REPORT OF THE CENTER COMMISSIONED EXTERNAL REVIEW (CCER)

1998

GENETIC RESOURCES DIVISION
PROJECTS IP-1, IP-2, IP-3, IP-4, IP-5

INTERNATIONAL CENTER FOR TROPICAL AGRICULTURE
(CIAT- CALI, COLOMBIA)

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EXECUTIVE SUMMARY

A Panel reviewed five projects in the Genetic Resources Division of CIAT from 15 20 November 1998 The projects were IP 1 Bean Improvement for Sustainable Productivity Input Use Efficiency and Poverty Alleviation Common Bean Breeding Strategy IP 2 Meeting Demand for Beans in Sub S thar in Africa in Sustainable W ays IP 3 Improved Cassava for the Developing World IP 4 Genetic Enhancement and Improvement of Rice and IP 5 Tropical Grasses and Legumes Optimizing Genetic Diversity for Multipurpose Use The Panel consisted of Dr J D Kelly Panel Chair and bean breeder at Michigan State University Dr C Borges do Valle Pasture Specialist EMBRAPA Dr J Jaramillo Subdirector and agronomist CORPOICA and Dr R S Zeigler Rice Pathologist and Irrigated Rice Program Leader IRRI

The Panel developed a set of Principal Recommendations for consideration by CIAT senior management as well as a specific set of recommendations for each project under review

Principal Recommendations

1 Beans rice cassava and forages (milk and meat) are the basic staples of many of the world s poor in tropical developing countries Research efforts to improve their quality and productivity are essential to improve the livelihood and welfare of both the rural and urban poor without long term commitments the quality and quantity of outputs will diminish as projects are unable to cope with the changing demands needs and opportunities

The Panel **strongly recommends** that CIAT management and BOT clearly reestablish their long term commitment to the four commodities and assure that adequate resources are then made available to each commodity to accomplish the objective set forth in CIAT s mission

2 The Panel detected three potentially serious deficiencies in CIAT's current structure that impact on the effectiveness of the projects under review (i) lack of a clear and stable alignment among projects in the Genetic Resources and Natural Resources Divisions (ii) lack of a framework for linking all institutional research relevant to a commodity and (iii) lack of a means for capturing synergies from interaction and/or collaboration among commodity projects The panel believes this is having a negative effect on the productivity and/or morale of the four projects under review There is the need to design a structure that efficiently integrates rather than fragments the commodity projects so as to strengthen both the institution and the projects The trend towards fragmentation of previously well integrated projects is particularly clear in the case of Cassava The failure to capture synergisms among germplasm projects is evident in the lack of management response to the proposed cross commodity marker aided selection initiative

> The Panel **strongly recommends** that management take immediate steps to align research projects between the two Divisions and establish mechanisms for linkages among projects within the Genetic Resources Division These measures must be derived from the first principles that originally inspired the dual thrusts in the Center

3 CIAT holds in trust extensive germplasm collections in beans forages and cassava In addition CIAT scientists have developed internationally recognized expertise through years of work and association with this germplasm They have engaged in strategic research in germplasm enhancement understanding and expanding genetic diversity and combining sources of resistance to a wide range of pests and pathogens and tolerance to different abiotic stresses This has resulted in the advance of fundamental knowledge of these species and in the release of germplasm adapted to a broad range of ecological niches CIAT's scientists have unique opportunities skills and experience to contribute to genetics on local national and international scales International recognition generates expectations and responsibilities that demand that these projects effectively integrate upstream research with germplasm enhancement

efforts However without strong and effective national public and privately supported delivery systems for improved germplasm and adaptive research CIAT s strategic research will be rendered largely irrelevant

The Panel **strongly recommends** that strategic research in germplasm enhancement be actively pursued without neglecting the downstream linkages so critical in the deployment of technology and achieving impact CIAT management must ensure that responsible public and private sector entities are identified or created and then supported for the delivery of outputs from research that fulfills CIAT s mission – even to the extent that unrestricted core funds are used

4 Public institutions depend upon sometimes fickle sources of funding and must adjust their research agenda according to donor and client interests There may appear to be only a fine line between chasing funds and adjusting to fundamental changes in the funding environment At times it may be necessary to accept large projects in order to shore up an institution s financial situation at the risk of distorting its long term strategies *However opportunistic gathering of small scattered and largely strategically irrelevant projects as a means of augmenting operational budgets is another matter entirely* The Panel appreciates that serious funding constraints in the past led CIAT management to encourage IRS to accept small externally funded projects in areas clearly outside CIAT s mandate and that at best contributed only very marginally to the Center s mission However these projects regardless of the level of funding that accompanies them consume the limited time of already over extended IRS from the high priority and well justified projects set forth in the Center s MTP The greatly improved funding environment as conveyed by the Director General suggests that this policy is no longer warranted Such projects come at a high cost as it is highly unlikely that they will generate outputs upon which CIAT can build for its long term strategic research agenda

The Panel **recommends** that the CIAT BOT deliberate on this policy matter and **strongly recommends** that CIAT management account in a transparent manner for the time expenditure of its IRS and support staff in projects or activities not explicitly presented in CIAT s Medium Term Plan

Specific Recommendations by Project

IP 1 Bean Improvement for Sustainable Productivity Input Use Efficiency and Poverty Alleviation Common Bean Breeding Strategy

1 The Panel strongly **recommends** that senior CIAT management play a proactive role in the establishment of research Foundations designed to replace the PROFRIJOL and PROFRIZA networks currently supported by the SDC in Central and South America The Foundations should be structured to deliver base food security in beans and maize to the poor in both regions through the use of improved agricultural technologies and germplasm CIAT management should design the donor and member structure of proposed Foundations to assure long term financial sustainability for research on the base food staples within each region

2 The Panel **recommends** that the project maintain the critical effort of tagging major genes of economic importance and positioning these on a genetic map This could open up the opportunity to locate gene clusters for disease and pest resistance and facilitate efforts to incorporate a broader range of valuable traits in improved germplasm

3 The Panel **suggests** that the CIAT bean project give serious consideration to evaluating the utility of gamete selection as a breeding method in comparison to other less demanding and more focused approaches

4 The Panel recognizes and applauds the integration and evaluation of improved germplasm of the bean project with other projects such as soils and IPM in Natural Resources The integration however needs to be better fostered at all levels outside of CIAT to ensure that the most elite bean germplasm is being evaluated in these projects Site specific participatory breeding in Central America is vital information for the bean breeding program The Panel **suggests** that every effort be made to include improved elite bean germplasm in those projects being conducted outside of CIAT

IP 2 Meeting Demand for Beans in Sub Saharan Africa in Sustainable Ways

1 The Panel **recommends** that CIAT administration maintain an active CIAT breeder in Malawi to ensure that the excellent work already initiated will be continued

2 The Panel **recognizes** the importance of the linkage of CIAT HQ and its interface with Africa in terms of technology and germplasm development Any weakening of that linkage would have far reaching negative impact on the Africa program The Panel supports the hiring of a bean geneticist at CIAT with partial (0 3) responsibility for the improvement of Andean beans given their importance in East Africa The rapid integration of that scientist into the project will be important to ensure that the flow of improved Andean germplasm to Africa continues without interruption

3 The Panel **suggests** that efforts be made to promote activities in bean breeding at the local level in order that local expertise be stimulated That could help to ensure long term sustainability of bean breeding in East Africa

4 The Panel **suggests** that scientists in the region need to consider publishing more actively in international journals in collaboration with either colleagues at CIAT HQ or elsewhere

5 The Panel **suggests** that the opportunity to collaborate with the Bean/Cowpea CRSP on specific research topics of mutual benefit and access potential resources within two collaborating U S Universities should not be overlooked

IP 3 Improved Cassava for the Developing World

1 The Panel **recommends** that the cassava project have at least a minimum critical mass to effectively develop scientific capacity and impact The Panel is concerned with the small size of the current cassava project

2 The Panel **suggests** CIAT needs to be aware of the changes in consumption and production due to the opening of the markets CIAT needs to adjust more rapidly to new demands through strategic planing

3 The Panel **stresses the need** to go towards upstream research in order to develop strategic scientific and technological products targeted at a wider array of consumer needs and more favorable growing regions

4 The Panel **suggests** that in the new environment the leaders of the projects dedicate time and efforts to pursue funds and institutional relationships Although they already have an overcrowded agenda some trade offs are needed Also certain profile traits should be taken into account for the leaders such as negotiating ability working with groups capacity and marketing skills

Specific Recommendations

1 The Panel **strongly recommends** that a funding mechanism such as consortium be established to integrate public and private sectors and support an efficient downstream system for technology transfer

2 The Panel **recommends** that CIAT administration fill the vacancy in physiology with an ecophysiologist to strengthen the research on cassava adaptation and understanding of the complex relationships existing in the different environment where cassava is grown Also the administration should consider meeting the need for a chemist or biochemist to work on nutrition root quality post harvest deterioration and starch uses in cassava

3 The Panel **recommends** the continued and expanded support for research on root rots and white fly pests as these are becoming more serious and widespread threat to cassava

4 The Panel **recommends** that emphasis be focused on pre breeding activities rather than on traditional breeding activities And also to reduce breeding sites from six to two distinct environments semi arid and sub humid regions These environments represent the most important zones for future cassava expansion and impact

IP 4 Genetic Enhancement and Improvement of Rice

1 The Panel **recommends** that management secure the current funding level for three to five years to enable the project on interspecific hybridization for yield enhancement to continue This project must at least reach the stage that its outputs are incorporated into the rice breeding gene pools and varietal development activities This is critical in light of the departure of the senior breeder leading this effort

2 The Panel is **concerned** over the departure of two very senior and experienced rice breeders (one from FLAR and one from CIAT s Rice Project) This is particularly worrisome in the case of the breeder managing the interspecific hybridization project and the genetics of resistance activities These activities require not only a very high level of breeding competence but an intimate

knowledge of rice germplasm in LAC and CIAT's germplasm pool as well. The Panel **recommends** that these positions be filled by mid 1999.

3. The Panel **suggests** that a process be developed to critically evaluate the advantages of the recurrent selection populations over the existing pedigree selection program and their potential contributions to enhancing genetic diversity in LAC commercial rice cultivars.

4. Once the transgenic rices for nuclear protein mediated induced cross protection for RHBV are available for use, the Panel **suggests** that a strategy for the combining and deployment of all the available genes be developed that will assure their long term durability.

5. The Panel **recommends** that sufficient resources be found (diverted if necessary) to see that analysis of the rice blast disease resistance is brought to a swift conclusion and the results published and applied in a timely fashion (see Recommendation 7).

6. The Panel **recommends** that CIAT vigorously pursue the placing of a joint IRRI/CIAT/IRS (equal cost sharing) to conduct research on integrated weed management with emphasis on herbicide transformed rices and physiological adaptation to wet seeding. This agreement should be finalized with IRRI before the end of 1998.

7. The Panel **strongly recommends** that the Rice Project undertake a concerted effort to publish its research outputs in a timely manner. This should include the establishment of specific (but realistic) publication targets (topics, target journal and expected submission dates) for each Project member and form a critical part of their annual performance assessment.

8 The Panel **suggests** that CIAT consider expanding its NRM activities to include critical water use efficiency issues in irrigated rice environments

9 The Panel **urges** CIAT to communicate more effectively to the global donor and scientific communities the vote of confidence in CIAT extended by Colombia with its core investment and the high esteem in which its research is held in its client countries as demonstrated by the creation of FLAR

IP 5 Tropical Grasses and Legumes Optimizing Genetic Diversity for Multipurpose Use

1 The Panel **recommends** that more administrative support and allocation of funding be given to the Forage Project leader and team for pursuing contacts and establishing multi institutional projects (international universities private enterprises in Latin America international funding agencies NARS)

2 The Panel **recommends** that the present Forage Network be strongly endorsed and boosted to become a multinational network therefore assuring the downstream adoption of the team s efforts The network should involve individual farmers as well as cooperatives foundations and forage seed companies which under the coordination of CIAT could establish trials in all stages of evaluation (from improved populations to grazing trials in order to evaluate animal performance)

3 The Panel **suggests** that every effort be made to ensure that activities related to pest and disease resistance and the use of molecular markers to hasten breeding for these traits in forages be promoted and supported by allocating appropriate core funding instead of dependency on special project funding

4 The Panel **suggests** that activities with forages related to conservation of natural resources be implemented through or together with Projects in Natural Resources

which internationally have been more successful in securing funds than commodity projects

5 There is a strong partner in animal production systems in Latin America – EMBRAPA Thus the panel **recommends** that the Forage Team seek close collaboration with Brazil so as to propose joint activities and utilize EMBRAPA s established infrastructure to evaluate promising germplasm from CIAT S breeding work under grazing systems (dairy/beef cattle goat or sheep)

II ORGANIZATION OF THE REPORT

This report is organized into seven sections The process followed for the review is briefly set forth in Section III In an Orientation section (IV) the similarities and differences are set forth among the different commodities under review A set of General Comments that highlight important issues dealt with in the review are presented in Section V Principal Recommendations that extend beyond the different projects and have larger implications for CIAT management are presented in Section VI The specific Project reviews are then presented in Section VII These individual project reviews follow the questions posed in the TOR as well as those presented to the Panel by the Director General during their informal orientation discussions with the Panel The specific technical and managerial recommendations for each project are found at the end of each review Appendices are included for the Terms of Reference the Panel review program and a list of CIAT scientists who participated in review activities

III PROCESS

The CCLR (Center Commissioned External Review) panel was charged with reviewing the following projects IP 1 Bean Improvement for Sustainable Productivity Input Use Efficiency and Poverty Alleviation Common Bean Breeding Strategy IP 2 Meeting Demand for Beans in Sub Saharan Africa in Sustainable Ways IP 3 Improved Cassava for the Developing World IP 4 Genetic Enhancement and Improvement of Rice and IP 5 Tropical Grasses and Legumes Optimizing Genetic Diversity for Multipurpose Use The panel met at CIAT Cali Colombia from November 15 20 1998 Previous to the Cali visit the Panel had been provided with ICER 98 Terms of Reference (Appendix 1) and briefing documents for the IP 1 IP 2 IP 3 IP 4 and IP 5 projects in the Genetics Resource Division The panel consisted of Dr J D Kelly Panel Chair and bean breeder at Michigan State University Dr C Borges do Valle Pasture Specialist EMBRAPA Dr J Jaramillo Subdirector and agronomist CORPOICA and Dr R S Zeigler Rice Pathologist and Irrigated Rice Program Leader IRRI

The week began with meetings with the Director of the Genetics Resources Division the Director General and a teleconference with Dr W Beaversdorf BOT to discuss the review The panel then met formally and informally with project mangers and scientists in the beans rice cassava and forage projects jointly and individually to review and discuss the five projects Visits included field greenhouse and labs in some cases In addition visits to the GRU and BRU were conducted to discuss the critical interface and interaction with the individual commodity projects The latter half of the week was spent in deliberations among panel members ad hoc consulting with CIAT staff and the writing of the final report The review concluded with a second teleconference with Dr Beavesdorf to discuss the draft review and proposed recommendation and a presentation of the report to the management team and the project managers The Director General was absent and was not involved in the final discussion

IV ORIENTATION

Like the rest of CIAT the four commodity projects are coming out of a difficult period of transition from a four commodity Center to a multifaceted institution that includes projects on germplasm enhancement for the four commodities integrated pest management natural resource management land use soils agroenterprises and impact assessment The Panel was asked to review only the germplasm improvement projects for beans (including Africa) cassava tropical forages and rice These commodities share a range of common features while each has its own unique set of characteristics Indeed it is their complementary nature that has maintained each as a central component of CIAT s strategy to alleviate poverty and hunger especially in LAC

These commodities constitute (or contribute to in the case of forages being the base for beef and milk production) to a large degree the daily diet of Latin Americans and are of major global significance They are particularly important for the poor and in times of economic hardship or disaster are the mainstays of survival It is noteworthy that during the Panel s visit CIAT was planning its participation in a major effort to alleviate the ravages of hurricane Mitch in Central America This effort focussed on assuring the timely delivery of large quantities of bean seed and grain for the region and complemented action by the CIAT sponsored Fondo Latinoamericano de Arroz de Riego (Latin American Irrigated Rice Fund—FLAR) doing the same for rice

All projects have put forward an ambitious program to target poverty alleviation and natural resources conservation reflecting a good internalization of CIAT s mission There is important and unique strategic research being pursued in each of the areas of germplasm enhancement and characterization The breeding programs are backed by strong germplasm collections Some better than others have undertaken actions involving farmers early on into their evaluation schemes to assure prompt technology transfer Farmer involvement also facilitates identification of research priorities Projects have adjusted to reduced manpower and budgets although there is still a ways to go for some The Panel was pleased to find overall reasonably high morale especially given the severe cutbacks that each commodity group has experienced in recent years

The major differences among the commodities can be summarized as follows

Beans are a self pollinated legume typically grown by small poor farmers who usually save their seed and who may or may not be integrated into the market It is a prized food over much of the region and is grown on a wide range of soil types and topographies There are a myriad of grain types that are often highly preferred in specific areas The crop is plagued by a large number of highly destructive pathogens arthropods and abiotic stresses and suffers serious post harvest losses CIAT is the leading bean research institution and has led in germplasm development for national bean improvement programs The center of origin of beans is in LAC

Cassava is a cross pollinated long season vegetatively propagated root crop with very high yield potential that is grown by small farmers on marginal lands that often suffer serious drought In some areas cassava is the only crop that will reliably survive to produce an acceptable yield Cassava farmers in LAC its center of origin are rarely well integrated into the market while in Africa it is the staple food in some of the most populous countries being actively traded There are only a few serious pests and diseases present in LAC and IITA covers most of the African production constraints Propagation material can be a problem in that it is bulky and can carry over pathogens It enters into regional and global trade as chips for animal feed and recently its high quality starch is attracting renewed commercial interest There is a poor international research structure

The **tropical forages** project works on a wide range of tropical legumes and grasses The species are typically selections from wild collections and are therefore quite rustic but sometimes marginally palatable or nutritious Grasses are mostly derived form African collections while legumes mostly come from the Americas Economically viable establishment of mixed pastures that persist under grazing remains a major challenge Target forage species may be used by very small to very large holders across the tropics The principal grass genus *Brachiaria* is afflicted with the severe pest spittlebug and the

legumes usually have a range of destructive pests and diseases Universities typically offer pastures curricula but CIAT and Brazil generate most research output

Rice is a self pollinated cereal crop that originated in Asia It is well integrated into the market economies of the region and being a wage good is politically important Rice has formal research programs in virtually all countries is grown by relatively large and technified farmers and has powerful advocates in the private sector (seed companies millers and well organized farmers groups) Most countries have statutory means of generating funds from the private sector to support research and extension through various kinds of check off systems There are a few serious and uniquely American diseases of rice in the region The Rice Project also can draw from an enormous collection of germplasm and strategic research through its links with the International Rice Research Institute Philippines Some projects (Beans and Forages especially) are facing serious uncertainty generated by impending lapse of external funding that supports key downstream research and technology transfer (eg The Forage network and Bean networks in Central America and the Andean zone) Rice has succeeded in stabilizing its funding base All have suffered serious attrition of key senior personnel although all are in various stages of recruitment Tropical Forages has the most formal linkages with other projects in the Natural Resources Division

V GI NI RAI COMMLNTS

1 CIA I m in igement is to be congratulated for successfully guiding this center through an extremely difficult financial and organizational period Hard but necessary decisions were taken and executed in a judicious and timely manner The result appears to be a financially secure and operationally stable center

2 The Panel was pleased to see an overall rather high level of morale among the scientists in the Genetic Resources Division The mood in every project was positive and focused on rebuilding and positioning the projects in pivotal strategic position for the next century of agricultural research

3 Viewing the mission of CIAT from a historic al perspective it is not always clear how the overall objectives of the current 16 individual projects mesh with the original mission of CIAT In our discussions with senior management the relevance of CIAT s commodity research to the needs of LAC region was not clearly articulated Approximately 50% of CIAT s budget is currently directed to the area of natural resource management in order to meet the perceived weaknesses in the original programs In addition CIAT feels justified in using the scientific capital of the Genetic Resources Division to address problems in tropical agriculture outside its stated mandate areas This decision appears to have been driven by a strong monetary need Its indirect effect on the productivity and effectiveness of scientific staff in their traditional project roles is not easy to assess other than the obvious time constraints that appears to exact a toll Scientists in the Natural Resources Division are strongly discouraged from following this policy and restrict research activities to the current CIAT mission Some uniformity in policy on this issue needs to be adopted between divisions

4 A number of project managers expressed the serious concern that the operations budget for their projects was too tight They indicated that a modest increase in that budget would greatly simplify their role as managers and increase their productivity

is scientists The amounts being sought were modest in all cases and seemed to be reasonable requests given the inordinate amount of time that project managers appear to have to devote to managerial tasks

5 Concern was expressed over the long term/short term funding situation in certain projects The need to seek funding for short term seed or germplasm multiplication could have drastic long term negative effects on improvement programs that were being neglected for lack of funds The optimum balance in many cases was being distorted towards the short term financial benefits CIAT s leadership role in germplasm enhancement in the four food/feed crops critical for the welfare of many of the poor is internationally recognized Thus greater consider t on should be given to strengthening their long term programs from which the future improved cultivars are to be derived

6 The Rice Project has successfully stabilized its funding situation and solved the upstream downstream dichotomy through the development of the FLAR However as we point out elsewhere in the document the special conditions of rice in LAC no doubt allowed this Such conditions do not exist for the other three commodities under review Nonetheless we believe that innovative long term funding solutions can be developed Possibilities include Consortia and Foundations and should involve a combination of members from the private and public sectors

7 The Panel had a general concern over whether certain complex problems could be adequately addressed in view of the personnel adjustments fragmentation across commodities and tight budgets Complex problems usually require an integrated team approach and in many instances are now being undertaken by a single scientist with a split appointment across projects In the absence of suitable collaborators at CIAT linkages across institutes may need to be fostered by offering opportunities for limited sabbatical leave for foreign scientists with expertise in these areas

5 The importance of the review process is recognized by the CGIAR system given the nature of the research being conducted at the IARCs the relative isolation of such centers and the requirements established by the donors However CIAT management needs to recognize the substantial time commitment that is demanded of its scientific staff obligated to frequent reviews due to the collaboration nature of their research projects Many staff in the Genetic Resources Division will be required to actively participate in reviews for three consecutive years Management needs to take a more realistic view of the time constraints and demands imposed of its staff when scheduling these reviews given the other expectations of its staff

VI PRINCIPAL RECOMMENDATIONS

1 Beans rice cassava and forages (milk and meat) are the basic staples of many of the world's poor in tropical developing countries Research efforts to improve their quality and productivity are essential to improve the livelihood and welfare of both the rural and urban poor Without long term commitments the quality and quantity of outputs will diminish as projects are unable to cope with the changing demands needs and opportunities

The Panel **strongly recommends** that CIAT management and BOT clearly reestablish their commitment to the four commodities and assure that adequate resources are then made available to each commodity to accomplish the objective set forth in CIAT's mission

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Division These measures must be derived from the first principles that originally inspired the dual thrusts in the Center

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strategies *However opportunistic gathering of small scattered and largely strategically irrelevant projects as a means of augmenting operational budgets is another matter entirely* The Panel appreciates that serious funding constraints in the past led CIAT management to encourage IRS to accept small externally funded projects in areas clearly outside CIAT s mandate and that at best contributed only very marginally to the Center s mission However these projects regardless of the level of funding that accompanies them consume the limited time of already over extended IRS from the high priority and well justified projects set forth in the Center s MTP The greatly improved funding environment as conveyed by the Director General suggests that this policy be no longer warranted Such projects come at a high cost as it is highly unlikely that they will generate outputs upon which CIAT can build for its long term strategic research agenda

The Panel **recommends** that the CIAT BOT deliberate on this policy matter and **strongly recommends** that CIAT management account in a transparent manner for the time expenditure of its IRS and support staff in projects or activities not explicitly presented in CIAT s Medium Term Plan

VII SPECIFIC PROJECT REVIEWS AND RECOMMENDATIONS

IP 1 Bean Improvement for Sustainable Productivity Input Use Efficiency and Poverty Alleviation

Project goals

The CIAT bean project is focused on germplasm enhancement to combine sources of resistance to a wide range of pests and pathogens tolerance to different abiotic stresses such as low fertility low pH drought stress adapted to a broad range of ecological niches on two continents The challenge is accentuated by the multitude of seed types differing not only in obvious seed traits but different genetic backgrounds sufficiently diverse to restrict free genetic exchange between diverse gene pools

The Research Program

Despite a drastic reduction in personnel the productivity demonstrated by the project has been very high A total of 67 publications in refereed journals 10 book chapters and a range of other articles are highly supportive of the productivity of the scientists A lag in these numbers would be expected given the usual two to three year publication delay and the limited staff in recent years

Given the opportunity that the CIAT bean team has to contribute to bean genetics on a local national and international scale that capability needs to be fostered and not repeatably damaged through attrition The scientists within the group are all recognized internationally for their merit and those capabilities should be explicitly recognized by CIAT Given the strong liaison with colleagues at major education centers the bean program is clearly poised to more effectively combine upstream research into germplasm enhancement efforts Upstream bean research in molecular markers gene tagging genetic characterization of pathogens white fly biotyping are highly visible and valuable technologies that provide CIAT scientists with a both international visibility and the high profile research sought by CIAT administration In addition these research activities put

CIAT scientists in a position to be more competitive in securing funding through collaborative projects

The Panel recognizes the critical need to maintain the effort of tagging major genes of economic importance and positioning these on a genetic map This could open up the opportunity to locate gene clusters for disease and pest resistance and facilitate efforts to incorporate a broader range of valuable traits in improved germplasm

Gamete selection has become a preferred methodology to combine many traits in early generations It assumes that these traits can be identified in the F1 generation and it assumes that all traits of value are similarly inherited Many of these assumptions are false and after making multi parental crosses the probability of finding the desired recombinants is very low In addition other valuable traits such as seed quality may be lost in the process and require further crossing to improve Any additional crossing will disrupt the previous gene combinations The Panel suggests that the CIAT bean project give serious consideration to evaluating the utility of gamete selection as a breeding method in comparison to other less demanding and more focused approaches

The Panel recognizes and applauds the integration and evaluation of improved germplasm of the bean project with other projects such as soils and IPM in Natural Resources The integration however needs to be better fostered at all levels outside of CIAT to ensure that the most elite bean germplasm is being evaluated in these projects Site specific participatory breeding in Central America is vital information for the bean breeding program The Panel suggests that every effort be made to include improved elite bean germplasm in those projects being conducted outside of CIAT

CIAT bean program needs to re evaluate the type of genetic materials being made available to NARS In order to show more immediate impact there is a tendency to send elite finished lines for testing This policy has spoiled many NARS bean programs in LAC as they expect and continue to expect finished materials for evaluation and potential release The ready availability of materials with a multitude of combined

economic traits hinders the development of local populations CIAT has not only been willing to make crosses advance and screen materials but indirectly CIAT scientists were possibly impacting negatively the agricultural research sector in many countries by releasing improved varieties

This dependency has long outlived its usefulness Governments and NARS looked to CIAT not only for bean germplasm needs given the presence of the large germplasm bank but also they sought finished varieties In many countries this eliminated all incentives to make crosses and advance or evaluate early generation materials Over time this perception has persisted and strengthened despite the obvious capability in local scientific staff In certain countries where independence was promoted by outside factors such as external support these programs with CIAT assistance have developed elite lines and cultivars on their own

Given the limited resources and personnel in CIAT there needs to be a revolution of the systems of technology transfer within LAC Clearly there will be differences among countries but access to germplasm should be given priority and not to the finished product despite the expected reaction Scientists in many countries view the challenge incorrectly they loose the perception and importance of creating a variety and give up the challenge all too quickly

CIAT needs to be careful not to establish a system of non sustainable long term dependency on other continents Consideration needs to be given to ways to set up a demand for a product as to drive future research rather than create a dependency through freely donated advice technology and germplasm

A balance must be struck between short medium and long term perspectives Certain projects by their nature are short term and results can be generated within a specific time Certainly not all science can be based on the hit and run model Research projects need to have a start and end date and clearly defined outputs But while more and more project funding is short term long term sustained scientific efforts that may yield the greatest returns are difficult to maintain Other projects are more difficult to maintain sometimes may be almost impossible to define or are not even relevant (e g

germplasm banks) Certain IARCs are commodity specific so long term improvement programs are never an issue allowing short term goals to be met and future improvement be advanced on these achievements Other research projects revolve around the central improvement programs in these IARCs There is a need however to sustain long term improvement efforts in the four commodities at CIAT and better integrate these activities within the system based approaches in the Natural Resource unit These commodities are the staple for the world s poor in many countries and in the absence of research directed at cultivar improvement in other institutes efforts to maintain and improve these commodities should be conducted at CIAT even for the sake of performing a social role in poverty alleviation

Resources available

During recent years the bean project has undergone serious retrenchment in personnel and resources The major concern within the bean project was the low staffing level that reduced the output of the project in certain areas The absence for 18months of a CIAT based bean pathologist and the critical need for a geneticist to interface with the BRU and GRU are the most striking examples of inadequate staffing levels to meet minimum expectations of the project The lack of staffing in these key positions put an inordinate strain on the other team members in terms of delivering results Fortunately the project is approaching some semblance of normality in this regard Currently there is a degree of optimism within the project unit with respect to their ability to meet the needs and challenges ahead of them

Upstream bean research are highly visible and valuable technologies that provide CIAT scientists with both international visibility and the high profile research sought by CIAT administration Besides it puts CIAT scientists in a position to be more competitive in securing funding through collaborative projects However without strong national program support CIAT lacks an effective delivery system for its improved germplasm

Two networks PROFRIJOL in Central America and PROFRIZA in Andean South America are critical players in the testing and dissemination of the germplasm and technologies developed by the CIAT bean program Without these networks the ability to deliver improved germplasm is severely restricted making the future of both networks a major concern to bean scientists at CIAT and to the international community The potential loss of PROFRIZA in December 99 and PROFRIJOL networks in 2002 would be a major limitation to all future bean genetic research conducted in CIAT for the LAC area Donor fatigue within the Swiss Development Community is a reality that could eliminate the downstream opportunities of CIAT in the area of bean breeding and genetics These networks need to be strengthened in both Central and South America At present there are efforts underway to form a Foundation supported by SDC IARCS Universities and NARS This activity needs to be aggressively promoted by CIAT administration Without the support to establish Foundations directed at the promotion and implementation of bean research the delivery system or conduit for all new advances in bean genetics will be non existent in these regions and the ability for CIAT to make impact in bean genetics will be lost

Project recommendations

- The Panel strongly **recommends** that senior CIAT management play a proactive role in the establishment of research Foundations designed to replace the PROFRIJOL and PROFRIZA networks currently supported by the SDC in Central and South America The Foundations should be structured to deliver base food security in beans and maize to the poor in both regions through the use of improved agricultural technologies and germplasm CIAT management should design the donor and member structure of proposed Foundations to assure long term financial sustainability for research on the base food staples within each region
- The Panel **recommends** that the effort of tagging major genes of economic importance and positioning these on a genetic map be maintained or reinforced This could open up the opportunity to locate gene clusters for disease and pest

resistance and facilitate efforts to incorporate a broader range of valuable traits in improved germplasm

- The Panel **suggests** that the CIAT bean project give serious consideration to evaluating the utility of gamete selection as a breeding method in comparison to other less demanding and more focused approaches
- The Panel **recognizes** and applauds the integration and evaluation of improved germplasm of the bean project with other projects such as soils and IPM in Natural Resources The integration however needs to be better fostered at all levels outside of CIAT to ensure that the most elite bean germplasm is being evaluated in these projects Site specific participatory breeding in Central America is vital information for the bean breeding program The Panel suggests that every effort be made to include improved elite bean germplasm in those projects being conducted outside of CIAT

IP 2 Meeting demand for beans in sub Saharan Africa in sustainable ways

The strong working relationship between the CIAT bean projects in LA and Africa has greatly benefited the subsistence bean farmers of East Africa Since 1983 the adoption and impact of CIAT lines has been unprecedented resulting in improved levels of productivity higher levels of disease and pest resistance while maintaining quality Can the level of impact be maintained given the current situation of the bean project in CIAT and the short term nature of the contractual agreements of CIAT staff in the East African region?

The Research Program

The Panel recognizes the importance of the linkage of CIAT HQ and its interface with Africa in terms of technology and germplasm development Any weakening of that linkage would have far reaching negative impact on the Africa program The Panel supports the hiring of a bean geneticist at CIAT with partial (0 3) responsibility for the improvement of Andean beans given their importance in East Africa The rapid integration of that scientist into the project will be important to ensure that the flow of improved Andean germplasm to Africa continues without interruption

CIAT must continue to focus on exploiting the variability in the germplasm bank through evaluation testing molecular screening and incorporation into elite materials of diverse seed types and genetic backgrounds This applies to all genetically enhanced materials that are developed regardless of the target market However the situation and needs between LAC and Africa are vastly different The need for elite materials to foster the growing utilization of improved bean genotypes in Africa is vital and CIAT is the only organization able to meet that need Germplasm enhancement directed at African countries needs to be continued if not strengthened if beans are to keep on making in impact on poverty alleviation The initial wave of improved materials were largely selections from the germplasm bank CIAT however needs to be wary not to set up a system of dependency in Africa based on elite finished materials which once

established will be difficult to retract in future years The Panel suggests that efforts be made to promote activities in bean breeding at the local level in order that local expertise be stimulated That could help to ensure long term sustainability of bean breeding in East Africa

The type and range of publications in Africa is in contrast to those published on beans in LA Emphasis has been placed on reporting results at workshops meetings and various proceedings essential for disseminating information locally Other published articles are mainly in local journals In order to improve visibility the Panel suggests that scientists in the region need to consider publishing more actively in international journals in collaboration with either colleagues at CIAT HQ or elsewhere

Given the funding constraints within the East Africa the Panel recommends that CIAT Africa establish a more active working relationship with the two Bean/Cowpea CRSP projects located in Tanzania and Malawi The Panel recognizes that the focus of the CSRP projects differs from the mission of CIAT but the Panel suggests that the opportunity to collaborate on specific research topics of mutual benefit and access potential resources within two collaborating U S Universities should not be overlooked

The germplasm and landraces grown in East Africa are recognized as possessing a narrow genetic base CIAT breeders however have identified traits for disease resistance in these materials that are not present in the core collection The Panel suggests that every effort be made to collect local landrace materials in different East African countries to preserve them for future evaluation and utilization

Resources available

The most immediate concern for the Africa bean project is the potential loss of a CIAT breeder in Malawi This scientist has focused on improving beans for abiotic stresses critically needed throughout all of Africa In addition the breeder has been the entry point for CIAT improved germplasm into southern Africa and been actively involved in breeding of local cultivars and distribution of improved germplasm Potential

loss of this vital position and linkage could have serious consequences for the region and the entire bean improvement effort in Africa

Project Recommendations

- The Panel **recommends** that CIAT administration maintain an active CIAT breeder in Malawi to ensure that the excellent work already initiated will be continued
- The Panel **recognizes** the importance of the linkage of CIAT HQ and its interface with Africa in terms of technology and germplasm development Any weakening of that linkage would have far reaching negative impact on the Africa program The Panel supports the hiring of a bean geneticist at CIAT with partial (0 3) responsibility for the improvement of Andean beans given their importance in East Africa The rapid integration of that scientist into the project will be important to ensure that the flow of improved Andean germplasm to Africa continues without interruption
- The Panel **suggests** that efforts be made to promote activities in bean breeding at the local level in order that local expertise be stimulated That could help to ensure long term sustainability of bean breeding in East Africa
- The Panel **suggests** that scientists in the region need to consider publishing more actively in international journals in collaboration with either colleagues at CIAT HQ or elsewhere
- The Panel **suggests** that the opportunity to collaborate with the Bean/Cowpea CRSP on specific research topics of mutual benefit and access potential resources within two collaborating U S Universities should not be overlooked

Project IP-1 Improved cassava for the developing world

The cassava plant is an important crop in Latin America Africa and Asia Its adaptation to different ecosystems especially to harsh environments as well as its versatility has made the cassava a main component of the rural and urban diets and an alternative in animal diets It is also a raw material in different industrial processes The cassava project has been leading several avenues of scientific research and transfer of technology that have had impact in the production systems Cassava serves the general objective of CIAT of alleviating poverty and transforming a crop of poor small growers into an important economic base for them The project has lead new industrial developments based on starch and components of balanced food for humans and animals New challenges to financial and human resources will be faced to meet expanding demands and opportunities offered by new developments The changes seen in the world economy as a result of opening markets will force the project and the Institution to develop new strategies and approaches New opportunities need to be generated for growers so that their production system can be more competitive and sustainable

Project Goals

The main goal of the cassava project is to increase and stabilize cassava production in diverse environments by developing and utilizing improved gene pools with different market potential in cooperation with NARS The project has centered its activities on the following three outputs

1 Evaluation and genetic improvement of the genetic base of cassava and *Manihot* species
2 Development of genetic stocks and distribution to NARS and IITA
3 Support and development of adaptive selection of improved cassava varieties in tropical and sub tropical Latin America and Asia

One of the major advantages of the cassava breeding activities at CIAT is the collection of 6 000 cassava accessions and 29 related *Manihot* species previously characterized for morphological biological and molecular traits The research goals have been clearly identified and prioritized with appropriate milestones specified Among these are the screening of resistance to major pests and abiotic stresses like white fly root root disease and mites Sources of improved root quality are incorporated through recombination and selection It is expected that the project should meet its objectives given the progress to date

Significant gains in yields and adoption have been obtained through enhanced biomass and harvest index such as the Rayong variety in Thailand New and improved breeding methodologies have been developed such as gene tagging mapping of progenies interspecific crossings and genetic stocks In the area of germplasm utilization the project has evaluated the cassava collection for resistance to different pests made inter specific crosses with four wild species as part of the germplasm enhancement program There has been a strong synergistic relationship between the germplasm unit and the cassava project Farmer participatory research approach in breeding has proved to be an efficient model to advance generations and directly evaluate germplasm with farmers and processors This scheme is becoming a means to conduct technology transfer in general given its wide approach and usefulness Results in breeding have strengthened CIAT position and could be used to negotiate new funds and support otherwise the continuity and timely delivery of improved germplasm will be limited by the lack of funds As the research demands a shift due to the changing economic environment priorities will have to be clearly defined in order to focus and direct the research This means that some priorities will change and both the project and CIAT management should be aware of these changes

For example in the case of Colombia there has been a very good working relationship with CORPOICA due to the opening of the economies CORPOICA had to prioritize activities on the areas for cassava growing based on economics and demand This meant

that not all places and activities of CIAT and CORPOICA were coordinated Therefore new strategies have to be designed by the two institutions to work together where they coincide In order to cover places where CORPOICA does not work other liaisons with the cassava project will have to be negotiated with NGO s

In relation to the markets it is important to consider that the final cassava product depends on a whole chain of components which starts with the seed Attention must be paid to each component in order to analyze and prioritize the areas in germplasm enhancement research that need to be addressed the most

Research Program

The Panel found an enthusiastic and highly motivated cassava project team with very high morale The research conducted by the cassava project is original powerful and opportune considering the constraints faced The balance between basic and applied research is not appropriate as too much emphasis is being placed on short term applied research As such the cassava should move into the upstream research leaving downstream research to NARS and other institutions working with cassava Cassava crop systems demand excessive activities in technology transfer that we feel should be done by groups other than CIAT A division of labor between partners will help to assign responsibilities The research activities and methodologies are in general appropriate to achieve the expected outputs However the lack of a chemist and support for quality on nutritional aspects and starch chemistry are limiting the expectations and the impact of results In addition the new demands on pests are stressing the capabilities of the project already diminished

On this respect the project group is advancing to the creation of a consortium as a way of linking with different countries sectors and institutions to obtain money for research CIAT management should encourage this activity because similar arrangements seem to be working well in the case of rice (FLAR)

The Panel stresses the need to replace the cassava physiologist given the needs to continue researching in agroecosystems and cassava development Also the departure of a researcher from CIRAD has left the research on quality nutrition and starch very weak Other possibilities with Institutions like CIRAD in France and Thailand Kasetsart University on this subject should be worked out

There is deep concern from the group of Cassava Research of the weakening relationship with the Agroindustry Unit This relationship has to be strengthened if useful results in cassava breeding activities are to be obtained Basic research on the biochemistry and molecular genetics of cassava starch can lead to the broadening of the scope for the marketing and industrialization of cassava products than can compete with other crops like grains and give new opportunities to the growers both small and extensive ones

Crop management aspects are important if new dwarf varieties are introduced to cassava production systems New developments on plant architecture and inter cropping systems will need to be designed

It is necessary that the research personnel understand and be aware of the changes that have taken place in the research process itself New activities and skills need to be developed by the researchers The multidisciplinary Inter Institutional approach should be implemented since it is not only a need but also strength in the future The ability to negotiate project funding should be a requisite for researchers leading projects

The number of publications per scientist is low and many were published as part of thesis conducted with local universities or published in local journals However considering the over burden of work compromises and extension activities it is commendable what they have published The Panel stresses that cassava scientists orient their publications toward international refereed journals to share the results generated by the cassava project In doing this CIAT has to provide a means and support for the researchers to stimulate publications in order to inform their peers in the field

Mechanisms such as the biotech network have done a good job delivering information to small producers This activity should be projected to cover a more wide arrangement of interested people in the crop Also the technical committee which did a good job before should be reestablished to continue supporting the timely flow of information among scientists involved in cassava research

Resources Available

The budget and staff of the cassava project is not enough for the delivery of the outputs although the facilities are adequate Every effort should be made by the institution to support the project because even with the high morale and enthusiasm encountered by the Panel the expected outputs may not be adequate We found a variety of alliances at project level but could be better structured The project itself has to continue looking for alliances and funds in a more proactive way A growing system of financing institutions for research projects both national and international and industrial contracts seem to be promising

The Panel is concerned with the actual size of the cassava staff in charge of research Only four part time specialists are working in the many aspects of crop development and technology transfer However the small group has made major efforts to built linkages and develops strategies to keep the ongoing and ever expanding research in cassava enhancement

Project Recommendations

General Recommendations

1 The Panel **recommends** that the cassava project have at least a minimum critical mass to effectively develop scientific capacity and impact for the future The Panel is concerned with the small size of the current cassava project

2 The Panel **suggests** CIAT needs to be aware of the changes in consumption and production due to the opening of the markets CIAT needs to adjust more rapidly to new demands through strategic planing

3 The Panel **stresses** the need to go towards upstream research in order to develop strategic scientific and technological products targeted at a wider array of consumer needs and more favorable growing regions

4 The Panel **suggests** that in the new environment the leaders of the projects dedicate more time and efforts to pursue funds and institutional relationships Although they already have an overcrowded agenda some trade offs are needed Also certain profile traits should be taken into account for the leaders such as negotiating ability working with groups capacity and marketing skills

Specific Recommendations

1 The Panel **strongly recommends** that a funding mechanism such as consortium be established to integrate public and private sectors and support an efficient downstream system for technology transfer

2 The Panel **recommends** that CIAT administration fill the vacancy in physiology with an ecophysiologist to strengthen the research on cassava adaptation and understanding of the complex relationships existing in the different environment where cassava is grown Also the administration should consider meeting the need for a chemist or biochemist to work on nutrition root quality post harvest deterioration and starch uses in cassava

3 The Panel recommends the continued and expanded support for research on root rots and white fly pests as each is becoming a more serious widespread threat to cassava

4 The Panel **recommends** that emphasis be focused on pre breeding activities rather than on traditional breeding activities And also to reduce breeding sites from six to two distinct environments semi arid and sub humid regions These

environments represent the most important zones for future cassava expansion and impact

Rice research in Latin America led by CIAT and in collaboration with IRRI and NARS has had substantial if not unprecedented impact on rice production in LAC over the past 30 years Through steadily declining real rice prices this has made a major contribution to poverty alleviation throughout the region for the millions of poor urban and rural consumers who depend upon rice as a primary staple Average yields continue to rise as marginal and fragile uplands are being removed from rice production and improved varieties on irrigated lands contribute more to regional rice production Thus the profitability of irrigated rice has indirectly made substantial contributions to the preservation of natural resources The contribution of CIAT research to this impact has been well documented and was clearly presented to the Panel (see briefing documents) There is every indication that this impact will continue and that the re oriented Rice Project is positioned to lay down the research foundation for further long term contributions to poverty alleviation sustainability of production and preservation of the resource base

For many good reasons CIAT is clearly moving more into the area of natural resource management (NRM) with its institutional overarching principle evolving towards one of Improving Land management Yet producing identifying and quantifying the impact of CIAT s efforts in NRM will be a major challenge and there will be a very long lead time before the impacts are readily seen Likewise there is good reason to believe that LAC will figure prominently in assuring global food security by substantially increasing its contribution to global rice supplies Thus the rice project will play an increasingly important role in the long term viability of CIAT by assuring a steady flow of large highly visible and easily quantifiable social and scientific impact

Project Goals

- The goals and objectives of the project are clearly put forth and relate well to CIAT s mandate and institutional goals The focus on expanding genetic diversity is well

placed given the relatively narrow base upon which most of LAC s rice production depends (in unfortunate consequence of the wide adoption of tropical indica semi dwarf varieties) The linkage with FLAR helps to assure th it the research priorities and objectives are consistent with regional demands

- The outputs of the project are clear and appropriate given the goals and certainly they are feasible within the time frame as demonstrated by mid term accomplishments
- The milestones are reasonably clear However they could be presented in a somewh it more quantified manner With very little extra effort estimates could be made for example of the numbers of lines to be generated for the new plant type crosses etc

Research Program

- The research program is well thought out with respect to the goals and objectives and very satisfactory progress is being made The following assessment is loosely based upon the logical framework presented in the MTP

  - There are several different paths being followed to achieve the desired broadening of the genetic base of LAC rice recurrent selection crosses with new plant types from IRRI and wide crosses with wild species for yield enh ncement

    - The successful wide hybridization between well adapted germplasm and wild species is an important development particularly with the preliminary indications that certain QTLs conferring higher yield have been transferred to the *Oryza sativa* backgrounds This is a visionary and exciting endeavor that establishes close linkages with ARIs (e g Cornell University) NARS and other CGIAR centers and CIAT is to be congratulated (See recommendation 1 & 2)

- The new plant types from IRRI are being rigorously and systematically examined for their potential contributions to the LAC rice gene pool As new iterations of a range of new plant types are developed by IRRI CIAT should make every effort to receive these materials as soon as they are available

- While it is prudent to adopt several parallel strategies when entering uncharted waters it may not be cost effective to pursue all of these indefinitely (See Recommendation 3)

♦ The Program maintains a conventional breeding program as one means of meeting its commitments to supply materials to LAC collaborators and manage the introgression into useable germplasm of transgenes that are expected to be available shortly (e g rice transformed for RHBV resistance via nuclear protein mediated cross protection) There is a well organized flow of germplasm clearly identified objectives and apparently effective methodologies to screen for the desired traits The distribution of early generations to NARS has assured that sufficient variation in crosses is available such that different varieties suitable for different environments can be derived from one cross

- Anther culture has been successfully incorporated into the breeding program as a routine tool It is used as an experimental tool (in the wide hybridization project) in conventional breeding to accelerate generation advance and as a means of minimizing the impact of sterility in indica x japonica crosses Problems continue however with the broad application of this technique to indica germplasm

♦ The project has clearly identified a few key constraints that are either limited to or have unique characteristics in LAC and that require strategic research investments suitable for a CGIAR center These are the rice *hoja blanca* virus (RHBV) /*Tagosodes oryzicola* complex (limited to the LAC region) and the blast disease (the fungal pathogen variants are extreme in LAC)

- Excellent progress has been made in refining the field screening for RHBV. It appears that a number of highly virus resistant rice lines will be released in the near future. Appropriate research has been conducted on the genetic variability of the virus (very low) and is underway on the mechanisms of resistance to the vector.

- There has been very good progress in developing an RHBV IPM scheme for Colombia. This program includes RHBV and *Tagosodes* resistant varieties, judicious and timely application of selective insecticides (against the nymphs of the vector) and monitoring of the percentage of vectors in the field. With the observed very high vector percentages of affected areas in 1997-98 (25% in some cases) the expected very high losses to the virus did not occur.

- In collaboration among virologists in the Rice Project and the Biotechnology Project a susceptible rice variety (CICA 8) has been successfully transformed with viral coat protein to provide systemic induced resistance. Convincing evidence was presented that this conferred effective resistance and that the resistance was effective during the first 20 days after emergence of the seedlings. Thus this resistance complements the currently used japonica derived resistance that is ineffective in the very early stages of plant development. Well conceived plans are in place to study how this gene will perform in different backgrounds and how it will behave in routine breeding programs (see Recommendation 4).

- DNA fingerprinting has been applied to simplify population analysis and it has been shown that different genetic families in the areas studied have repeatable differences in virulence spectra. Based on this information predictions were made as to which genes should be combined to confer resistance to the overall population. Early results indicate that significantly

higher frequencies of resistant plants are obtained following this approach than would normally be expected

- Selection at Santa Rosa (the blast disease hot spot site) has yielded a commercial variety (Oryzica Llanos 5) that has the highest known level and most durable blast resistance for any commercial rice variety The Program in collaboration with the Biotechnology Project is undertaking a molecular dissection of this variety to identify how many and which major genes and QTLs if any might be involved in mediating the resistance So far it seems that at least four major genes are involved with an undetermined number of QTLs

  - This analysis of resistance in Oryzica Llanos 5 is an extremely important undertaking that offers a rare insight into what are the genetic determinants of durable blast resistance The Rice and Biotechnology Projects have a unique opportunity to make a world class contribution to plant science However this project has been moving along very slowly (see Recommendation 5)

- Transgenic herbicide resistant rices will shortly be grown widely in LAC and thereafter in Asia There are important questions regarding the transfer of herbicide resistance genes into weedy (red) rices that CIAT should take the lead in addressing As this is an issue specific to direct seeded rice and as Asia is rapidly moving to direct seeded rice in response to rising wage rates and water scarcity it is equally important in Asia There are also a suite of strategic research issues related to sustainable weed management that are of mutual interest to IRRI and CIAT There are strong indications that CIAT and IRRI will agree to place a jointly appointed IRS to work in these areas in LAC (see Recommendation 6)

- The research quality has every indication of being at international standards with some of it being at the cutting of agricultural science The many topics mentioned above all merit timely communication to the scientific community

  - However the publication record of the project is deficient on an absolute scale (10 refereed publications from the project 1996 98) Given the varied apparently high quality exciting and relevant work the panel was presented it is difficult to imagine a credible excuse for this lapse Publication is not a scientific luxury With publication as an expected output there is pressure to plan the research and analyses properly and rigorously The peer review process provides unbiased and external assessments of the scientific quality of the research that is needed by research managers and donors Most importantly it is the obligation of the scientist to the community to report promptly and reliably their research products so that society can benefit from their application Publication is also a medium to showcase cutting edge research and position CIAT to secure future competitive funding (see Recommendation 7)

Linkages

What sets the Rice Project apart from the other germplasm improvement projects at CIAT is its strong linkage with rice farmers through the Fondo Latinoamericano de Arroz de Riego (FLAR – or the Latin American Irrigated Rice Fund) Founded as a response by LAC rice growers to the threat of the loss of access to CIAT s and other international rice research products its formation is a clear indication of the high regard in which CIAT s contribution is held This farmer funded regional organization is demand driven and focuses on rice improvement with research priorities set by LAC rice growers FLAR serves as a primary source of global rice germplasm introductions for all LAC countries through its support and management of INGER conducts the final breeding program for developing fixed rice lines suitable for release as varieties and serves as a principal delivery mechanism for rice germplasm By assuming these responsibilities FLAR frees the CIAT Rice Project to conduct more upstream basic

research and prebreeding without the risk of abandoning the downstream activities essential for impact It is autonomous from CIAT yet maintains very close linkages as its headquarters are at CIAT Palmira and both CIAT and IRRI are founding and sustaining members

This Fund provides the mechanisms for continued farmer input into research prioritization at the level of FLAR and via FLAR to the CIAT Rice Project In a very real sense this farmer researcher partnership is a highly sophisticated form of farmer participatory plant breeding CIAT should take pride in this tangible recognition of the importance of its research by its partners and take every opportunity to communicate this to the world This impressive innovation not withstanding there are issues that deserve scrutiny and will be addressed later in this section

The Rice Project has an excellent set of institutional linkages Through the FLAR there is free flow of information technology and demands among NARS CIAT and IRRI FLAR also has facilitated the placement of technical assistance within the Project in the form of seconded staff (e g from FEDEARROZ) graduate students and senior NARS scientists on sabbatical leave at CIAT (e g Cuba) The Project also has strong links with CIRAD (two senior scientists) Cornell and Purdue Universities WARDA and IRRI The Project has been creative in using such linkages to leverage resources to accomplish its research agenda

There are some presently minor cautionary points regarding FLAR

- Earlier concerns that many LAC rice producing countries would be denied FLAR s outputs are largely moot since most countries have now joined or are otherwise affiliated Efforts should be made to see that Peru Ecuador Guyana and Surinname join the special challenges presented by the latter two major rice exporters notwithstanding

- While FLAR is an outstanding model for international research collaboration there are some aspects that should be monitored closely The linkage with the rice growers sector should never curtail the strategic research effort of the Project (There is no evidence that this is occurring—on the contrary but there is the risk as FLAR matures and founding members move on)

- FLAR funds are often considered to be private rice grower funds however most are in fact de- ed from legally mandated check off monies They are in reality derived from a tax and are therefore public funds Each FLAR member represents its entire country and is responsible for the free flow of information in its country While the Panel is sympathetic with the argument that FLAR can not enter into the internal affairs of each member country it feels that mechanisms eventually should be put into place that will prevent a member from restricting access to information within its country

The Panel was puzzled to find INGER LAC and FLAR both of which are clearly and uniquely Rice Project activities listed under SN 2

Linkages within CIAT are strong with the Biotechnology Project and IPM scientists Beyond a modest effort in the Hillsides Project there is little linkage with other CIAT projects especially in the Natural Resources Division This is not surprising since these projects focus on marginal uplands where little rice is grown Nonetheless the Project has strong linkages with the Brazilian program (CNPAF) on upland rice pasture rotations for which two of the four most recently released rice varieties were from CIAT There is an opportunity for the project o play a key role in improving land management by linking with GIS and other groups in the Natural Resources Division to improve the efficiency of water capture and management The FLAR would be an excellent partner in this endeavor (see Recommendation 8)

Resources

There is a critical mass of scientists in the Project with a tight but adequate level of funding The group is doing an admirable job of producing prodigious and high quality outputs The visibility and impact of these outputs is an excellent return on the 1 5 5% of CIAT s budget that is invested in rice

The project has a good record of resource mobilization The development of FLAR has had important implications for funding of the Project principally in allowing it to free its precious resources to conduct strategic research that will bear fruit in 10 years or more This is a wise investment indeed by the LAC rice sector that deserves to flourish The Colombian government earmarks an important part of its contribution each year to CIAT for the Rice Project Additional funds come from the Rockefeller Foundation USAID and CIRAD

Considering the Colombian contribution of ~$500K specifically earmarked for the Project and a similar contribution from FLAR (that CIAT counts as a restricted core contribution) CIAT s investment of $500K is matched 2 for one Realistically if CIAT did not invest this $500K there would be no Colombian counterpart and no FLAR at CIAT The ratio and unpalatable alternatives are very attractive incentives to maintain the status quo in funding Such highly visible and specific support by one country for a CIAT activity is a compliment of the highest order and a show of solidarity that should be sources of great pride for CIAT (See Recommendation 9)

Rice Project Recommendations

1 The Panel **recommends** that management assures that the current level funding be secured for the project on interspecific hybridization for yield enhancement to continue This project must at least reach the stage that its outputs are incorporated into the rice breeding gene pools and varietal development activities This is critical in light of the departure of the senior breeder leading this effort

2 The Panel is **concerned** over the departure of two very senior and experienced rice breeders (one from FLAR and one from CIAT s Rice Project) This is particularly worrisome in the case of the breeder managing the interspecific hybridization project and the genetics of resistance activities These activities require not only a very high level of breeding competence but an intimate knowledge of rice germplasm in LAC and CIAT s germplasm pool as well

3 The Panel **suggests** that a process be developed to critically evaluate the advantages of the recurrent selection populations over the existing pedigree selection program and their potential contributions to enhancing genetic diversity in LAC commercial rice cultivars

4 Once the transgenic rices for nuclear protein mediated induced cross protection for RHBV are available for use the Panel **suggests** that a strategy for the combining and deployment of all the available genes be developed that will assure their long term durability

5 The Panel **recommends** that sufficient resources be found (diverted if necessary) to see that analysis of the rice blast disease resistance is brought to a swift conclusion and the results published and applied in a timely fashion (see Recommendation 7)

6 The Panel **recommends** that CIAT vigorously pursue the placing of a joint IRRI CIAT IRS (equal cost sharing) to conduct research on integrated weed management with emphasis on herbicide transformed rices and physiological adaptation to wet seeding This agreement should be finalized with IRRI before the end of 1998

7 The Panel **strongly recommends** that the Rice Project undertake a concerted effort to publish its research outputs in a timely manner This should include the

establishment of specific (but realistic) publication targets (topics target journal and expected submission dates) for each Project member and form a critical part of their annual performance assessment

8 The Panel **suggests** that CIAT consider expanding its NRM activities to include critical water use efficiency issues in irrigated rice environments

9 The Panel **urges** CIAT to communicate more effectively to the global donor and scientific communities the vote of confidence in CIAT extended by Colombia with its core investment and the high esteem in which its research is held in its client countries as demonstrated by the creation of FLAR

IP 5 The Tropical Grasses and Legumes Project

Unlike the other three commodities being reviewed tropical forages constitute a unique situation where a range of wild species and genera are being evaluated and bred with a relatively small team The team must generate basic knowledge and protocols that are given for most other commodities The situation in tropical forages is one of very few commercial cultivars available for recommendation and a large demand for any new improved genotype for use over extensive and extremely variable environments This situation certainly puts pressure for selection and prompt release of germplasm even prior to fully determining potential impact on animal production and the potential environmental impact of adoption

CIAT holds in trust an invaluable tropical forage germplasm collection both native and exotic which has been largely characterized and cataloged An important sub collection of grasses and legumes has been evaluated over different environments for several years through the RIEPT (International Network for Tropical Pasture Trials) with unprecedented impact on forage research in Latin America RIEPT fostered not only the introduction of promising novel germplasm into established animal production systems but allowed for training utilization of a common methodology and exchange of information among pasture researchers throughout Latin America The information gathered by RILPT constitutes today an important data base that is being heavily used in the Natural Resources Division GIS for determining target genera and species to incorporate into hillside and forest margins research CIAT continues to be seen as a leader in tropical forages research and as a focal point for integrating germplasm utilization and pasture research for the tropics But National Agricultural Research Services share a common concern over decreasing staff and budget allocation to Pasture Research in CIAT Does this signal a declining interest in forages and animal production by CIAT s administration in particular and by the international community in general? If so this is in contrast to trends in increased consumption of beef and milk throughout the world but especially in the expanding population in the tropics

It is unquestionable that important results can be delivered by the work underway at CIAT such as new improved varieties (*Arachis Stylosanthes Brachiaria* hybrids) or upstream techniques to hasten breeding procedures (molecular markers for spittlebug resistance and for apomixis) These will bring about large benefits not just to the production systems in Latin America and Asia but also to the scientific community in National Programs throughout the region

Even after the drastic cutback the project is well structured to respond to demands on its large germplasm collection and is especially suited to provide options for animal use and/or land and environmental conservation in variable production systems There are strong links between this project and Forage Genetic Resources and Biotechnology The Forages team is well integrated with several Natural Resources Projects (Farmer Participatory Research Partnerships for Agricultural Research and Development Soil /water conservation) providing stable grass and/or legume cover to improve fallow degraded lands and as alternatives for sustainable land use and small farming mixed production systems Important information gathered on forage genotypes evaluated for feed value and reaction to biotic and abiotic constraints in target environments constitute an invaluable data base to be utilized by GIS (PE 4) in predicting forage utilization and expansion to variable ecosystems

Research Goal Contribute to the improved welfare of small farmers by increasing animal production while conserving and enhancing the natural resource base

Project Purpose To identify superior gene pools of tropical grasses and legumes based on characterization of genetic diversity in plant attributes that can contribute to livestock and agricultural production and to protection of the environment in sub humid and humid areas

The following outputs were used to measure progress towards the research goals

- Grass and legume gene pools with known quality attributes

- Grass and legume gene pools with known diversity in host/parasite/symbiont interactions
- Grass and legume gene pools with known adaptation to edaphic and climatic constraints
- Superior and diverse grasses and legumes delivered to partners for evaluation

Are the research goals and priorities clearly identified? Milestones well indicated?

The project goal and purpose are clearly set Given the germplasm being exploited the experience accumulated and the progress reported so far there is clear indications that the objectives of identifying superior genotypes of tropical grasses and legumes and their utilization in sustainable agricultural systems in sub humid and humid regions will be fully attained assuming continued funding is provided

Milestones are clearly indicated and specifically refer to germplasm development and as such allow for easily monitoring of achievements

Are research objective feasible within the time frames?

The research objectives are ambitious but feasible if financial resources continue to be available for participatory research The project has established mechanisms for identifying demands by consultation with NARS livestock private sector small farmers participants with private consortiums and through special projects The proposed research activities encompass a wide array of priorities only limited by the size of the team involved and the number of species/genera involved

Research Program

The team is clearly geared to fulfilling CIAT s mission in alleviating poverty through the increase in animal output in diverse ecosystems while conserving natural resources The project s goal includes working on three target ecosystems hillsides forest margins and savannas by generating better forages for the welfare of small farmers

The project has wisely prioritized forage species based on accumulated experience germplasm collections available and limited human resources The team is spread thin (5 6 Staff) over several genera and species and has outlined a wide range of activities with numerous outputs and sub outputs The Panel is concerned that such widespread targets may not receive the in depth attention needed especially if significant staff time has to be allocated to searching for funds for the continuation of important in farm and participatory research

> The Panel **recommends** that more administrative support be given to the Forage Project leader and team in pursuing contacts for multi institutional projects (international universities private enterprises in Latin America international funding agencies NARS)

The impact or benefit of developing superior forage grass is somewhat scale independent where farm size is concerned i e a promising variety would benefit both the small farmer and the big rancher However the large farmer/rancher would certainly be in a better position to finance research activities related to improving this germplasm and should be involved early in the evaluation process Also the impact of such a development in the savannas for example where beef operations are anything but small farming is certainly much greater and may fully justify theirs and CIAT s investment Welfare of small farmers in this case may come indirectly as a spill over from research conducted with ranchers

Such is not the case for genotype by environment interaction in the case of legumes which are much more sensitive to both biotic and abiotic stresses Therefore these need to be evaluated for adaptation to the target environment under the conditions for which they will be recommended such as cut and carry dairy or dual purpose cattle soil cover green manure or extensive grazing by beef

Tropical forages are recognized as having lower quality/nutritive value when compared to temperate species Therefore it makes very good sense to emphasize nutritional value on grasses and legumes for animal utilization The approach of the project is scientifically and methodologically sound and involves basic (biochemistry and characterization of anti quality compounds) as well as applied research (genotype x environment interaction on quality parameters testing different germplasm for animal performance – milk yield)

Emphasis on screening forage germplasm for disease and pest resistance is an area of expertise in CIAT and one upon which the international community is very dependent The project is supported by the biotechnology team in this area on the identification of molecular markers for spittlebug resistance in *Brachiaria* the most damaging pest on millions of hectares planted to the susceptible cultivar *B decumbens* cv Basilisk Breeding for disease resistance has gained new pace this past year by the development of a faster and very practical greenhouse technique allowing for greater number of genotypes to be tested The development of a molecular marker could not only allow for greater accuracy but also for year round screening due to independence of live insect populations in the field

Anthracnose in *Stylosanthes* is also a major limitation to the adoption of this forage legume in animal production systems CIAT is actively collaborating with EMBRAPA and CSIRO in the study of this pathogen and important advances have been made and published

Given the potential impact of pest and disease resistance studies the Panel **suggests** that every effort be made to ensure that activities related to this subject be promoted

including by allocating appropriate core funding instead of dependency on special project funding

Grasses and legumes are grown over a wide array of climate and soils Pastures are usually established in marginal areas in view of the lower economical return as compared to crops Therefore it becomes increasingly important to identify germplasm with adaptation to edaphic and climate constraints This line is being pursued with the part time participation of a soil scientist Methodology is being developed to screen for adaptation to low soil fertility in both grass and legume species Other studies include adaptation of germplasm to cool climates poorly drained soils and dry season tolerance

A very important aspect of the Forages Project is the collaboration with the private sector in delivering selected grass and legume germplasm for on farm trials Seed of promising *Brachiaria* and *Desmodium* accessions are being evaluated through partnerships and should be released by 2000 in Central America and Colombia A range of *Brachiaria Arachis* and *Desmodium* accessions are being evaluated in a multilocational trial and a list of potential new cultivars should be available by 2000

There is increasing concern over lack of funding (93% of projects funds came from special projects) to pursue further multilocational trials and on farm testing of improved germplasm Therefore the Panel **recommends** that the present Forage Network be strongly promoted by CIAT management to become a multinational network thereby assuring the downstream adoption of the team s efforts

The integration of this team with projects in the Natural Resources Division is to be commended Selected accessions are being tried in different production systems being utilized to improve soil quality in marginal environments and to promote sustainable land use A workgroup has been formed to link the available forage data (mainly generated by RIEPF) with GIS in order to correlate geographic information to biological data thus enabling prediction of potential for forage utilization in variable and heterogeneous ecosystems

There is a good balance between basic and applied research considering the worldwide level of development in tropical forages research It is important to keep in mind that this project evaluates wild species where very little information or basic knowledge is available

Research quality is at international standards however the publication record is too concentrated on few journals (of 13 in refereed journals between 1997 and 1998 – 4 in CIAT s Pasturas Tropicales and 6 in Tropical Grasslands) We suggest that other channels be sought to inform the scientific community

Resources available

The project team has been drastically reduced during CIAT s restructuring but has adjusted its activities to the resources available Priorities have been defined accordingly and the logical frame proposed is consistent with international demands and attainable outputs

As a means of synergistically operating with the restricted staff levels the Panel **recommends** that the Forage Team seek close collaboration with NARS such as EMBRAPA in Brazil so as to propose joint activities and utilize established infrastructure to evaluate promising germplasm from CIAT S breeding work under grazing systems

Project Recommendations

1 The Panel **recommends** that more administrative support and allocation of funding be given to the Forage Project leader and team for pursuing contacts and establishing multi institutional projects (international universities private enterprises in Latin America international funding agencies NARS)

2 The Panel **recommends** that the present Forage Network be strongly endorsed and boosted to become a multinational network therefore assuring the downstream adoption of the team s efforts The network should involve individual farmers as well as cooperatives foundations and forage seed companies which under the coordination of CIAT could establish trials in all stages of evaluation (from improved populations to grazing trials in order to evaluate animal performance)

3 The Panel **suggests** that every effort be made to ensure that activities related to pest and disease resistance and the use of molecular markers to hasten breeding for these traits in forages be promoted and supported by allocating appropriate core funding instead of dependency on special project funding

4 The Panel **suggests** that activities with forages related to conservation of natural resources be implemented through or together with Projects in Natural Resources which internationally have been more successful in securing funds than commodity projects

5 There is a strong partner in animal production systems in Latin America – EMBRAPA Thus the panel **recommends** that the Forage Team seek close collaboration with Brazil so as to propose joint activities and utilize EMBRAPA s established infrastructure to evaluate promising germplasm from CIAT S breeding work under grazing systems (dairy/beef cattle goat or sheep)

APPENDIX I

Center Commissioned External Review
CCER 1998

A Center Commissioned External Review (CCER) is conducted yearly for part of the CIAT research program In a five year cycle the entire research program of CIAT is reviewed The next review will take place November 16 20 and will concern all science conducted in genetic improvement projects IP 1 to 5

Purpose of the Review

The purpose of this review is two fold First of all it is a review requested by the Board of Trustees They want to have a report from outside experts on the quality and relevance of CIAT s research The report of the review is therefor a BOT document and will be shared with the TAC Secondly although not yet implemented it is hoped that the CCER will replace to some degree the EPMR review conducted every five years The CCER is thought to be a less expensive and more relevant review as far as scientific quality is concerned when compared with the EPMR

The BOT will at its December meeting receive the panel report and recommendations with the draft reply from CIAT In the following December BOT meeting (1 year later) a report on progress towards implementation of the review recommendations will be discussed

To increase the value of this review CIAT will ask the review panel besides a report with recommendations for a separate report containing far reaching unconventional ideas that need to be dealt within the center Such ideas can be used in developing future strategies to contribute to a strategic plan etc but are not ready yet to be shared with the TAC

Terms of Reference and review Panel

The Board approved terms of reference are attached for your information Also attached is the guideline for the preparation of an about 8 10 page background document for each project for information t the panel

The review panel is composed of the following persons

Dr J D Kelly Chair bean breeder at Michigan State University
Dr J Jaramillo Subdirector CORPOICA (agronomist)
Dr C Borges do Valle pasture specialist EMBRAPA
Dr R Zeigler pathologist IRRI

September 16 1997

CENTER COMMISSIONED EXTERNAL REVIEW
CCER 1998

The CCER 1998 review concerns Genetic Enhancement and Crop Improvement which is concentrated in Projects IP 1 2, 3 4 and 5 and in PLAR Although reviewed this year the GRU and BRU will be linked to this review

The review will be conducted November 16 20, 1998 This date was chosen as it follows completion of annual reports and out posted staff can participate in conjunction to the Annual Review This date will allow for sufficient time to prepare the responses to the recommendations for the December BOT meeting

The review is chaired by Dr J Kelly bean breeder from Michigan State University Jim did his PhD at CIAT and remained a collaborator in various projects including the bean/cowpea CRSP

The Terms of Reference for the review are

a) Project goals
Are the research goals and priorities clearly identified and is the process to measure this adequate
Are milestone clear and well indicated and can their achievements be monitored
Are projected output and impact well defined and feasible
Are the research objectives feasible within the indicated time frame
Do the proposed research activities respond to regional priority demands

b) The research program
Are the proposed research activities and methodologies used appropriate to achieve the expected output
Is the research original and is the balance between basic and applied research adequate
Is the proposed science rigorous of international standards and is the peer review process in place to assure those standards
Are past research results and review recommendations used in planned activities
Is research progress adequate and according to projected outputs and impact

Is the quantity and quality of the of the various research publications adequate

Is the research adequately linked with other projects

c) Resources available

Is the right organization in place and can the expected outputs be delivered with the available resources (budget facilities and staff)

Are strategic alliances exploited with NARSs Universities NGOs and the private sector

Are fund raising activities adequate

Appendix 2 CIAT Participants in Panel Discussions

CIAT SENIOR MANAGEMENT

G Scobie
A van Schoonhoven
J Ashby

BIOTECHNOLOGY

William Roca
Martin Fregene
Zaida Lentini
Valerie Verdiere
Joe Tohme
Ann Marie Thro

BEAN PROJECT

Steve Beebe
George Mahuku
Cesar Cardona
Francisco Morales
Idupulapati Rao
Howard Gridley

CASSAVA PROJECT

Carlos Iglesias
Bernardo Ospina
Clair Hershey
Anthony Bellotti
Ann Marie Thro
Elizabeth Alvarez

RICE PROJECT

Fernando Correa
Carlos Buzzone
Michel Vales
Luis Eduardo Berrio
Marc Chatel
Lee Calvert
Zaida Lentini
Cesar Martinez
Jaime Borrero
James Gibbons
Luis R Sarint
Francisco Morales
Maribel Cruz

TROPICAL FORAGES

Carlos Lascano
Segenet Kelemu
Idupulapati Rao
César Cardona
John Miles
Daniel Peck
Michael Peters

GENETIC RESOURCES

Claudia Guevara

APLNDIX 3

CIAT

Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

Tentative Program
Center Commissioned External Review
CCER

16-20 November 1998

(All meetings will take place in the Quimbaya Room)

Saturday, 14 November

Arrival of Panel Members

Sunday, 15 November

Reserved for Panel work examination of reports TORs and first meetings

Monday, 16 November

08 00 08 30	Teleconference with Wallace Beversdorf
08 30 09 30	Meeting with Director General
10 00 12 30	Meeting with Project Managers Each project manager will introduce his project for 5 minutes followed by questions and answers (about 30 minutes per project)
14 00 14 30	Claudia Guevara Genetic Resources Unit
14 30 15 00	Willy Roca Biotechnology Research Unit
15 00 17 00	Reserved for Panel work
17 00 18 00	Happy Hour' VIP Room
19 30	Panel dinner with Director General CIAT dining room

Tuesday, 17 November

07 00 08 00	Breakfast with Dr Jacqueline Ashby Main Dining Room
	Visits with individual Projects The meeting is with all project staff and can include field lab and/or screenhouse visits The meetings start in the office of the respective project manager Very short introductory presentations can be made
08 00 10 00	Visit with Projects IP 1 and IP 2 (beans)
10 00 12 00	Visit with Project IP 4 and FLAR (rice)
12 00 13 30	Lunch
13 30 15 00	Visit with Project IP 3 (cassava)
15 00 16 30	Visit with Project IP 5 (tropical pastures)
17 00 18 00	"Happy Hour" VIP Room

Wednesday, 18 November

08 00 11 00	Panel work project staff on stand by
11 00 12 30	Visit to Genetic Resources Unit and Biotechnology Unit
12 30 14 00	Lunch
13 30 15 00	Panel discussion
15 00 16 00	Seminar by C Martinez Rice breeding with molecular markers (Nariño Room)
17 00 18 00	"Happy Hour"

Thursday, 19 November

08 00 09 30	Teleconference with Wallace Beversdorf
09 30 17 00	Panel work staff on stand by

Friday, 20 November

08 00 12 00	Reserved for Panel work
12 00 13 00	Lunch
13 00 14 30	Presentation of recommendations by Panel to the Management Team (Board Terrace)
14 30 15 30	Presentation to Project Managers (Quimbaya)
15 30 17 00	Reserved for Panel work Final Report writing
20 00	Dinner at Cali Viejo with Project Managers (Depart CIAT at 19 00 hrs

Saturday, 21 November

Departures

THE FUTURE OF CIAT?

The CGIAR98 Panel was asked to brainstorm on the future of germplasm research at CIAT. The following bullet points reflect the outputs of this process. These thoughts were solicited to serve as input into the first steps of CIAT's next round of strategic planning. The Panel opted simply to present these ideas without elaboration.

GERMPLASM RESEARCH

A center focusing on improvement of high value horticultural crops targeting the export market

Seed production and tissue culture multiplication center for high value intransigent neo tropical endangered species

Not for profit yet income generating (self sufficient) producer of licensed products of plant biotechnology for food and horticultural crops

Contractual plant biotechnology and seed production arm for one (or more consortium?) of agricultural products companies focussing on LAC

Campus for the Smithsonian (Harvard? UC Santa Cruz?) for basic research on tropical agriculture and biodiversity

A center focusing on developing germplasm for (and solving problems of) peri urban vegetables fruits and dairy production

Center for bioengineering of tropical crops for profit or not for profit

CENTER

Social center for poverty alleviation focus on technology transfer

Global Agricultural Research and Technology Think Tank

Tropical agricultural university

Self financing regional training center for biotechnology and social sciences

Tropical agro biodiversity research and advanced education park

Botanical garden containing tropical crops representation of LAC's biodiversity (trees?) and a museum of the Green Revolution

RESPONSE TO REPORT OF THE CENTER COMMISSIONED EXTERNAL REVIEW (CCER), November 15-20, 1998[1]

PROJECTS IP 1 IP-2 IP 3 IP-4 and IP-5

Update NOVEMBER 5 1999

A Panel reviewed five Genetic Resources Projects of CIAT from 15-20 November 1998 The projects reviewed were IP-1, Bean Improvement for Sustainable Productivity Input Use Efficiency, and Poverty Alleviation IP-2, Meeting Demand for Beans in Sub-Saharan Africa in Sustainable Ways, IP-3 Improved Cassava for the Developing World, IP-4 Genetic Enhancement and Improvement of Rice and IP-5 Tropical Grasses and Legumes Optimizing Genetic Diversity for Multipurpose Use The Panel consisted of Dr J D Kelly, Panel Chair and bean breeder at Michigan State University, USA Dr C Borges do Valle Pasture Specialist, EMBRAPA, Brazil, Dr J Jaramillo, Sub-director and agronomist, CORPOICA Colombia and Dr R S Zeigler, Rice Pathologist and Irrigated Rice Program Leader, IRRI

The Panel praised CIAT for successfully guiding the center through an extremely difficult time, during which a restructuring took place and hard decisions were made Staff morale was good and projects were found positioning themselves to meet the challenges of the next century The establishment of FLAR was praised, both as a fundraising mechanism and to link closely with the end user of CIAT technology Throughout the report the panel expressed concern about the narrow funding base of the projects under review

The Panel developed four principal recommendations for consideration by CIAT senior management, as well as a set of 31 recommendations in total specific for each project under review

[1] Nov 28 98

Principal Recommendations

1 Beans rice, cassava and forages (milk, and meat) are the basic staples of many of the world s poor in tropical developing countries Research efforts to improve their quality and productivity are essential to improve the livelihood and welfare of both the rural and urban poor Without long-term commitments the quality and quantity of outputs will diminish, as projects are unable to cope with the changing demands, needs and opportunities

> The Panel **strongly recommends** that CIAT management and BOT clearly reestablish their long-term commitment to the four commodities and assure that adequate resources are then made available to each commodity to accomplish the objective set forth in CIAT s mission

CIAT Board and management confirm their long-term commitment to the four commodities Donor support and the ability by the center to raise funds largely govern funding allocations to them CIAT will continue to monitor the rapidly changing agricultural sector, and will continue to consult with national systems in setting its research priorities

Update 1999 no update

2 The Panel detected three potentially serious deficiencies in CIAT s current structure that impact on the effectiveness of the projects under review (i) lack of a clear and stable alignment among projects in the Genetic Resources and Natural Resources Divisions (ii) lack of a framework for linking all institutional research relevant to a commodity and (iii) lack of a means for capturing synergies from interaction and/or collaboration among commodity projects The panel believes this is having a negative effect on the productivity and/or morale of the four projects under review There is the need to design a structure that efficiently integrates rather than fragments the commodity projects so as to strengthen both the institution and the projects The trend towards fragmentation of previously well-integrated projects is particularly

clear in the case of Cassava. The failure to capture synergism among germplasm projects is evident in the lack of management response to the proposed cross-commodity marker aided selection initiative

> The Panel **strongly recommends** that management take immediate steps to align research projects between the two Divisions, and establish mechanisms for linkages among projects within the Genetic Resources Division These measures must be derived from the first principles" that originally inspired the dual thrusts in the Center

The center decided to establish two separate, but interactive directorates to provide strong leadership and to be able to respond efficiently to the increasingly and highly specialized demands set by the research and farming sector Management and Board are determined that this organizational structure shall not hinder across project interaction Examples of definite action to realize this interaction are cited in various responses to recommendations They include the appointment of many staff members in more than one project, the role of pastures in NRM, participatory plant breeding, nutrient use, IPM development, etc to name some However, the center must continue to integrate all research activities to develop sustainable production increases The topic of Project interaction among GR projects will be an important priority in the management agenda The across project on marker integrated activity could not be funded in 1998, but is first priority for funding by the SRI in 1999

Update 1999 The across project on marker integrated activity was funded in 1999

3 CIAT holds in trust extensive germplasm collections in beans, forages and cassava. In addition CIAT scientists have developed internationally recognized expertise through years of work and association with this germplasm They have engaged in strategic research in germplasm enhancement, understanding and expanding genetic diversity and combining sources of resistance to a wide range of pests and pathogens and

tolerance to different abiotic stresses This has resulted in the advance of fundamental knowledge of these species and in the release of germplasm adapted to a broad range of ecological niches CIAT s scientists have unique opportunities skills and experience to contribute to genetics on local national and international scales International recognition generates expectations and responsibilities that demand that these projects effectively integrate upstream research with germplasm enhancement efforts However without strong and effective national public and privately supported delivery systems for improved germplasm and adaptive research, CIAT's strategic research will be rendered largely irrelevant

> The Panel **strongly recommends** that strategic research in germplasm enhancement be actively pursued without neglecting the downstream linkages so critical in the deployment of technology and achieving impact CIAT management must ensure that responsible public and private sector entities are identified, or created, and then supported for the delivery of outputs from research that fulfills CIAT s mission – even to the extent that unrestricted core funds are used

During its restructuring CIAT moved its research program up-stream Broadening the genetic base of its commodities is a priority research objective, as well as the deployment of relevant technologies made available through biotechnology, such as tissue culture, transgenic plants and marker assisted selection The need to deliver the output to the end users is met in a variety of ways For beans the principal mechanism is through the three regional networks, for rice through FLAR. Similar mechanisms are being sought for the other commodities These include NGO's, FLAR-like structures, etc

Update 1999 During 1999 CLA-YUCA was formed This is like FLAR a private sector funded research fund to conduct cassava research according to the needs of the end users

4 Public institutions depend upon sometimes fickle sources of funding and must adjust their research agenda according to donor and client interests There may appear to be only a fine line between chasing funds and adjusting to fundamental changes in the funding environment At times it may be necessary to accept large projects in order to shore up an institution s financial situation at the risk of distorting its long term strategies *However opportunistic gathering of small scattered and largely strategically irrelevant projects as a means of augmenting operational budgets is another matter entirely* The Panel appreciates that serious funding constraints in the past led CIAT management to encourage IRS to accept small externally funded projects in areas clearly outside CIAT's mandate and that at best contributed only very marginally to the Center's mission However these projects, regardless of the level of funding that accompanies them consume the limited time of already over extended IRS from the high priority and well-justified projects set forth in the Center's MTP The greatly improved funding environment as conveyed by the Director General suggests that this policy' is no longer warranted Such projects come at a high cost, as it is highly unlikely that they will generate outputs upon which CIAT can build for its long-term strategic research agenda.

> The Panel **recommends** that the CIAT BOT deliberate on this policy matter and **strongly recommends** that CIAT management account in a transparent manner for the time expenditure of its IRS and support staff in projects or activities not explicitly presented in CIAT s Medium Term Plan

CIAT is aware of the additional cost of managing projects outside the traditional mandate and their impact on mandate crop outputs To reduce that effect to the maximum possible, such projects carry full overhead recovery and should be lead by junior experienced staff to fulfill most of the research and reporting requirements And CIAT fully agrees with the recommendation that outside

mandate projects should not be sought with the purpose to raise money However, CIAT is convinced that its mission in the tropics to reduce poverty can sometimes be served much better by research on other than the mandated crops An example may be cited in research for the Colombian flower industry where 130 000 persons are employed, or research on tropical fruits CIAT sees fully financed research to support such industries could serve two purposes employment and income generation (reduce poverty) and as it often concerns a reduction in use of pesticides it attends the other pillar of CIAT's mission environmental protection Time spend on those and other activities are part of the yearly IRS workplans

Update 1999 The impact of trade liberalization on agriculture is becoming clearer Tradition food imports by developing countries are becoming huge Governments are looking for agricultural export markets and tropical fruits are an obvious target Seen the relatively large number of projects CIAT has in tropical fruits we decided to present this as a CIAT proposed activity in ICW 99 The proposal was very well received by donors, and should now seek TAC approval

Specific Recommendations by Project

IP-1 Bean Improvement for Sustainable Productivity Input Use Efficiency and Poverty Alleviation

5 The Panel strongly **recommends** that senior CIAT management play a proactive role in the establishment of research Foundations designed to replace the PROFRIJOL and PROFRIZA networks currently supported by the SDC in Central and South America. The Foundations should be structured to deliver base food security in beans and maize to the poor in both regions through the use of improved agricultural technologies and germplasm CIAT management should design the donor and member structure of proposed Foundations to assure long term financial sustainability for research on the base food staples within each region

CIAT fully agrees with this recommendation Several steps have already been taken to prepare for the continuity of these networks after the current financing ends in 1999 and 2002 This includes among others, discussion with current donor and search for alternative donors, grower and national government support to these networks

Update 1999 A proposal to create a new legume network for the Andean zone for joint funding by the private sector and SDC has been submitted This would replace PROFRIZA With CIMMYT the formation of an umbrella foundation called FRIDA, is planned to finance PROFRIJOL and an agreement to this effect was signed last September In addition, a concept note for the future funding of PROFIJOL was also submitted to another donor

6 The Panel **recommends** that the project maintain the critical effort of tagging major genes of economic importance and positioning these on a genetic map This could open up the opportunity to locate gene clusters for disease and pest resistance and facilitate efforts to incorporate a broader range of valuable traits in improved germplasm

We agree A new scientist was recently recruited (expected arrival early 1999), with cutting–edge experience in marker assisted selection and gene mapping

Update 1999 The scientist arrived in April 1999

7 The Panel **suggests** that the CIAT bean project give serious consideration to evaluating the utility of gamete selection as a breeding method in comparison to other less demanding and more focused approaches

This valuable recommendation will be followed up It is suggested to conduct parallel breeding experiments, comparing the cost and output to NARS of components of both, traditional pedigree (or its modifications) with gamete selection

Update 199 In stead of running costly parallel breeding experiments available data are being used to compare the cost and effectiveness of both breeding methods

8 The Panel recognizes and applauds the integration and evaluation of improved germplasm of the bean project with other projects such as soils and IPM in Natural Resources The integration however needs to be better fostered at all levels outside of CIAT to ensure that the most elite bean germplasm is being evaluated in these projects Site specific participatory breeding in Central America is vital information for the bean breeding program The Panel **suggests** that every effort be made to include improved elite bean germplasm in those projects being conducted outside of CIAT

CIAT agrees with this recommendation This forms part of the workplan of network leaders Interaction with the bean/cowpea CRSP and NGO's are other mechanisms exploited

Update 1999 no update

IP-2 Meeting Demand for Beans in Sub-Saharan Africa in Sustainable Ways

9 The Panel **recommends** that CIAT administration maintain an active CIAT breeder in Malawi to ensure that the excellent work already initiated will be continued

CIAT strongly supports the negotiations between the Government of Malawi and the DfID to support a breeder for Malawi or for the region Progress to achieve this goal has been slow and the outcome remains uncertain another donor may need to be sought

Update 1999 As there was no progress with DFID the Malawi government undertook action to allocate part of the EU bilateral funding to collaborative bean research This is now in an advanced stage of negotiation and is led by our BOT member Dr E Sibale

10 The Panel **recognizes** the importance of the linkage of CIAT HQ and its interface with Africa in terms of technology and germplasm development Any weakening of that linkage would have far-reaching negative impact on the Africa program The Panel supports the hiring of a bean geneticist at CIAT with partial (0 3) responsibility for the improvement of Andean beans given their importance in East Africa. The rapid integration of that scientist into the project will be important to ensure that the flow of improved Andean germplasm to Africa continues without interruption

This topic is related to IP-1, recommendation 6 The new assignment of the highly experienced breeder to support the African network has a greatly reduced responsibility as compared with his predecessor He will not need to support the Andean and Central American networks, which his predecessor did Time freed is available to more strongly support the African network. As this breeder has many years of bean breeding experience he will thus provide immediate support to Africa. The bean geneticist will also work on the implementation of marker assisted selection, for use by both breeders

Update 1999 The new bean breeder/geneticist has provided immediate support to the African bean network, as well as implemented marker assisted selection The cost of this in the case of bean golden mosaic resistance breeding is about half as compared to the traditional breeding

11 The Panel **suggests** that efforts be made to promote activities in bean breeding at the local level in order that local expertise is stimulated That could help to ensure long term sustainability of bean breeding in East Africa

Farmer participatory bean breeding is taking place in Ethiopia, Rwanda and Tanzania and is supported through special funding In addition, linkages with the system-wide farmer participatory project further respond to this recommendation However, there is a need to strengthen traditional plant breeding by NARS, especially in Africa

Update 1999 no further update

12 The Panel **suggests** that scientists in the region need to consider publishing more actively in international journals in collaboration with either colleagues at CIAT HQ or elsewhere

Publication record is an important (but not the only) part of the yearly performance evaluation system of all staff of CIAT CIAT encourages publication of research results with support staff and partners in the region This will stimulate doing research together and promote impact

Update 1999 no further update

13 The Panel **suggests** that the opportunity to collaborate with the Bean/Cowpea CRSP on specific research topics of mutual benefit and access potential resources within two collaborating U S Universities should not be overlooked

CIAT gives high importance to this recommendation, and is pleased to report that this is to a degree the case particularly in Africa, where an informal agreement exists on division of labor In addition, the CIAT bean project manager is a member of the technical committee of the bean/cowpea CRSP The Panel chair is a principle scientist of this CRSP

Update 1999 The Central American CRSP has developed excellent red seeded lines, which the CIAT network assists in promoting in the region and in the Caribbean Some of these lines are used as parents in our breeding program

IP-3 Improved Cassava for the Developing World

14 The Panel **recommends** that the cassava project have at least a minimum critical mass to effectively develop scientific capacity and impact The Panel is concerned with the small size of the current cassava project

CIAT shares this concern, however, it points out that the review took place after the resignation of the two breeders These are being replaced soonest In addition, CIAT

is attempting to involve the cassava feed and starch industry in supporting this project in a similar mode as was done for rice through the formation of FLAR. This would also assure close links with the end users despite the more up-stream nature of our research (see earlier recommendation)

Update 1999 the two replacements have taken up their duties In addition, CLA-YUCA was formed and is managed by an executive director to further strengthen cassava research and private sector interaction

15 The Panel **suggests** CIAT needs to be aware of the changes in consumption and production due to the opening of the markets CIAT needs to adjust more rapidly to new demands through strategic planning

The research project of any CIAT project is strongly influenced by two players farmers, mainly through farmer participatory projects (e g NE Brazil) and the needs of the starch industry, and their willingness to underpin their demands through financial support. It is not clear as yet if this industry strategy will be successful

Update 1999 see updates for recommendations 4 and 14

16 The Panel **stresses the need** to go towards upstream research in order to develop strategic scientific and technological products targeted at a wider array of consumer needs and more favorable growing regions

A plant breeder position in Asia has been converted into a geneticist position at HQ At this moment CIAT is in the interview process of potential candidates to fill that post

Update 1999 the biotechnology position was filled in July 1999 Due to the appearance of the African Mosaic Virus vector in Latin America, high priority is given to the development of lines for Latin America with resistance to this virus as its appearance in this region is most likely The breeder and the executive director of CLA-YUCA have

developed strong relationships with the private sector both in the starch industry as well as in the animal feed industry

17 The Panel **suggests** that in the new environment the leaders of the projects dedicate time and effects to pursue funds and institutional relationships Although they already have an overcrowded agenda, some trade-offs are needed Also certain profile traits should be taken into account for the leaders such as negotiating ability working with groups capacity and marketing skills

CIAT has appointed a temporary staff member to explore the formation of an FLAR-type structure for cassava to support cassava research and technology adoption by the industry Such a consortium, as is the case for rice, would assure delivery of technology to the end users See also response to recommendation 3
Update 1999 this fund was established in 1999

18 The Panel **strongly recommends** that a funding mechanism such as consortium, be established to integrate public and private sectors and support an efficient downstream system for technology transfer

See above recommendation
Update 1999 no update

19 The Panel **recommends** that CIAT administration fill the vacancy in physiology with an eco-physiologist, to strengthen the research on cassava adaptation and understanding of the complex relationships existing in the different environment where cassava is grown Also the administration should consider meeting the need for a chemist or biochemist to work on nutrition root quality post-harvest deterioration and starch uses in cassava

While we agree with this recommendation, its implementation will have to wait for additional resources

In spite of the lack of resources CIAT has signed an agreement with the physiologist of the National University to manage the physiology laboratory of CIAT Students have initiated research which may support both CIAT projects as well as those of the University

20 The Panel **recommends** the continued and expanded support for research on root rots and white fly pests as these are becoming more serious and widespread threat to cassava.

Root rots and whiteflies, both serious pests of many important food crops of farmers, require continued high-level research support. CIAT is the convener of the system-wide whitefly project, seeking aggressively support to manage this problem, cited as "the pest of the century" Research support by ORSTOM, France, has enabled CIAT to free time for the cassava pathologist to focus on the root rot problem

Update 1999 In addition, many crosses have been made involving the whitefly resistance sources which are currently under evaluation They will also clarify inheritance of resistance

21 The Panel **recommends** that emphasis be focused on pre-breeding activities rather than on traditional breeding activities And also to reduce breeding sites from six to two distinct environments semi-arid and sub-humid regions These environments represent the most important zones for future cassava expansion and impact

The newly selected cassava breeder, once he has assumed his duties, will evaluate the value of the different testing sites and will make recommendations for streamlining this work.

Update 1999 The recently appointed breeder has adjusted the breeding sites according to the demand from cassava growers Currently three environments are being utilized for selection the sub humid coast the acid soil savannas and mid altitude environments

IP-4 Genetic Enhancement and Improvement of Rice

22 The Panel **recommends** that management secure the current funding level for three to five years to enable the project on interspecific hybridization for yield enhancement to continue This project must at least reach the stage that its outputs are incorporated into the rice breeding gene pools and varietal development activities This is critical in light of the departure of the senior breeder leading this effort

CIAT Board and management are convinced of the importance of rice research It will support this within the financial climate of the center It is CIAT's intention to fill this consultant position at the full senior staff level, through redeployment of funds, including from a postdoctoral position in rice This research is among the most promising being conducted at CIAT

Update 1999 it is anticipated that this position will be file at the senior staff level starting January 2000

23 The Panel is **concerned** over the departure of two very senior and experienced rice breeders (one from FLAR and one from CIAT s Rice Project) This is particularly worrisome in the case of the breeder managing the interspecific hybridization project and the genetics of resistance activities These activities require not only a very high level of breeding competence but an intimate knowledge of rice germplasm in LAC and CIAT s germplasm pool as well The Panel **recommends** that these positions be filled by mid-1999

See response to recommendation above In addition, CIAT is concerned about the shortage of applied breeders in the private sector and their ability to contract them

Update 1999 See above The person we anticipate to fill the position mentioned in recommendation 22 is a highly experienced rice breeder with molecular training In addition Peter Jennings has been contracted on a part-time basis by FLAR Similarly Dr T Ishij another highly experienced rice breeder was hired to conduct rice breeding activities for the South

24 The Panel **suggests** that a process be developed to critically evaluate the advantages of the recurrent selection populations over the existing pedigree selection program and their potential contributions to enhancing genetic diversity in LAC commercial rice cultivars

CIAT fully agrees with this valuable recommendation It has the same intention and response as for gamete selection in beans, and will receive high priority in the rice breeding efforts

Update 1999 A workshop was held in Brazil to evaluate the advantages and contributions of recurrent selection in rice in September with participation from 9 countries All countries reported the recurrent selection had broadened the genetic base of breeding populations, improved adaptation to local conditions, yield etc All considered this method to have high impact in the future and considered this a priority research

25 Once the transgenic rices for nuclear-protein mediated induced cross protection for RHBV are available for use the Panel **suggests** that a strategy for the combining and deployment of all the available genes be developed that will assure their long-term durability

This is being attempted to secure a maximal duration of resistance genes deployed. The rice project has built this recommendation into its research plans

Update 1999 recombination of traditional resistance with transgenic was made and lines resulted with higher levels of resistance Clearance is sought from the Colombian government to evaluate these materials under field conditions obeying Colombian bio-safety guidelines

26 The Panel **recommends** that sufficient resources be found (diverted if necessary) to see that analysis of the rice blast disease resistance is brought to a swift conclusion, and the results published and applied in a timely fashion (see Recommendation 7)

Although possibly at a lower level of resources than under ideal circumstances, this work is pursued to the maximum possible for its application and publication This has been incorporated into the workplan of staff concerned

Update 1999 a molecular breeding course was conducted which included a one week section on blast resistance breeding using the results referred to Early 2000 manuscripts will be submitted for publication

27 The Panel **recommends** that CIAT vigorously pursue the placing of a joint IRRI-CIAT IRS (equal cost sharing) to conduct research on integrated weed management with emphasis on herbicide transformed rices and physiological adaptation to wet seeding This agreement should be finalized with IRRI before the end of 1998

CIAT and IRRI are in an advanced stage of negotiation to realize this highly desirable recommendation IRRI has agreed to the stationing of a scientist, and the level of recruitment is still under discussion

Update 1999 no further progress can be reported

28 The Panel **strongly recommends** that the Rice Project undertake a concerted effort to publish its research outputs in a timely manner This should include the establishment of specific (but realistic) publication targets (topics, target journal, and expected submission dates) for each Project member and form a critical part of their annual performance assessment

CIAT will monitor this recommendation as part of the workplans of staff concerned

Update 1999 this is part of the workplan for 1999 and manuscripts are expected to be ready for publication in 2000

29 The Panel **suggests** that CIAT consider expanding its NRM activities to include critical water use efficiency issues in irrigated rice environments

CIAT will be open to incorporate demands from the rice production sector in its research activities as a valuable field of cooperation and support exists This could include topics such as GIS tools to map zones suitable for rice according to water resources, soil management issues, etc

Update 1999 no update

30 The Panel **urges** CIAT to communicate more effectively to the global donor and scientific communities the vote of confidence in CIAT extended by Colombia with its core investment, and the high esteem in which its research is held in its client countries as demonstrated by the creation of FLAR.

CIAT agrees with this recommendation, which does not apply to rice only As an example, the (now ex-) minister of agriculture of Colombia was given a token of recognition for his support to CIAT in the plenary session of last International Centers Week in Washington, with all CGIAR donors attending

Update 1999 no further update

IP-5 Tropical Grasses and Legumes Optimizing Genetic Diversity for Multipurpose Use

31 The Panel **recommends** that more administrative support and allocation of funding be given to the Forage Project leader and team for pursuing contacts and establishing multi-institutional projects (international universities private enterprises in Latin America, international funding agencies, NARS)

CIAT agrees with this need, and each project seeks an optimal balance in its resource allocation between research and administration to manage the project and establish international linkages

Update 1999 Additional funding has been obtained and more is sought Private sector linkages and funding are beginning to be explored

32 The Panel **recommends** that the present Forage Network be strongly endorsed and boosted to become a multinational network, therefore assuring the downstream adoption of the team s efforts The network should involve individual farmers as well as cooperatives foundations, and forage seed companies which under the coordination of CIAT could establish trials in all stages of evaluation (from improved populations to grazing trials in order to evaluate animal performance)

The support from the system-wide livestock program to the Tropileche consortia is a mechanism to achieve this Additional support for this consortium is sought, as is for the case of the bean networks

Update 1999 No further update

33 The Panel **suggests** that every effort be made to ensure that activities related to pest and disease resistance and the use of molecular markers to hasten breeding for these traits in forages be promoted and supported, by allocating appropriate core funding instead of dependency on special project funding

CIAT agrees that such work is essential However, further resource allocations will have to wait for additional resources to come in

Update 1999 Research on the development of molecular markers for spittlebug resistance is now underway

34 The Panel **suggests** that activities with forages related to conservation of natural resources be implemented through or together with Projects in Natural Resources which internationally have been more successful in securing funds than commodity projects

This is being implemented in Central America, particularly Honduras and Nicaragua In addition joint project proposal for funding by BMZ, Germany is in an advanced stage to stimulate forage utilization in crop-livestock systems in joint research with NRM projects

Update 1999 A special project was approved for funding by Germany to execute this work on multiple-purpose forages

35 There is a strong partner in animal production systems in Latin America – EMBRAPA Thus the panel **recommends** that the Forage Team seek close collaboration with Brazil so as to propose joint activities and utilize EMBRAPA s established infrastructure to evaluate promising germplasm from CIAT s breeding work under grazing systems (dairy/beef cattle goat or sheep)

The Project manager and EMBRAPA partners have been asked to develop concrete proposals for close interaction, both under existing and additional funding situations Management, together with project staff will aggressively seek funding to support this collaboration CIAT agrees with reduced funding and an expanded research agenda, the only option to be successful is through doing research together

Update 1999 no further update