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Consultant Final Report
IICA/EMBRAPA-PROCENSUL II

"SECA DE PONTEIROS" IN FORESTRY PRODUCTION IN THE RIO DOCE VALLEY

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Theodore T. Kozlowsky

Brasília, abril de 1989

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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 consultoría 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 agradeceria 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: THEODORE T. KOZLOWSKY

2. Specialist in: PLANT PHYSIOLOGY (FORESTRY)

3. Title of IICA Project: 2.SB.3

4. EMBRAPA Program for which consultancy is provided:

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June to July ,1988	CNPF, Curitiba
CONTRACT EXTENTION PERIOD (If any)	DUTY LOCATION (Center)

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SECA DE PONTEIROS

Report of consultancy of Dr. T.T. Kozlowski, Specialist in Plant Physiology (Forestry), during July 9-27, 1988, in Mirais Gerais Province, Brazil.

TITLE OF ACTIVITY

Cooperation with EMBRAPA on research activities in the field of crop and forestry production .

ACKNOWLEDGEMENTS

The consultant expresses his sincere thanks for the gracious hospitality of all those assisting, including members of EMBRAPA, CAF , CENIBRA, ACESITA, and the University of Vicosa. the genuinely friendly cooperation of all concerned made the mission unusually enjoyalbe. Very special thanks are extended to Dr. Maria Elisa Graca who so ably assisted the consultant by serving as interpreter and handling many of the arrangements. Her help was invaluable.

INSTITUTIONS ASSISTING:

EMBRAPA, CAF, ACESITA, CENIBRA, AND University of Vicosa

ITINERARY OF CONSULTANT STAFF

July 8, 1988. Left Santa Barbara, California, U.S.A. for Brazil.

July 9. Arrived at Curitiba, Brazil. Met by Dr. Maria Elisa Graca, Woody-plant Physiologist, EMBRAPA, Centro Nacional de Pesquisa de Florestas (CNPF).

July 10. Continued at Curitiba. Discussion of Seca de Ponteiros (Seca) with Maria Elisa Graca.

July 11. Meetings at EMBRAPA, CNPF,headquarters. Received by Dr. Luciano Lisbao, Jr., Chefe, CNPF and Jose Elidney Pinto, Jr., Vice Director. The consultant visited research laboratories and discussed research programs of CNPF with various staff members. The consultant participated in a conference on the extent and etiology of Seca. An overview of the problem was presented by Wilson Oliveira Campos, Centre Florestal, S.A. Other participants included Luciano Lisbao, Jr, and Sarbas Y. Shimizu, Chefe Adjunto Tecnica, Maria Elisa Graca, Linda Lacerda da Silva (CENIBRA).

July 12. Travel to Belo Horizonte. Meeting with Walter Suiter Filho, Superintendente (CAF) and Maria Elisa Graca.

July 13 Continued at Belo Horizonte. The consultant participated in a conference in the CAF auditorium on the history, extent, and origin of Seca. Participants included Teotonio Francisco de Assis, Departamento Tecnico Florestal, Mehoramento Florestal e Biotechnologia (ACESITA); J.G. Rivelli Magelhaes, Gerente de Departmenta Tecnico Florestal; Mario Campos Toronato; Walter Suiter Filho, Vicente Brady Mariolins; and Maria Elisa Graca, (CNPF). Departed for Ipatinga.

July 14. Visited CENIBRA tissue culture laboratories and greenhouses. Reviewed plant propagation techniques, including propagation by cuttings and grafting. Participants included Linda Lacerda da Silva, Vivianne Donato, Clayton Coute, Engenheiro du Solos e Nutricao; and Maria Elisa Graca (CNPF).

Meeting with CENIBRA personnel. Officers discussed history of CENIBRA and presented a film on management of the company. Participants included Gerardo Erico Speltz, Superintendete; Koichi Kinoshita, Director Florestal; Yoshikazu Morioka, Assessor

Diretoria; Italino Borsatto, Div. de Silvicultura; Clayton Coute; and Maria Elisa Graca.

The consultant visited several stands of eucalyptus trees showing severe Seca. Departed for Timoteo.

July 15. Continued at Timoteo. Visited ACESITA ENERGETICA. Met with officials and examined several eucalyptus stands exhibiting various degrees of Seca. Pariticipants included J.G. Rivelli, Magelhaes, Gerente do Departmento Tecnico Florestal; Teotonio Francisco de Assis, and Maria Elisa Graca (CNPF).

Visited ACESITA research laboratories. Consultant led discussion and reviewed his observations in the field on causes of Seca. Participants included Danilo Rocha, Engenheiro Agronomo e Solos e Nutricao de Plantes; Teotonio Francisco de Assis; Eduardo Pinheiro Henriques; Eng. Florestal Manejo Florestal Coord. De Pesquisas); Maria das Gracas Barros Rocha, Eng. Florestal- Microbiologia e Fitopatologia; Marden Ulhoa, Tecnico Agricola - Protecao Florestal e Viveiro; Adameston Bomfairo Vorelli, Tecnico Agricola Mello Ramento Florestal e Producao de Sements; and Maria Elisa Graca (CNPF).

July 16. Travel from Timoteo to Belo Horizonte.

July 17. Visited Ouro Preto.

Departed for Vicosa.

July 18. Continued at Vicosa.

Attended conference with Department of Forestry members at University of Vicosa. Attended excellent presentation by Professor Francisco Ferreira of development and characteristics of Seca. Consultant also participated in discussion of Seco with Professor Francisco Ferreira, and Geraldo

Reis (CNPF). Also attending were Rita G. Barges and Maria das Gracas Ferreira Reis of the University of Vicosa. Departed for Ponte Alta.

July 19. Continued at Ponte Alta with CAF personnel. Visited several plantations showing various degrees of Seca. Participants included Monica de Melo Barbosa, Pesquisa Florestal; Fabio Rubio Scarano, Entomology and Ecology Researcher; Grace Miranda Gomes, Biotechnology; Elvecio P. Martins, Research Technician; and Maria Elisa Graca (CNPF).

Departed for Ipatinga.

July 20. Continued at Ipatinga. Visited ACESITA. Visited plantations showing Seca. Emphasis was on species and clonal variations. Participants included Leonidas da Carvalhou Filho, Research Tecnician; Milton Araujo Ulhoa, Research Technician; Helio Nunes, Head of Plant Production in Col. Fabriciano; and Maria Elisa Graca (CNPF).

The consultant presented his observations on the etiology of Seca and on needed research to staff numbers at CENIBRA. The consultant was introduced by Iuiz Roberto Capita, research Director.

July 21. Departed for Belo Horizonte.

July 22. Continued at Belo Horiaonte. The consultant presented a lecture in the CAF auditorium to representatives of CNPF, ACESITA, CENIBRA, and the University of Vicosa on causes of Seca and made suggestions for research needed to solve the seca problem.

The consultant was introduced by Luciano Lisbao, Jr. The lecture was followed by a question and answer session as well as a summary of progress and plans for organizing research on Seca.

Returned to Curitiba.

July 24. Continued at Curitiba. Worked on report on Seca.

July 25. Continued at Curitiba. Conference with Luciano Lisbao, Jr. Also conferred with CNPF staff members about various research problems.

July 26. Continued at Curitiba. Conferred with CNPF staff members about various research problems.

July 26. Departure. Arrival in U.S.A. on July 27.

RESULTS OF ACTIVITIES OF CONSULTANT

On the basis of extensive field examinations of eucalyptus trees with Seca and soils in the Rio Doce Valley as well as discussions with cooperating personnel from CNPF, CAF, ACESITA, CENIBRA, and the University of Vicosa, the following conclusions were reached:

Seca de Ponteros (Seca), which results in heavy growth losses, is commonly found at low elevations in most species of Eucalyptus planted in the Rio Doce Valley, east northeast of Belo Horizonte, Minais Gerais province of Brazil. As shown in Fig. 1. Seca typically shows a pattern of onset during the dry season of the second year after planting, following a strong rainy season. Most trees recover during the next rainy season but Seca recurs during the subsequent dry season (third year). The trees generally recover during the fourth year and Seca is not severe thereafter.

Seca is characterized by leaf browning and shedding near the top of the tree, preceded by development of lesions in leaf axils and branches of the upper crown. The lesions are invaded by fungi which generally are weak pathogens or saprophytes. Leaves on approximately the lower two thirds of the crown are lost by natural pruning, whether Seca does or does not occur.

Susceptibility to Seca varies appreciably among species, clones, seed sources, ground elevation, slope, and tree dominance. Whereas most species planted in the Rio Doce Valley are variously susceptible to Seca, *Eucalyptus torreliana*, *E. camaldulensis*, and *E. teraticornis* are variously resistant. *E. citriodora* is very susceptible to Seca but recovers rapidly, usually within 1.5 years after planting. Other susceptible speicies include *E. grandis*, *E. pilularis*, *E. maculata*, *E. urophylla*, *E. saligna*, and *E. cloeziana*.

The rapid appearance of Seca early in the dry season following a wet season suggests that the trees are preconditioned during the wet season to become susceptible to Seca. When the dry season suddenly occurs the relatively shallow roots do not appear to be able to absorb soil water fast enough to supply the extensive leaf area with water. Leaf growth (water loss capacity) and root growth (water absorbing capacity) became imbalanced because root growth is impeded by poor soil aeration during the rainy season.

An important factor contributing to onset of Seca appears to be competition for soil water during the dry season between the closely-grown trees (35), and the understory vegetation, including grasses and other herbaceous and woody plants. Several grasses, including *Agropyron desertorum*, *Dactylis glomerata*,

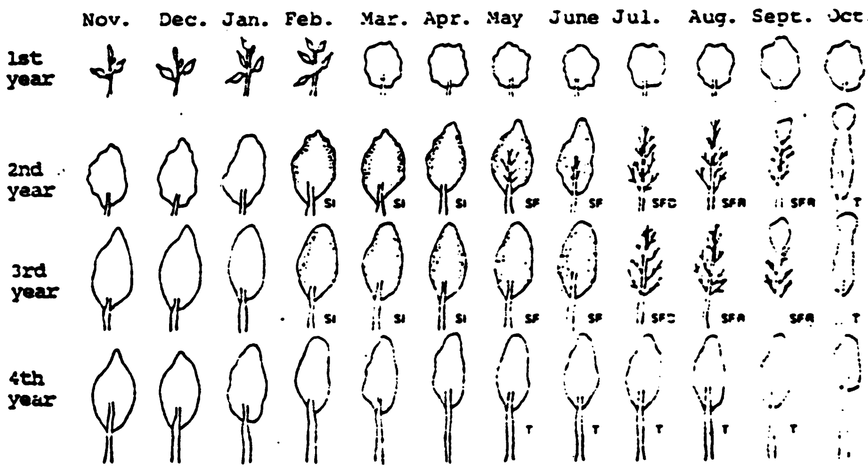

Fig. 1. Cycle of Seca de Ponteiros in the Rio Doce Valley. SI, initial symptoms; SF, strong symptoms; SFD, strong symptoms with defoliation; SFR, strong symptoms with recuperation; T, tolerance (recovery). From Ferreira (1936).

and *Bouteloua gracilies* competed with *Pinus ponderosa* trees for soil water (12).

Much evidence shows that poor soil aeration inhibits growth of roots and induces extensive root decay by activity of *Phytopthora* fungi (6, 25-28, 32, 37, 48, 55, 59-61). Hence the trees become less drought tolerant because the small root systems cannot supply water fast enough (7, 16-18). When the rainy season ends in the Rio Doce Valley, the vapor pressure gradient between the leaves of eucalyptus trees steepens abruptly early in the dry season, causing rapid transpirational water loss. The uppermost shoots of eucalyptus trees have a very high water requirement (3,4). Because root growth has not kept pace with leaf growth, the trees tend to dehydrate.

As mentioned, Seca also occurs during the dry season of the third year after planting, but is not as severe as it was during the second year. This is consistent with the observation that the increasing natural pruning of the lower branches has acted to correct the imbalance between the transpiring leaf surface and the water absorbing root surface. By the fourth year this imbalance is further corrected by additional natural pruning of the lower branches and loss of more of the leaf surface area. Hence, the recovering trees have relatively few lower branches. These observations are in accord with the predominance of Seca in flatlands and valleys which accumulate runoff water during the wet season. Therefore the valley soils are more poorly aerated than those higher on the slopes. Furthermore, Seca is severe in the dry season following a season of heavy rainfall. It is much less severe when the amount of rainfall is below average.

Both rusts and cankers occur, largely on certain species. E. saligna is highly susceptible to canker. Other species are resistant. Several provenances of E. cloeziana and one provenance of E. grandis are susceptible to rust. Other species are resistant.

Some investigators have suggested that air pollution may be the primary cause of Seca. Professor Francisco Santana of the University of Vicosa has shown that air pollution from industrial plants is appreciably higher in the Rio Doce Valley than it is in Vicosa. The consultant hoped to meet with Professor Santana and discuss his research on pollution in relation to Seca but the Professor was not available. The consultant also was not able to obtain Professor Santana's full report. However, on the basis of available evidance, several factors appear to militate against pollution as the primary cause of Seca. Considerable evidence from work with other broadleaved species shows that sulfur dioxide (SO_2) damage to leaves is quite distinct and appears as necrotic inveinal patches while the veins stay green (9,22, 23, 29). Ozone damage causes a stippling or mottling of the leaves because of death of individual cells (9,22,23,29). The consultant did not see much distinct symptoms on trees in the Rio Doce Valley. In addition many experiments show that SO_2 injures the medium-sized leaves more than the young leaves, which appeared not to be the case with Seca injury. Also Seca injury close to the point source of pollution was not obviously greater than it was at some distance from the source. Such a gradient often has been demonstrated (29) and would be expected if air pollution were the primary cause of Seca. Furthermore, the effects of continuous pollution are cumulative. Hence, it is difficult to explain the recovery of trees during the fourth year on the basis of a pollution effect. In any event, if pollutants are involved in causing Seca the symptoms should be readily induced by injecting specific pollutants and combinations of pollutants into the air and/or soil within growth chambers that will otherwise protect the trees from industrial sources of pollution The injected pollutants should not exceed the amounts emitted by the industrial sources of pollution.

SUGGESTIONS AND RECOMMENDATIONS

The most important objectives for research that may lead to a solution of the Seca problem appear to be the following:

1. Identifying and producing Seca-resistant planting stock by selection and breeding.

2. Identifying the cause or causes of Seca.

3. Identifying mechanisms of resistance to Seca of some species (i.e. E. torelliana), clones seed sources, and hybrids.

4. Determining silvicultural practices that will decrease the incidence of Seca in susceptable trees.

It seems unlikely that the Seca problem will be solved easily or rapidly for a number of reasons, including the following:

1. Eucalyptus trees in the Rio doce Valley are grown for charcoal and for pulp. The species with wood qualities that are best for charcoal are not the best for pulp. Hence, different Seca-resistent species are needed.

2. The 4-year cycle of Seca development and recovery needs

to be studied in detail in both susceptible and tolerant species and genetic materials.

However, data will be most informative only if each of the 4 successive years has a strong rainy season followed by a dry season. If there is a light rainy season during one of the 4 years the experiment may fail to yield useful data. Hence, as Professor Ferreira suggested the same experiment should be initiated in each of 3 successive years.

3. Some researchers and facilities are located a long distance from the plantations where Seca occurs.

4. The necessary research will be complicated and require support and continuity. Research must be conducted in well planned, adequately replicated experiments and data statistically analyzed. Close communication among agencies involved (EMBRAPA, Universities, CAF, ACESITA, and CENIBRA) is important. It would be very useful if all investigators on Seca submitted annual reports to a coordinating agency such as EMBRAPA. Such reports would be distributed to other investigators two weeks prior to an annual meeting at which the research findings would be discussed by the researchers. Such an annual meeting would help to avoid duplication and generate new ideas for further research.

RECOMMENDED RESEARCH FOR OBJECTIVE 1.

Breeding, selection, and progeny testing are promising and should be continued. Some Seca-resistant hybrids and clones have already been identified. Professor Ferreira suggested that selections should be made at the first cycle of Seca when the symptoms are most severe. It is likely that achievement of Objective 1 will be promoted by experiments designed to achieve objectives 2 and 3. For methods see citations to literature.

RECOMMENDED RESEARCH FOR OBJECTIVES 2 AND 3.

The following background in formation is germane to achievement of these objectives:

Trees may be drought tolerant because they can avoid dehydration or because they can undergo extreme protoplasmic dehydration. However avoidance of dehydration is much more important (18-20, 24, 33-35, 44).

Adaptations for avoidance of dehydration may be found in both root and leaf characteristics (5, 18, 19, 34,35). The most important dehydration-avoiding adaptation of roots is a capacity for rapid growth (4, 8, 45). Trees with large and multi-branched root systems can avoid dehydration of crowns by acting as an efficient water absorbing system (18, 35). For example, the greater drought avoidance of E. camaldulensis over that of E. globulus seedlings was attributed to capacity of the former species to produce a deep and ramifying root system that absorbed water from deep soil layers after the surface soil dried (47). On dry sites E. socialis grew better than E. incrassata because of the higher root-shoot ratio of the former species. Rapidly growing Populus clones had more root weight per unit of leaf area and higher rates of root elongation after transplanting than a slower-growing clone did, suggesting better dehydration avoidance in the rapidly growing clone (42).

Leaf adaptations for drought avoidance may include heavy deposition of wax on leaf surfaces, occlusion of stomatal pores with wax small or few leaves; small few, and sunken stomata; rapid closure of stomata during drought; and shedding of leaves.

Wide variations occur among species in deposition of leaf waxes. *Acer saccharum* had a thick layer of wax and many stomatal pores occluded with wax. In contrast, *Fraxinus americana* had a thin layer of leaf wax (10,30). The wax in the antistomatal chambers of some species may reduce transpirational water loss by as much as two thirds when the stomata are open (15).

Tree breeders have shown considerable interest in the role of stomata in dehydration avoidance because there is genetic variation in stomatal size, frequency, and control of stomatal aperture (3,5,39-41,44). When differences in leaf dehydration occurred among *Populus* clones they often were correlated with variations in stomatal conductance (39-41,43,58). However, variations in capacity for early stomatal closure sometimes are more important in dehydration avoidance than are differences in stomatal size and frequency (18). Because of rapid stomatal closure, *E. sideroxylon* avoided drought better than *E. polyanthemos* or *E. rostrata* (50). Stomatal responses of different species and genotypes vary widely in response to atmospheric factors (light intensity, humidity, temperature) that influence transpiration and cause leaf dehydration (35,44).

Early leaf shedding of some species during drought has been well documented (16,18,19,21). Such leaf shedding may occur because of true abscission which is stimulated by ethylene (38). In other species the leaves simply wither and die (21).

Both studies of growth characteristics of eucalyptus and plant and soil water relations are needed.

Studies in the nursery and greenhouses should be conducted on growth characteristics of tolerant species and genetic materials that may confer drought tolerance. Identification of growth-or anatomical features that are correlated with drought avoidanoe might provide a tool for early selection of planting stock. For example, Blake and Filho (4) showed that slow root growth, combined with high stomatal conductance, rendered some eucalyptus cultivars susceptible to drought because of lack of capacity to avoid dehydration. Such experiments should be extended to include studies of leaf characteristics as well as growth characteristics. The development of leaves, changeover of juvenile leaves to adult leaves, capacity for natural pruning, leaf abscission, and leaf anatomy of susceptible and resistant trees should be studied. In particular the size and distribution of stomata on both the upper and lower leaf surfaces of juvenile and adult leaves should be studied. Our studies showed that the juvenile leaves of E. camaldulensis had stomata on both leaf surfaces whereas those of E. globulus had them on the lower (abaxial) leaf surface only (47). Stomatal size and frequency are easily studied by coating leaf surfaces with latex or Duco cement, removing these films, mounting them on slides and studying stomatal characteristics microscopically (56-58,67).

The structure and distribution of leaf waxes of susceptible and persistant species and genetic materials should be studied with scanning electron microscopy (30, 56). The consultant was informed that the University of Vicosa has such a scope.

Possible a cooperative arrangement could be made to have leaf surfaces studied. It is important to study tree water relations of susceptible i.e. E. citriodora, E. cloeziana) and tolerant species (i.e. E. torelliana) continuously before the wet season, during the wet season, and during the subsequent dry season. Useful experiments could be conducted in plantations and in the nursery as well as under simulated conditions (greenhouses) with containerized seedlings growing in soil obtained from the Rio Doce Valley. Both practical field research and basic research are suggested.

In plantations it would be useful to excavate root systems of whole trees one month before the rainy season, monthly during the wet season, and monthly during the dry season. Observations should include changes in leaf number and area, length of roots in different size classes, and root-leaf ratio (dry weight of roots/dry weight of leaves.) In addition root growth could be studied periodically in plantations by taking soil samples with soil augers and studying the roots in sample cores (2,11,36,46,49,52-54).

Changes in moisture contents of leaves in the Seca-affected zones (uppertree crown) would provide insight into the differences in dehydration of susceptible and tolerant species. Similar experiments on susceptible and persistant clones and provenances would provide useful data. Concurrently with these experiments the water relations of soils in the field should be studied. The following observations should be made periodically before, during, and after the wet season. Observations at 2-week intervals in plantations, with and without understory vegetation, are suggested

1. Soil moisture content at various soil depths determined with a neutron probe.

2. Soil aeration (64-66).

It would also be useful to conduct more detailed studies in greenhouses with containerized seedlings growing in soil obtained from the Rio Doce Valley. For example, responses of seedlings of a susceptible species and a resistant one could be grown in large pots and flooded continuously for 30 or 60 days. Unflooded seedlings that are watered periodically <u>but not flooded</u> during the same 30 or 60 days would serve as controls. Important observations taken before flooding, during flooding, and for some period (for example, 90 days) after flooding are suggested. Important observations should include: leaf development and anatomy, numbers of leaves, leaf areas, stomatal size, frequency (56-58, 67); and aperture (determined with a LiCor Steady State Porometer, LiCor, Lincoln, Nebraska, U.S.A.); leaf water deficits as leaf water potential determined with a Scholander pressure chamber (PMS Instruments, Corvallis, Oregon, U.S.A.), and transpiration rate (Steady State Porometor). Transpiration of potted plants might also be determined gravimetrically (35). Because of large differences in leaf area of different trees transpiration should be determined as rate per unit of leaf area (porometer) and rate per tree. Total water loss (evapotranspiration) can be determined with lysimeters (14,62).

It is well known that mycorrhizae increase the capacity of trees for absorption of water and minerals (35). To that end studies should be continued on infecting planting stock with mycorrhizal fungi and comparing drought avoidance of plants with and without mycorrhizae. Dr. D.H. Marx of the U.S. Forest Service, Athens, Georgia has considerable experience in this area and his research should serve as excellent resource material.

Crucial to understanding the nature of Seca will be an explanation of the specific causes of the lesions in leaf axils. These may be induced by some compounds produced by trees growing in poorly aerated soils. For example, flooding of soils induces stem hypertrophy, production of hypertrophied lenticels, and proliferation of phloem parenchyma cells (1,25,26,57,68,69). Possibly the altered hormone relations (i.e.ethylene production) may be involved. Attempts should be made to induce the lesions with ethephon which releases ethelene, and other compounds released by the stressed trees. More basic research is needed here.

RECOMMENDED RESEARCH FOR OBJECTIVE 4.

In order to determine if competition for water between eucalyptus trees and between the trees and understory vegetation will affect the severity of Seca symptoms the following treatments might be applied to stands of susceptible species and genetic materials. Adjacent stands without these treatments should serve as controls.

1. Removal with herbicides of all weeds and competing understory vegetation. The dead plants should be physically removed to avoid possible alleopathic effects.

2. Pruning-removal of some of the leaves in the lower part of the normally Seca-affected zone (lower part of the upper crown) as well as leaves in the lower stem if natural pruning has not yet occurred.

3. Beginning at the end of the wet season (year 2) irrigating for some time during the dry season . Care should be taken so the soil is not kept in a flooded condition.

4. Removal of every second tree in the row to decrease competition for water.

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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 ás 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 agronômica 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 8 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 paises 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 própios 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.

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Interessados em receber mais exemplares deste o de outros Relatórios de Consultores poderão solicitá-los a:

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Título Seca de ponteiros in forestry production in the Rio Doce Valley

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