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Consultant Final Report
IICA/EMBRAPA-PROCENSUL II

PLANT GENETICS

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PLANT GENETICS

Consultant Final Report
IICA/EMBRAPA-PROCENSUL II

J
Enno Krebbers

Brasília, junho de 1989

INSTITUTO INTEFAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA
EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA

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APRESENTAÇÃO

A reprodução e difusão dos Relatórios de Consultores, no âmbito restrito das Diretorias das Unidades do Sistema Nacional de Pesquisa Agropecuária, vinculado à EMBRAPA, tem como objetivo principal o de divulgar as atividades desenvolvidas pelos consultores e as opiniões e recomendações geradas sobre os problemas de interesse para a pesquisa agropecuária.

As atividades de consultoria são realizadas no âmbito do Projeto de Desenvolvimento da Pesquisa Agropecuária e Difusão de Tecnologia na Região Centro-Sul do Brasil - PROCENSUL II, financiado parcialmente pelo Banco Interamericano de Desenvolvimento - BID e a EMBRAPA conforme os contratos de Empréstimo 139/IC-BR e 760/SF-BR, assinados em 14 de março de 1985 entre o Governo Brasileiro e o BID.

As opiniões dos consultores são inteiramente pessoais e não refletem, necessariamente, o ponto de vista do IICA ou da EMBRAPA.

A coordenação dos Contratos IICA/EMBRAPA agradecerá receber comentários sobre estes relatórios.



Horacio H. Stagno
Coordenador Contratos IICA/EMBRAPA



INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
IICA/EMBRAPA CONTRACT

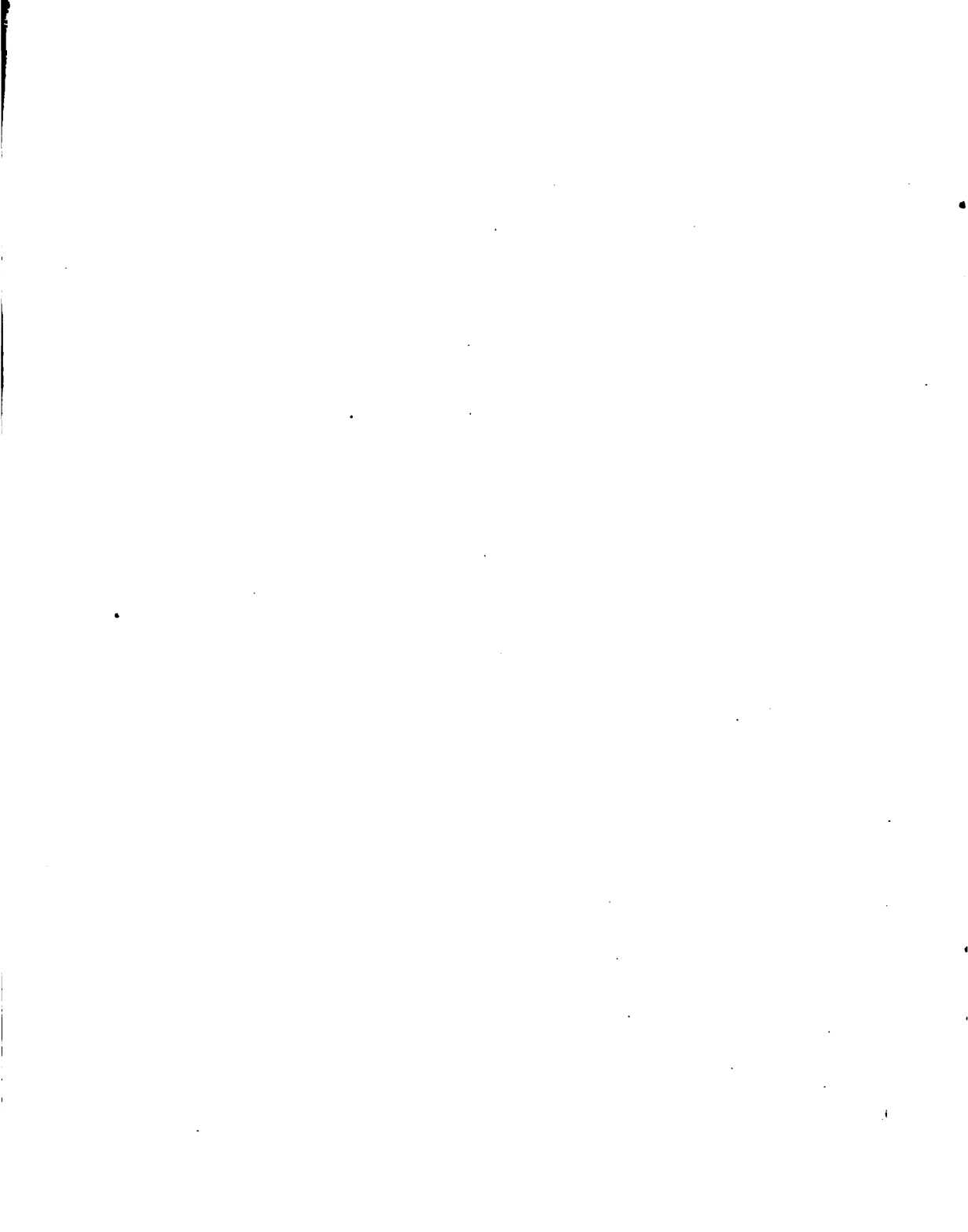
CONSULTANT FINAL REPORT

1. Consultant's full name: *Enno Krebbers*
2. Specialist in: *Plant Genetics*
3. Title of IICA Project: *2.SB.3*
4. EMBRAPA Program for which consultancy is provided:

PROGRAMA : *PROCENSUL II*
SUBPROGRAMA : *05 - CONTROLE BIOLÓGICO*

IICA Project Activity Code: <i>2.SB.3.</i>		Administrative Code: <i>R4894 B1B 03105</i>	
Title of Activity of IICA Project corresponding to this consultancy		<i>Cooperation with EMBRAPA on research and applications of genetic resources, biotechnology and biologic control of plagues, diseases and weeds.</i>	
CONSULTANT CONTRACT PERIOD		DUTY LOCATION (Center)	
<i>February 13 st. to 17st., 1989.</i>		<i>CENARGEN/EMBRAPA</i>	
CONTRACT EXTENTION PERIOD (If any)		DUTY LOCATION (Center)	

5. Financial support: *PROCENSUL II*



6. ACTIVITIES UNDERTAKEN BY THE CONSULTANT AND RESULTS

6.1 RESEARCH DONE UNDER DIRECT RESPONSIBILITY OF THE CONSULTANT

Research activities developed	Results Achieved
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The major purposes of the short (5 day) visit was to coordinate future collaborative work, establish lines of communication, meet the personnel involved, report on progress in related research at Plant Genetic Systems and the University of Gent, and to make recommendations as to the strengthening of the effort at EMBRAPA/CENARGEN. The results of these activities are reported in other sections of this document. No "hands on" research was performed in this period.

6.2 SUPPORT TO RESEARCH UNDERTAKEN BY OTHER EMBRAPA RESEARCHERS

Research activities developed	Results achieved
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It is a pleasure to acknowledge the hospitality of the entire group at CENARGEN. No direct "hands on" research was undertaken in this period (see 6.1).

6.3 TRAINING ACTIVITIES DEVELOPED BY THE CONSULTANT

Date	Training subject matter	Type of event*	Number of beneficiaries	
			From EMBRAPA	From other institutions

A seminar was given concerning work at Plant Genetic Systems and the University of Gent. This was attended by most of the molecular biology group of EMBRAPA. In addition, and more importantly, over the course of the entire week formal and informal discussions were held in pairs and larger groups with both students and scientific staff in which the implications of the results obtained so far were discussed, future strategy discussed, and technical advice given and received on subjects ranging from molecular and cell biology to tissue culture. It was agreed that a variety of manuscripts, protocols, and certain clones and seed lines would be sent to EMBRAPA to support the research efforts there. At least 15-20 people from the molecular biology and tissue culture groups were involved in the discussions.

* Short courses, seminars, conferences, etc.

6.4 IN-SERVICE TRAINING PROVIDED BY THE CONSULTANT

In-service training subject matter	Names of counterparts
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There was no formal "In-service training" program. See 6.3.

6.5 ACTIVITIES IN SUPPORT OF RESEARCH STRATEGY AND PLANNING

Research subject matter	Research program to which subject matter is concerned
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A major purpose of the visit was to coordinate the activities of PGS and EMBRAPA in the areas covered by the contract between the two parties. This was accomplished on the basis of a more detailed document of which Prof. Luis Antonio de Castro has possession; it is too long to be included here. Briefly, it was agreed that EMBRAPA will carry out research whose goal is to characterize 2S albumin gene promoters isolated from Brazil nut, and that PGS will supply certain vectors useful in this effort; that EMBRAPA will attempt to express 2S albumins from Brazil nut in tissues other than seed, and that again PGS will supply promoter cassettes useful in this effort. Discussion concerning the techniques needed to analyze the results of this work were discussed as well as which model plants would be best suited (see also section 8 concerning tissue culture work). PGS will supply any technical help it can on other, related projects at EMBRAPA not directly mentioned in the collaboration contract, and some recommendations concerning strategy were made.

6.6 ACTIVITIES IN SUPPORT OF OTHER CENTERS AND UNIVERSITIES IMPROVING THE RESEARCH CENTERS LINKS WITH ABROAD

Subject matter on which links were recommended	Persons, centers and universities recommended for contact
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As stated above, the major purpose was coordination of contacts and links with PGS and the University of Gent. EMBRAPA already has other contacts in the United States (UCLA and Florida); these were discussed and encouraged. As part of the contract between EMBRAPA and PGS it is possible for EMBRAPA personnel to come to Gent for short or long term training. A longer document, again in the possession of Prof. de Castro, summarizes the conditions under which this can take place and how to maximize the chance of success of such visits. It was emphasized that while the leaders of the EMBRAPA group are always welcome, it is important that young people and those people directly involved in technical side of the work should be able to benefit from such visits.

See also section 7 regarding possible interaction within Brazil.

6.7 PUBLICATIONS AND REPORTS UNDERTAKEN WITH THE CONSULTAT'S PARTICIPATION

Author(s)*	Title of publication or Report and other bibliographic identification
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Not applicable

* Personal, institutional, etc.

6.8 SUPPORT PROVIDED TO EMBRAPA RESEARCHERS IN THESIS AND DISSERTATION WORK

Name of the student	Thesis subject matter and synthesis of advice
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See sections 6.3 and 6.5. Several of the projects discussed will be carried out in part by students, who will thus benefit from the materials sent. Students particularly involved in the discussions were Deborah, Marcel, Thalís, Layla, and Vera (it was not always clear who was engaged in thesis work). Discussions ranged from possible choices of projects to more detailed technical advice to suggestions on where to best obtain basic theoretical training.

6.9 OTHER ACTIVITIES DEVELOPED BY THE CONSULTANT

Not applicable.

7. OTHER NATIONAL SYSTEM CENTERS, APART FROM DUTY STATION CENTER, ASSISTED BY THE CONSULTANT

Research center	Area of assistance provided by the consultant
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The consultant also visited the Federal University of Rio De Janeiro (Programa de Biotecnologia Vegetal). This trip was not undertaken at cost to EMBRAPA/CENARGEN. A much shorter but similar general discussion were held there. It was surprising to find that two groups working in similar areas and with to some extent complementary skills have little or no interaction. There are several areas where the two groups could profitably interact, perhaps most promisingly in a proposed project concerning the expression of 2S albumins in peanuts. These possibilities were discussed and arrangements made for contacts in the near future.

B. CONSULTANT'S SUGGESTIONS AND TECHNICAL OR INSTITUTIONAL RECOMMENDATIONS FOR THE IMPROVEMENT OF THE RESEARCH SERVICE

It is clear that the EMBRAPA/CENARGEN is developing into a solid research institute. However, there are some areas in which problems have or are developing which should be addressed as soon as possible in order to maintain and improve the productivity of the institute.

The most serious of these is the effort in plant tissue culture. The work in this area is currently handicapped by:

- a) A lack of good scientific leadership
- b) Material problems
- c) Personnel problems
- d) An organizational structure which will lead to inefficiency and poor motivation of the scientific staff.

a) Discussion with several members of the tissue culture lab showed that most or all were willing and able to work hard. However, in contrast to the molecular biology group, where 5-6 members of the staff with Ph.D.s and in some cases significant postdoctoral experience guide a similar number of students and technical staff, none of the members of tissue culture lab who joined the discussions had such experience (with the exception of one individual on a temporary stay), and in particular it was understood that none of the members of this group who work on projects related to the molecular biology effort have such experience. While some staff members will be returning from training overseas in the course of a year, the numbers mentioned will not be sufficient for the effort required. This situation is most unsatisfactory, and it is unclear how it was allowed to arise. While those staff present may do their best, that can be no substitute for the experience needed when problems arise. It is certainly not reasonable to expect untrained staff to develop transformation techniques for species and varieties not previously transformed, and the latter should be one of the main missions of the institute. Such efforts are specifically included in research plans, and are a logical role for an institute in a country with the numbers of as yet uncharacterized but very interesting species as Brazil.

b) Material problems: Conditions inside the laboratory are reasonable. However, it will not be possible to develop a broad program without adequate facilities for growing plants. During the visit there was only one greenhouse available for tissue culture work, and it is unsuitable due to poor maintenance and design. If this situation is not dealt with immediately, within a year progress in certain fields will stop simply because it will not be possible to grow transformed plants to seed. It is recognized that in Brazil financial means are limited, but this is no reason not to keep a greenhouse clean, free of weeds, and free of contaminating fungi. In any case the size of the greenhouse was insufficient, and a design not incorporating a paved floor will in the long run be more expensive to keep free of pests. It is thus urgently recommended that qualified technicians be consulted in the design of new greenhouses (for which funds were said to be available), and in particular for the design of economical temperature and humidity controls (the latter of which appears to be lacking in the current structure). The climate at the research station is not such that the most expensive apparatus is needed. In any case a hardened (probably concrete) floor should be installed; while initially more expensive the costs of maintenance and pest control will be considerably lower. At least 2-3 greenhouses the size of that observed should be dedicated to the needs of the tissue culture/molecular biology group.

In addition growth chambers will need to be made available. It was explained that funds for maintenance of these were limiting. It should be made clear to budgetary authorities that it is little use authorizing expenditure on a complex machine if service cannot be provided. There was some concern over use of the chambers by both the tissue culture and biocontrol groups. These problems should be soluble by reasonable discussion among the leaders of the groups involved and their immediate scientific supervisors (see section d below).

The work load would obviously be eased if it were possible to use more disposable labware (there appeared to be few support staff, so that technical staff had to do much preparatory work themselves). It is recognized that this may not be possible in the current economic climate.

c) None of the members of the tissue culture group, and certainly none of those involved in the seed protein projects, had a long term employment contract. Thus, in principle there is no permanent tissue culture group. The financial problems of Brazil in the past months is recognized. However, it is clear that a persistence of this situation will lead to a demotivation of those in this situation.

A more subtle problem is the apparent perception among those working in tissue culture that their work is less valued than that of molecular biologists, that they feel less respected as scientists, and that they are not made to feel involved in the project as a whole. This is in part due to a lack of communication between the groups. It is apparently only recently, and inconsistently, that tissue culture staff have been invited to take part in progress seminars and strategy sessions with the molecular biology group. Particular efforts must be made to overcome the separation (in two buildings) of the two groups. Experience in other groups has shown that such a lack of communication will eventually lead to problems, as tissue culture is too complex a task to be considered a "service". This problem is considered further in part d) below.

d) Perhaps all the problems discussed above are in part due to, and certainly will be exacerbated by, the organizational structure currently in operation at CENARGEN. This is the system under which the heads of the tissue culture, biocontrol, and molecular biology report directly to the administrative head of the institute, and not to the project coordinator. No biotechnology program can hope to succeed without extremely close integration of the molecular biology, plant transformation, and plant analysis stages. This means that projects must be conceived, planned, and coordinated throughout by all groups working together under direction of a director who fully understands the basic concepts and the importance of each phase of the project. All the successful biotechnology programs, basic and applied, which the consultant has seen operate with complete integration of these technologies and the people carrying them out. Examples include not just Plant Genetic Systems and the University of Gent but the Max Planck Institute in Koenig, West Germany; the Monsanto company in the U.S.A., and many other academic departments in both Europe, the U.S.A., and elsewhere. A system in which the administrative structure is such that the different parts of a program must in principle compete for resources (both of people and materials) is doomed to failure. It is essential that this system be altered so that an overall scientific coordinator can take action to correct the imbalance which currently exists, and to establish good coordination and communication between the groups.

There are some other problems worthy of note aside from the tissue culture issue. The amount of time that some scientists are required to spend on purely administrative tasks was striking, particularly in the case of the scientist also responsible for protein biochemistry. Given that much of the plant analysis work will later involve protein analysis, it would be best if in this case in particular and in general, such tasks could be shifted to non-scientific personnel.

The laboratory is in large part well equipped. Budgetary problems do result in lack of maintenance and problems in obtaining consumable supplies. The agreement with PGS is meant to relieve the latter problem to some extent. However, it should be made clear to budgetary authorities that in the long term, maintenance and supplies must be granted appropriate priority.

9. AGREEMENTS OR COMMITMENTS ESTABLISHED WITH EMBRAPA RESEARCHERS IN-SERVICE OF
THE FUTURE DEVELOPMENT OF RESEARCH IN THE CONSULTANT'S FIELD OF SPECIALIZATION

A major purpose of the visit was to coordinate the future research programs at EMBRAPA/CENARGEN and PGS in the context of the contract between the parties. This was in large part accomplished as outlined in the different sections above. Both parties have more detailed documents with more technical details.

10. CONSULTANT'S COMMENTS ON CIRCUMSTANCES WHICH AFFECTED THE CONSULTANCY WORK

It is a pleasure to again acknowledge the hospitality of the EMBRAPA/CENARGEN team; the visit was intellectually stimulating and a personal pleasure. It was unfortunate that no housing for guests is available nearer the institute; much time was lost in transportation to and from downtown Brasilia.

Date:

Signature

Programa II. Geração e Transferência de Tecnologia

O Programa de Geração e Transferência de Tecnologia é a resposta do IICA a dois aspectos fundamentais: (i) o reconhecimento, por parte dos países e da comunidade técnico-financeira internacional, da importância da tecnologia para o desenvolvimento produtivo do setor agropecuário; (ii) a convicção generalizada de que, para aproveitar plenamente o potencial da ciência e da tecnologia, é necessário que existam infra-estruturas institucionais capazes de desenvolver as respostas tecnológicas adequadas às condições específicas de cada país, bem como um lineamento de políticas que promova e possibilite que tais infra-estruturas sejam incorporadas aos processos produtivos.

Nesse contexto, o Programa II visa a promover e apoiar as ações dos Estados membros destinadas a aprimorar a configuração de suas políticas tecnológicas, fortalecer a organização e administração de seus sistemas de geração e transferência de tecnologia e facilitar a transferência tecnológica internacional. Desse modo será possível fazer melhor aproveitamento de todos os recursos disponíveis e uma contribuição mais eficiente e efetiva para a solução dos problemas tecnológicos da produção agropecuária, num âmbito de igualdade na distribuição dos benefícios e de conservação dos recursos naturais.

INSTITUTO INTERAMERICANO DE COOPERAÇÃO PARA A AGRICULTURA

O Instituto Interamericano de Cooperação para a Agricultura (IICA) é o organismo especializado em agricultura do Sistema Interamericano. Suas origens datam de 7 outubro de 1942, quando o Conselho Diretor da União Pan-Americana aprovou a criação do Instituto Interamericano de Ciências Agrícolas.

Fundado como uma instituição de pesquisa agrônômica e de ensino, de pós-graduação para os trópicos, o IICA, respondendo às mudanças e novas necessidades do Hemisfério, converteu-se progressivamente em um organismo de cooperação técnica e fortalecimento institucional no campo da agropecuária. Essas transformações foram reconhecidas oficialmente com a ratificação, em 3 de dezembro de 1980, de uma nova convenção, que estabeleceu como fins do IICA estimular, promover e apoiar os laços de cooperação entre seus 31 Estados membros para a obtenção do desenvolvimento agrícola e do bem-estar rural.

Com um mandato amplo e flexível e com uma estrutura que permite a participação direta dos Estados membros na Junta Interamericana de Agricultura e em seu Comitê Executivo, o IICA conta com ampla presença geográfica em todos os países membros para responder a suas necessidades de cooperação técnica.

As contribuições dos Estados membros e as relações que o IICA mantém com 12 Países Observadores, e com vários organismos internacionais, lhe permitem canalizar importantes recursos humanos e financeiros em prol do desenvolvimento agrícola do Hemisfério.

O Plano de Médio Prazo 1987-1991, documento normativo que assinala as prioridades do Instituto, enfatiza ações voltadas para a reativação do setor agropecuário como elemento central do crescimento econômico. Em vista disso, o Instituto atribui especial importância ao apoio e promoção de ações tendentes à modernização tecnológica do campo e ao fortalecimento dos processos de integração regional e sub-regional.

Para alcançar tais objetivos o IICA concentra suas atividades em cinco áreas fundamentais, a saber: Análise e Planejamento da Política Agrária; Geração e Transferência de Tecnologia; Organização e Administração para o Desenvolvimento Rural; Comercialização e Agroindústria, e Saúde Animal e Sanidade Vegetal.

Essas áreas de ação expressam, simultaneamente, as necessidades e prioridades determinadas pelos próprios Estados membros e o âmbito de trabalho em que o IICA concentra seus esforços e sua capacidade técnica, tanto sob o ponto de vista de seus recursos humanos e financeiros, como de sua relação com outros organismos internacionais.

FECHA DE DEVOLUCION			

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