions of that site can be accurately estimated from existing climate databases Soils on the other hand are spatially much more heterogeneous and methodologies for on site evaluation of soils are required for successful use of Homologue and CropIdent Work has commenced on the development of a Rapid Soil Appraisal (RSA) methodology Revision of previous work suggests that the RSA can be based on the work in Mexico of Siebe Jahn and Stahr of the University of Hohenheim

4 3 2 Inventory of Neo Tropical Fruits

A first step in the setting up of CropIdent is to have a full inventory of all the potential crops In the case of tropical fruits we have initiated the establishment of a readily accessible database of Neo Tropical Fruits This work is based on the ethnobotanic inventory of neotropical fruits currently on the web which was developed by CIRAD FLHOR and IPGRI based on original work by Fouque This inventory was conceived a an electronic book and its structure is not appropriate for eventual incorporation into CropIdent and linkage to Homologue

In conjunction with IPGRI the information in the electronic book is being transferred to a structured database During this proce s additional information is being added with emphasis on geographical distribution of the species and the availability of germplasm Linkages are being established with such organizations as the Missouri Botanical Garden which have extensive databases on tropical plants with massive information on the geographical distribution of pecies

4 4 Participative Selection of Perennials

In spite of the attractive nature of new varieties of fruit trees as a means to increase rural income there are few examples of successful formal breeding efforts to improve perennial tropical fruit crops The lack of success in breeding fruit trees is related to few long term efforts to improve fruit trees particularly in tropical species and the long generation interval and period of testing required in formal breeding programs Furthermore with so many different fruit crops it is most unlikely that traditional research organizations will dedicate the time and resources necessary to structure comprehensive breeding programs similar to those developed for short season annual crops or food staples On the other hand most fruit tree varieties favoured and planted by farmers throughout the world are the result of selections made by farmers themselves or researchers from chance variation found in naturally occurring seedlings The key to successful u e of these selections i first of all to nurture them and recognise their value Second is asexual propagation which ensures that all the plants are genetically identical but which is also carried out in such a manner that systemic diseases are not propagated

A major potential limitation of participative selection of perennial species is the location specificity of the elite lines and hence the difficulty of transferring the technology We are developing methodologies to determine the similarity of sites in different locations (see above) and this will be used to determine in which areas the selected elite lines are likely to be successful

We have taken two species Lulo (*Solanum quitoense*) and Sour Sop (*Annona muricata*) and are using them as model species to develop methodologies for farmers and traders to select superior materials that are found spontaneously in the field multiply them and plant them in areas where they will perform well

4 4 1 Lulo

The work on Lulo is carried out in cooperation with farmers from the Mondomo Pescador region and the Tierra Adentro area of the Cauca department and CORPOICA and is partially financed by the Ministry of Agriculture and Rural Development of Colombia In previous years CIAT had improved upon micro-propagation techniques for lulo During the course of this year we demonstrated that micro propagated clean plants developed normally and produced well under field conditions

Farmers normally select seeds from lulo plants in their own fields for propagation these seeds do not breed true as lulo is open pollinated and hence farmers face considerable variability in their fields Occasionally farmers do propagate their best lulos by cuttings however these are normally infested with diseases and pests and the practice is not widely used We surmised that the new propagation techniques would allow farmers to select elite materials from their fields and reproduce them with a minimal transfer of diseases from one generation to the next

A meeting was organized in CIAT with farmers from the two regions to gauge their interest in the possibility of using the new technology to select elite materials and propagate them with minimal diseases infestation The farmers showed interest in the new technique and indicated the difficulties they had in controlling diseases and pests They al o expres ed their concern about losing genetic diversity and the need to maintain gardens with a variety of lulo types so as to be able to continue selecting improved materials in the future

After the initial meeting CIAT and CORPOICA representatives have visited the regions and with the farmers have defined the processes required to select, propagate and evaluate elite materials The basic scheme is for farmers to select elite material from their current production fields for CIAT to propagate the elite materials and return them to the farmers for them to evaluate Furthermore the

farmers themselves were concerned about genetic erosion and loss of their native germplasm negotiations are under way to obtain germplasm from CORPOICA to introduce to the region and to enrich the diversity of lulo for future selection

4 4 2 Sour sop

In collaboration with Corporacion Biotec we developed micro grafting propagation techniques Plants from micro grafts continue to perform well in the field in several locations and hence we now have the confidence to scale up these techniques for use on a commercial scale Corporacion Biotec is taking the lead in this project, and with CIAT support, has obtained a grant from Colciencias to develop commercial production of selected trees It is expected that Corporacion Biotec will convert itself into one of the Centres of Excellence that are a keystone of the research policies to support established production chains in Colombia (see below) In order to ensure that the farmers obtain materials that are adapted to their conditions and that are attractive to traders both farmers and traders will select elite material for propagation The material will be micro-propagated first of all in the CIAT laboratories but later as techniques are adapted for commercial production by a commercial nursery Profutales Distribution of material to new areas will be based on the work being developed in Homologue (see above) so a to ensure that selected materials are only planted in areas to which they are well adapted

4 5 Thematic Tropical Fruits Network

This year making use of REDECO s Internet experience to generate a flow and exchange of pertinent, updated information, the Tropical Fruits Program and REDECO plan to create a thematic network of users interested in the theme of tropical fruits The network will facilitate identification of the demand, capture and diffusion of specialized information, and will promote dialogue between users interested in belonging to the network From May 2003 the theoretical framework of the Thematic Network on Tropical Fruits was developed, and a survey prepared aimed at the REDECO community

4 6 Fruit flies

There are certain groups of pests that consist of a species complex that can attack and damage numerous fruit species The fruit fly complex is an example of a pest that can damage numerous fruit species and hence its study falls within our strategy of research on generic problems of fruits

In this initial study we aimed to establish a reference collection of fruit fly (*Anastrepha* spp) from the fruit growing regions of Valle del Cauca Tolima and Quindio Departments of Colombia to identify fruit hosts and the associated fruit fly species in the region and to develop laboratory rearing methods to eventually study the biology and behavior of these species

In Colombia fruit flies are a serious problem and are found in nearly all of the fruit growing regions of the country They are especially important for quarantine reasons in the export business and can cause considerably economic loss in the fruit industry In Latin America about 20 fruit fly species have been reported causing losses calculated at about 25 million dollar per year

In Colombia the most important species belong to the genera *Anastrepha Toxotrypana* and *Ceratitis* Of the three genera *Anastrepha* is considered to be the most important economically owing to the considerable damage it causes on different fruit species throughout the continent We collected mango guava papaya cassava chirimoya plum, zapallo (calabash) sour sop (guanabana) zapote (sapodilla) granadilla and papayuela in Quindio and Valle del Cauca Two hundred and twenty nine specimens were collected from these fruits spread across six separate *Anastrepha* species The species *A striata* was collected from guava in several localities in Quindio and Valle del Cauca There are

several other species reported from guava from these regions including *A fraterculus A obliqua* and *A ornate* The fact that only *A striata* was collected from guava may be related to the timing of the collections September to October 2002 This supports the need to sample fruits throughout the year in order to determine if seasonality exists for the different *Anastrepha* species and the time of fruit infestation

4 7 Anthracnose in Sour Sop

Colombia is the center of origin for sour sop and the crop suffers various problems caused by phytopathogens that have co-evolved with it, in particular anthracnose This fungal disease caused by *Colletotrichum* species is spreading as the crop expands into areas that are environmentally favorable for the fungus As a result, anthracnose is now a major constraint to soursop production in Colombia

In the initial samplings low incidence of disease was observed in commercial crops and in non commercial, household trees mainly because climatic conditions were dry Interviews with farmers confirmed that severe outbreaks of the disease occur in rainy seasons when management of the disease—understood by them as chemical control—becomes important. Sampling after the rains carried out on most farms confirmed that the climatic conditions of rainy seasons favor disease development in terms of dynamics and epidemiology

Inoculation by spraying and wounding the plant under high relative humidity (90%—98%) and at temperatures between 25 and 30 C reproduced characteric symptoms of the disease mainly in the stems This confirms that *Colletotrichum* spp are causal agents of anthracnose in soursop

The symptoms of the disease were described Four different types of isolates were identified from colonies grown on potato dextrose agar Three of these were selected for further studies Molecular analysis suggests that isolates with the same colony type present high genetic variability making necessary a molecular analysis for each morphological group We infer that high variation exists in the pathogen populations between different agricultural and climatic regions with geographic isolation and high variation within groups of isolates selected previously for their morphological traits such as colony diameter This suggests that more systematic analysis i required in *Colletotrichum* populations which cause anthracnose in soursop The isolates differed in their pathogenecity All the isolates from sour sop were sensitive to benomyl Of various plant extracts tested for control none inhibited fungal growth

These results showed the variability both phenotypic (i e morphological traits) and genetic (molecular traits) that exists within the causal agent of anthracnose in oursop The results also verified that different species of the pathogen are associated with the disease

4 8 New Research Policies for Fruit Crop Research

The Colombian Ministry of Agriculture and Rural De elopment (MADR) requested assistance from CIAT in designing research policies to support tropical fruit based enterprises Working closely with the MADR we have developed guidelines for more effective u e of research resources on Tropical Fruits Although the policies are directly related to the Colombian situation many of the recommendations are highly relevant to many other developing countries The development of strong national or local research capacity is a *ine qua non* for success in promoting tropical fruits and strengthening local capacity is an integral part of the program strategies

Fruit producers and all the actors who form part of the production chain depend to a greater or lesser extent on good technology in order to be competitive particularly when their efforts are dedicated to export markets Good technology is necessary to improve productivity and the quality of the final product and to maintain commercial enterprises in the face of new threats Furthermore effective technology depends on continued research support Thus for any agro business to be competitive it must be supported by research and technology development fruits and vegetables are no exception to this rule

Although research is sometimes seen as just another expense there is no doubt that investing in agricultural research is highly profitable providing economic benefits for the actors in the production chain and social benefits in terms of lower prices and improved quality for the consumers The research intensity[3] in the agricultural sector is approximately 0 62 in the developing countries (and only 0 14 / in Colombia) whilst it i more than 2 6 / in the developed countries[4] It is probable that the low competitiveness of Colombian producers is at least partially due to extremely low research intensity in agriculture over many years and without doubt very little research has been carried out in the horticultural sector

A marked difference between the developed and the developing countries is the lack of private sector research investment in the developing countries Recently it has been suggested that private non profit organizations could be an interesting alternative to close the gap between private and public sector research in the developing countries[1] In the case of Colombia this is already occurring with a considerable proportion of the total research effort being carried out by the CENIs (National Research Centres) financed by para fiscal funds obtained by levies on specific agricultural products

In the case of fruits and vegetables with a very limited number of centers of excellence and few strong producer groups the quality of the majority of the research proposals received by the donor agencies has been poor[5] In most cases the proposals do not form part of a long term research plan that has been discussed and agreed by both the research agency and the production chain

A workshop to discuss the National Fruit[6] plan recognized the deficiencies in the current research system The workshop highlighted the lack of articulation between different research efforts and the need to consolidate research in centers of excellence dedicated to individual crops with a critical mass of researchers in each Centre of Excellence It is worth noting that the system of specialized centers of excellence is found in several developed countries with individual universities and experimental stations concentrating their efforts on specific crops or work areas The recommendations of this workshop also imply that there is a need to improve the dialogue between researchers and the actors

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The production chain defined as the Group of economic agents who participate directly in the p oduction transformation and mov ment to th markets of the same gricultural product Durufle Fabre y Young Translated to Spanish by IICA)
www p ompex gob pe/p ompex/Inf_Sectorial/ gro/I DI MAC A/PilarCoral pdf

[3] Research intensity is defined as research expenditure as a percentage of the total gross product value of the ecto involved

Philip Pardey nd Nineke B entema (2001) Slow Magic www ifpri o g/pubs/fp /fp 36 htm

Personal communications f om officials of Colciencias MADR, SFN A and soh fru ol

[6] Clemencia Gomez Alva o Caicedo Panor C s erra y Jai o Osorio Rel torio del Taller del Plan Nacional de Frutale 26 No iembre 2002 CORPOICA Tibaitata

in the production chain noting that eventually research itself should become an integral part of the overall production chain

4 8 1 Proposed research system

The proposed Colombian national research system for fruits is designed to ***support the existing and future fruit production chains in such a manner that these contribute to increased income and improved welfare of the rural population*** Within this context the technology developed must be commercially and socially viable

Broadly speaking the research supports three different categories of production chains which are (i) existing production chains (ii) potential or incipient production chains and (iii) production chains dedicated to technology support. Each of these production chains has particular characteristics and these relate to specific requirements in terms of research support

The existing production chains are those in which the production, processing and marketing procedures are well established and are a carried out in a routine manner The new or incipient production chains are those that have not yet reached the point of including all the stages of the production chain which normally includes primary production in the field transformation and marketing At the same time they are production chains that could develop in the future

The concept of a technology export production chain is a novel one for Colombia and most of the developing countries We believe that there is an opportunity for Colombia to develop technologies based in its enormous bio-diversity and to sell these technologies abroad

4 8 1 1 Existing Production Chains

Research to support the existing production chains should support them by (i) solving existing production problems (ii) protecting the chain from potential problems (iii) opening up new opportunities

4 8 1 1 1 Features of the Proposed Model

The research system is based on the establishment of Centers of excellence which provide the production chains with the research and technology they require The centers of excellence will wherever possible be hosted by existing organizations such as existing research stations and universities These centers of excellence will have the following features

Concentration of re earch and development efforts in permanent Centres of Excellence formed for each production chain

The research and development agenda will be discussed with and approved by a Research Development Council whose members between them have excellent knowledge of the production chain and expertise in research and development

The Centres of Excellence will be the principal contact point between the production chain and research and technology development and will satisfy the research and technology development needs of its sector

The Centres of Excellence will ally themselves with other agencies so as to provide a range of technological innovations

Stable financing for the Centres of Excellence will be provided by coordinated actions by the financing agencies but will be contingent on meeting mile tones and providing required support to their respective sector with their continued existence dependent on satisfying the needs of the ector

4 8 1 2 Implementation of the Model

A series of well defined steps are needed to implement the model They include legitimizing the model and promulgating the policies to support its establishment Once the model is accepted its implementation involves bringing potential hosts of centers of excellence and production chains together with the production chains electing the hosts for their centers and establishing research and development councils for each centre At the same time the financing agencies will coordinate their activities so as to provide the centers with seed capital and also to finance projects[7] related to the need of the production chains that have been approved by the research councils

4 8 1 3 New or Incipient Production Chains

The essence of the research and development in new or incipient production chains is to develop new options for the horticultural sector Currently there is tremendous interest in developing new options for export

The initiative for developing new crops often comes from independent producers however the pioneers are often not able to appropriate a large proportion the benefits of their investment and the knowledge they have obtained In other words they are producing a public good in the form of improved and accessible knowledge which can be utilized freely by the rest of the population For this reason private entrepreneurs are reluctant to develop totally new options on their own

In agriculture and horticulture the most successful crops are normally introduced species grown far from their centre of origin Consequently there is a high probability that the most promising new options will be species from distant lands and local development agencies and researchers are probably not aware of their existence In addition agencies that are looking for new options are accustomed to looking at what are considered promising local species or those grown by neighbors

The research and development efforts geared to providing new options has to work simultaneously on two fronts the research must determine what new products could be produced in a particular regions and how those new products can be marketed

The optimal strategy for obtaining information on potential crops or species is by visiting areas similar to the target areas in terms of ecological conditions but which are geographically distant Once exciting prospects have been identified, exchange of germplasm and technical know will be necessary On the other hand marketing may be a case of opening up totally new markets or of competing in previously established markets Marketing of export crops will also have to be closely linked with quarantine problems of both importing germplasm, and exporting fruit products with attention being paid to assessing risks

4 8 1 3 1 Policy

CCI and other agencies will continue to study the potential for production and marketing new products and theses agencies will expand the horizons to include alternatives from other regions particularly Africa and Asia Marketing studies should be financed by ASOHOFRUCOL, ONGs official agencies such as MADR, Proexport and international agencies Universities and other research agencies such as CORPOICA and CENICAFE should assume the responsibility of looking for new crop options particularly well adapted to specific target regions of the country The

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[7] In the case of Public Universities CORPOICA or other publicly funded organization in which part of the their basic costs are financed directly from public funds it may be acceptable to institution using part of those funds as counterpart funding in order to avoid the state paying twice for the same service

prospecting should be based on looking for alternatives that grow well in areas that are ecologically similar to the target areas The MADR, Colciencias Asohofrucol and Proexport should finance these initiatives as long term development efforts The Centre of Phytosanitary Excellence (CEF) should continue in its role of risk assessment broadening its scope to include a wider range of options particularly those from other continents

4 8 2 Technology Export

The possibility of exporting fruit technology as opposed to fruits themselves is a novel and probably polemical idea for the developing countries Nevertheless there are two incontrovertible facts the majority of important export crops are cultivated more widely outside their centre of origin whilst at the same the basic germplasm required for their development resides principally in the centers of origin At present Colombia imports technology in the form of improved seeds a wide range of purchased inputs and most of the machinery for production and processing At present there is little incentive for the country to collect and develop its germplasm if the likely beneficiaries are farmers ins other parts of the world The question them becomes one of how to ensure that the exchange of knowledge and germplasm can be made economically attractive for those in the centre of origin who collect, and improve germplasm, and for those who use the technology for production It appears that there may be a possibility to exploit local germplasm and biodiversity by improving it and exporting the results

The policies required to achieve this are still being developed

5 *Problems and Solutions*

5 1 Funding Problems

The funding difficulties have already been alluded to in section 4 1 The solutions require at least partially strategic decisions in the Centre as a whole Principally these involve either (a) dedicating a greater portion of the core budget to setting up new programs such as Tropical Fruits or (b) a concerted effort by senior management and the project manager to identify a major donor who is wishes to enter into a long term partnership to develop a Tropical Fruits Program The current situation of looking for special project funding is largely untenable due to (a) the lack of a well established program to support special projects and (b) the lack of core leverage to reduce costs (see section 4 1

5 2 High transaction costs

The dependence of a new program for inputs from many other different projects results in a large proportion of the project manager s time being spent convincing or cajoling other project managers to collaborate The tropical fruits program needs to work with at least twelve[8] of the projects (and Institutes) and Regional offices that exist in CIAT More effective planning procedures with a more agile decision making process on what is to be carried out and mechanisms to allocate funds to those activities that form part of the agreed plan would improve the situation

In addition the different projects within the centre tend to compete for funds rather than work together to present combined proposals In a recent case more than fifteen concept notes were prepared and two were then accepted by management for development into full proposals with less than two months to go from concept note to proposal after internal approval A consequence of this short time frame is that much work must be done on developing the full proposal before the concept note is approved, so s to be able to prepare the full proposal before closing date This problem could be resolved by making early decisions on which proposals should be developed for specific donors In other words develop a plan for financing the different activities of the centre rather than a competitive grants scheme within the centre itself

[8] Genetic Re ource Land Us IPRA TSBF II M Rural Agro Ent rprises Rural Inno tion Institut Impact Studies Africa Central Am rica Asia

Tropical Fruits Indicators 2003

1 TECHNOLOGIES METHODS & TOOLS

1 1 Released Varieties

1 2 None The focus is on farmer selection of varieties

1 3 Genetic Materials Distributed

Selected Sour Sop clones being tested in farmers fields in Colombia selections of elite materials of Lulo (*Solanum quitoense)* made at the field level and under multiplication for distribution

1 4 Elite Material Developed

Elite Sour Sop clones under testing at the field level

1 5 Genetic Mechanisms Understood

Characterization of genetic variation in Sour Sop

1 6 Sources Identified

Elite genetic material of Lulo identified at field levelNone

1 7 Methodologies

Testing of methodologies for farmer selection of perennial cash crop

1 8 Rural Development Methods

Projects written and presented to donors for application of new technologies for farmer participatory selection of non true breeding woody species First testing of methods initiated at the field level

1 9 Decision Guides/Support Tools (models/software)

Conceptual basis for CropIdent established Progress mad on development of Homologue Formation of neo tropical fruit germplasm database underway

1 10 Data Bases or Maps

2 PUBLICATIONS

2 1 Refereed Journals Papers pre ented to Field Crops Research Acta Horticulturae and as co-author to Crop Science and pre ently under review

Books

2 2 **Book Chapters**

2 3 **Published Proceedings** James H Cock (2003) Homologue a tool to determine what will grow on my farm In Schmelzer G H and Omino F A Editors Plant Resources of Tropical Africa proceedings of the first PROTA workshop 23 25 September 2002 Nairobi Kenya 281 284

James H Cock (2003) La investigation com propulsor y suporte de la inovacion y el desarrollo tecnologico en el sector hortifruticola Memorias IV Simposio Internacional de Competitividad en Frutas y Hortalizas Bogota September 12 1 2002 pp 315

2 4 **Scientific Meeting Presentations** Plenary Presentation on the Importance of Research at the Annual General Meeting of Cevipapa

2 5 **Working Papers Other Presentations or Publications**

12

3 STRENGTHENING NARS

3 1 **Training Courses**

3 2 **Individualized Training**

3 3 **PhD M Sc and pregraduate thesis students**

2 pregraduate worked closely with 1 PhD student

3 4 **Workshops and Meetings**

Biotechnology and Plant Development, Bellagio November 2003

Fruit fly meeting organized by ICA September

Technical assistance

Colciencias and SENA evaluation of Tropical Fruit projects

CORPOICA assistance in planning of fruit crop program

MADR advise on fruit research policies

3 5 **ARO Research Partnerships**

4 RESOURCE MOBILIZATION

4 1 **Proposals funded**

Spanish Co ernment Cuanabana (Sour Sop) US$100 000

Colombia Convenio US$120 000

Colciencias Presented by Corporacion Biotec and CIAT Scaling up Propagation techniques for Soursop Approximately US$100 000 for Corporacion Biotech

4 2 Proposals and concept notes submitted

Spanish Government Flowering of Tropical Fruits & Perennial Propagation methods

Colombian Government: Integrated Pest Management for Uchuva

CP Water Challegne Genetic resources of native and exotic fruit species in the Brazilian semi arid region improved livelihoods through consolidated agribusiness in the irrigated areas of the Sao Francisco basin presented jointly with EMBRAPA

Presented to Asohofrucol Zonas Aptas Para Produccion De Frutas Y Hortalizas Especificas

To be presented to BMZ Bringing information symmetry in small holder coffee systems for intelligent production and transparent marketing of high value products developed under the leadership of Land Use

Presented to CG ICT/KM Better informed decisions through the integration of local and scientific knowledge developed by a multi project group in CIAT

Concept notes were also prepared and presented to various donors on the following themes The development of Homologue and CropIdent to determine what to grow where Selection and Propagation of Proven Perennial Fruit Trees What to Grow Where Technical Assistance to Strengthen the Production of Alternative Agricultural Commodities in Colombia and other Andean Countries and Flowers in the Park

In addition the project leader was actively involved in developing the concepts for the Learning to Innovate initiative

4 3 Resource mobilization activities

Active contact mainly by the Director General, with several donor agencies Up to the present we have not been able to identify a major donor prepared to provide long term support for Tropical Fruits

5 IMPACT MONITORED

Too early to start this!