

## 付 属 資 料

- 1．ミニッツ（中間評価報告書）
- 2．分野別活動項目達成状況表（和訳）
- 3．プロジェクト・デザイン・マトリックス（PDM：和訳）



1. ミニッツ (中間評価報告書)

**Minutes of Discussions on  
the Mid-term Evaluation for  
the Research Project on Small-Scale Horticulture  
in Southern Brazil**

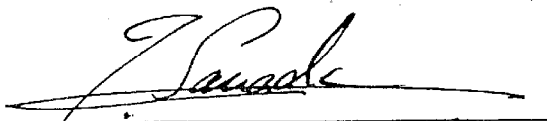
Japan International Cooperation Agency (hereinafter referred to as "JICA") organized the Advisory Team (hereinafter referred to as "the Team") headed by Dr. Tetsuro Sanada, and assigned to the Federative Republic of Brazil from the 22nd November to 9th December, 1999.

The Joint Evaluation Committee which consisted of 6 members from the Team and 5 members from the Federative Republic of Brazil was jointly organized for the purpose to conduct Mid-term Evaluation and make necessary recommendations for the Research Project on Small-Scale Horticulture in Southern Brazil (hereinafter referred to as "the Project").

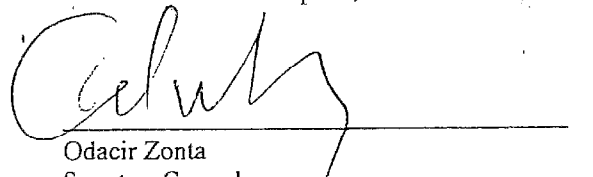
The Joint Evaluation Committee conducted evaluation in the form of interviews, field surveys, and prepared the Mid-term Evaluation Report (hereinafter referred to as "the Report"). The Report was presented and discussed in the Joint Coordinating Committee Meeting of the Project.

The major items agreed in the Joint Coordinating Committee Meeting are attached, and are being recommended to the respective Governments.

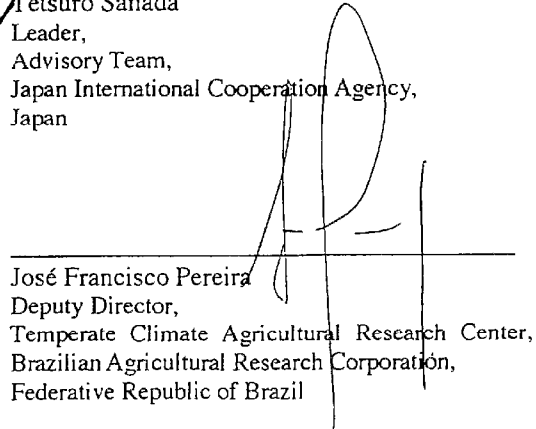
Florianópolis, 6th December, 1999



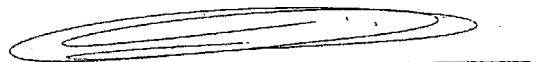
Tetsuro Sanada  
Leader,  
Advisory Team,  
Japan International Cooperation Agency,  
Japan



Odacir Zonta  
Secretary General,  
Secretariat of Rural Development and Agriculture,  
The State of Santa Catarina  
Federative Republic of Brazil

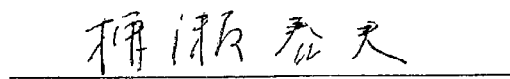


José Francisco Pereira  
Deputy Director,  
Temperate Climate Agricultural Research Center,  
Brazilian Agricultural Research Corporation,  
Federative Republic of Brazil




Dionisio Bressan Lemos  
President,  
Agricultural Research and Rural Extension  
Enterprise of Santa Catarina,  
Federative Republic of Brazil

Witnessed by



Haruo Yanase  
Leader,  
Japanese Expert Team,  
The Research Project on Small-Scale  
Horticulture in Southern Brazil,  
JICA

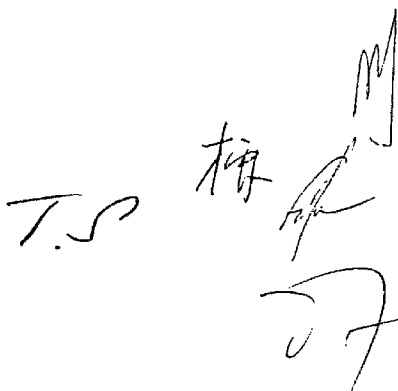


Roberto Fabeni Ricardo Júnior  
Representative,  
Brazilian Cooperation Agency,  
Federative Republic of Brazil

## ATTACHMENT

1. The Joint Evaluation Committee has presented the Report as per attached as ANNEX1.
2. The Joint Coordinating Committee has agreed and accepted the Report presented by the Joint Evaluation Committee and taken note of the recommendations made for successful achievement of the Project purpose, therein.
3. The Joint Coordinating Committee has agreed and accepted the Project Design Matrix of the Project as per attached as ANNEX2
4. The Brazilian side expressed a strong expectation for the continuation of technical cooperation in the field of temperate fruits even after the termination of the Project.

In reply, the Team has agreed to convey the expectation to the Japanese Government.



Mid-term Evaluation Report  
on  
the Research Project on Small-Scale Horticulture  
in Southern Brazil

São Joaquim, 3rd December, 1999

Japan – Brazil Joint Evaluation Committee

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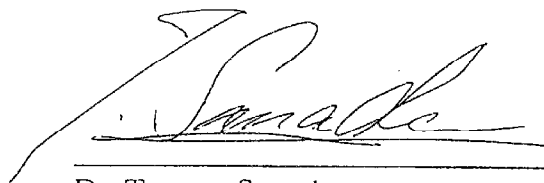
Mid-term Evaluation Report  
on  
the Research Project on Small-Scale Horticulture  
in Southern Brazil

The Joint Evaluation Committee( hereinafter referred to as “the Committee”) was jointly organized by Japan International Cooperation Agency(hereinafter referred to as “JICA”) and authorities concerned of the Federative Republic of Brazil for the purpose to conduct Mid-term Evaluation and make necessary recommendations for the Research Project on Small-Scale Horticulture in Southern Brazil (hereinafter referred to as “the Project”).

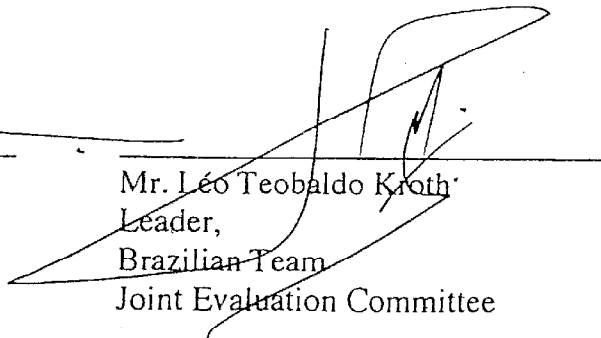
The Committee conducted joint evaluation in the form of interviews, field surveys, and discussions.

This report was prepared as the result of joint evaluation with the cooperation of Agricultural Research and Rural Extension Enterprise of Santa Catarina (hereinafter referred to as “Epagri”) and Brazilian Agricultural Research Corporation( hereinafter referred to as “Embrapa”).

São Joaquim, 3rd December, 1999



Dr. Tetsuro Sanada  
Leader,  
Japanese Team  
Joint Evaluation Committee



Mr. Léo Teobaldo Kroth  
Leader,  
Brazilian Team  
Joint Evaluation Committee

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## 1. BACKGROUND AND OUTLINE OF THE PROJECT

### 1 - 1. Background of the Project

Recently consumption of deciduous fruits, such as apple, pear, grape and peach tends to increase in Brazil. Southern Brazil, including the State of Santa Catarina is the main producing districts of deciduous fruits in Brazil and they become one of the economically important agricultural crops grown in this district. However, their cultivation techniques have not been enough developed to attain the stable production of fruits with good quality.

Since 'Mercosul' started for liberalization of international trade within southern parts of South America in 1994, deciduous fruit growers have been forced to compete with growers from other countries in these regions, such as Argentine and Uruguay where the cultivation of deciduous fruits has been well developed.

The government of the Federative Republic of Brazil made a proposal for project-type technical cooperation by Japan International Cooperation Agency (JICA) in order to improve productivity and quality of apple fruits, and to introduce and expand Japanese pear cultivation as a new crop to support the small-scale fruit growers in Brazil.

After a series of discussions for preparation, the Research Project for Small-Scale Horticulture in Southern Brazil was started on 1st December 1996.

### 1 - 2. Outline of the Project

The design of the Project is as follows.

Overall goal : To improve the farming of small-scale horticulturists by the application of appropriate and suitable cultivation techniques of horticultural crops (apple and Japanese pear)

Project purpose : To improve research and enlightenment activities of the Agricultural Research and Rural Extension Enterprise of Santa Catarina (Epagri) on the development of apple and Japanese pear cultivation techniques

Outputs and Activities :

- 1) The evaluation and selection techniques for cultivars and rootstocks
- 2) The cultivation techniques suitable for the soil, climate and social conditions in southern Brazil
- 3) The plant protection techniques for main diseases and pests

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- 4) Enhancement of studies on soil, fertilizer application and physiological disorders
- 5) The dissemination of the techniques and knowledge developed in the Project to small-scale horticulturists in the region

## 2. METHODS OF THE EVALUATION

### 2 - 1. Purpose of the Evaluation

The evaluation activities were performed with the purposes to:

- 1) Evaluate the inputs and degree of achievement based on the Tentative Detailed Implementation Plan (TDIP) during last three years of the Project;
- 2) Assess the appropriateness of the project design, prospects for sustainability and Impacts;
- 3) Identify problems on any aspects of Project implementation and propose necessary solution and
- 4) Amend the TDIP for the rest period of the Project if necessary.

### 2 - 2. Composition of the Joint Evaluation Committee

#### (1) Japanese members

##### 1) Dr. Tetsuro Sanada

Director, Persimmon and Grape Research Center,  
National Institute of Fruit Tree Science,  
Ministry of Agriculture, Forestry & Fisheries (M.A.F.F.)

##### 2) Mr. Satoru Hagiwara

Director, Livestock and Horticulture Division,  
Agricultural Development Cooperation Department, JICA

##### 3) Mr. Yasusuke Sakagami

Chief, Laboratory of Entomology,  
Apple Research Center, National Institute of Fruit Tree Science, M.A.F.F.

##### 4) Dr. Kiminori Kato

Chief, Laboratory of Soil and Fertilizer, Pomology Division,  
Fukushima Prefectural Fruit Tree Experiment Station

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5) Mr. Toshihiro SAITO

Senior Researcher, Laboratory of Japanese Pear and Chestnut Breeding,  
Department of Breeding, National Institute of Fruit Tree Science, M.A.F.F

6) Mr. Akio Takiguchi

Project management officer, Livestock and Horticulture Division,  
Agricultural Development Cooperation Department, JICA

(2) Brazilian members

1) Mr. Léo Teobaldo Kroth

Planning Manager, Agricultural Research and Rural Extension  
Enterprise(Epagri)

2) Dr. Carlos Roberto Pierobom

Professor of Plant Pathology, Pelotas Federal University (UFPel)

3) Mr. João Bernardi

Director, Vacaria Experiment Station,  
Brazilian Agricultural Research Corporation (Embrapa)

4) Mr. Emílio Della Bruna

Researcher, Urussanga Experiment Station, Epagri

5) Dr. Marco Antônio Dal Bó

Director, Videira Experiment Station, Epagri

2 – 3. Items of the Evaluation

The following items were evaluated.

1) Inputs

2) Appropriateness of the Project Design

3) Achievement

4) Prospects for Sustainability

5) Impact

6) Amendment of TDIP

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## 2 – 4. Schedule of the Evaluation

The Joint Evaluation Committee spent 5 days from 30th November to 6th December 1999, and carried out the following activities.

11/30	Tue	AM : Confirmation of the evaluation methods   : Evaluation on the project achievement PM Selection and evaluation of cultivars and rootstocks Cultivation techniques Plant protection
12/1	Wed	AM : Evaluation on the project achievement Soil, plant nutrition and physiology PM : Compilation of the results of evaluation
2	Thu	AM : Preparation of the draft evaluation report PM : Discussion on the result of the evaluation
3	Fri	AM : Final discussion on the result of the evaluation
6	Mon	AM : Joint Coordinating Committee Presentation of the evaluation report Signing of the Minutes of Discussions

## 3. RESULTS OF THE EVALUATION

### 3 – 1. Inputs

Inputs to the Project from both Japanese and Brazilian sides are shown in Attached Sheet 1.

### 3 – 2. Appropriateness of the Project Design

Project design is thought to be appropriate from the following viewpoints.

- 1) Apple cultivation has been developed well and becomes one of economically important agricultures in southern Brazil. However, it is necessary to promote a further technical development through well-planned research activities for improvement of fruit quality and productivity in future.
- 2) Promotion of apple cultivation in Brazil has been supported by federal and concerned state governments, and the Project meets the demands of small-scale apple growers who desire to improve their farming.

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- 3) Japanese pear is now expected as profitable fruit in the regions of the State of Santa Catarina. Government of the State and small-scale fruit growers expect the contribution of the Project for the development of cultivation techniques of Japanese pear trees.

### 3 - 3. Achievement

The detailed evaluation is described in the Attached Sheet 2. The highlights in major fields of activities are as follows.

#### (1) Evaluation and Selection of Cultivars and Rootstocks

The apple cvs. Sansa and Imperial Gala have been selected as cultivars showing early harvest and ideal characteristics for consumption and also cv. Catarina has been selected as a late ripening and scab resistant cultivar. Four CG rootstocks, which were grafted with cv. Fuji scions, have been showing good results with regards to dwarfing effect, productivity, fruit shape and color. In order to obtain seedlings resistant to apple scab, color rot, mite, and wooly aphid, the experiments are in progress.

*Pyrus calleryana* D12 and *P. betulaefolia* have been selected as rootstocks showing higher rooting ability for Japanese pear cultivars. Within last three years cv. Housui showed a good growth among 13 cultivars grafted on two rootstocks.

Therefore, the most of activities in this field are evaluated to be progressing well, however, further emphasis is required in the selection of middle season cultivars and in the establishment of inoculation methods of *Phytophthora cactorum* to evaluate susceptibility of rootstocks to Japanese pear color rot.

#### (2) Elaboration of Cultivation Techniques

The use of M.9 as interstem has been reducing vigor and height of cvs. Fuji and Gala trees on Marubakaido rootstocks. In the case of 20cm length of the interstem, the appropriate spacing trees was estimated to be 2 by 5m judging from yield, vigor and longevity in future etc.. A modified central leader with limbs arranged crosswise showed higher productivity comparing with traditional training system.

Three different training systems of Japanese pear trees, such as central leader,

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open center, and V shape are being tested, but none of them have shown difference because only a few years passed after planting. The cause of floral bud abortion has not yet been found. However, based on results obtained in the various experiments, fluctuation of winter temperature and temperature during latter period of dormancy were related with the increase of floral bud abortion. Artificial pollination was effective for decrease of damage of floral bud abortion.

Most of activities in this field are evaluated to be progressing well, however, it is recommended to intensify investigations on floral bud abortion because it is a critical factor to the establishment of Japanese pear cultivation in southern Brazil.

### (3) Development of Plant Protection Techniques

The main diseases and pests occurred in the Japanese pear orchards were identified. Newly described diseases are Fabraea leaf spot (*Entomosporium mespili*), canker (*Dothiorella* sp.) in cv. Kousui, and etc.. Fruit flies and mites are also found as the major pests. The other pests are aphids, *Diabrotica speciosa* that is newly described, and etc..

A heavy infestation of Two-spotted spider mite was observed. This phenomenon is judged to be caused by over application of pyrethroides, rather than the development of miticide resistance.

Causal fungi of Gala leaf spot which is one of the serious apple diseases, have been identified as *Colletotrichum gloeosporioides*, *C. acutatum* and *C. sp.* and the relationship between temperature conditions and leaf wetness necessary for conidia infection was made clear.

Apple chlorotic leaf spot virus (ACLSV) which causes decline of apple trees on Marubakaido could be eliminated from shoot tips of infected scions by sprays of ribavirin. About 6,000 clean plantlets of Marubakaido were obtained with the combination of shoot tip cultures and thermotherapy.

Therefore, it is evaluated that the activities in this field are well progressing.

### (4) Enhancement of Studies on Soil, Plant Nutrition and Physiological Disorders

As the experiments of soil and plant nutrition in apple orchards started in 1998/99, only partial results of one-year period have been obtained.

The nutritional survey in Japanese pear orchards revealed nutritional unbalances, such as low contents of Mg, Zn, and B, high amounts of K and Mn in

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the foliage. Based on the results of foliage and soil analysis, corrective measures were recommended to growers.

Occurrence of several physiological disorders in apple orchards and/or in cold storages, such as water core, lenticel blotch spot, boron deficiency, bitter pit, cork spot, and internal breakdown were observed.

On Japanese pears, the occurrence of following physiological disorders in commercial orchards was observed: Russetting on fruits, Mg deficiency and K excess on leaves and B deficiency on fruits.

Most of the experiments on soil and nutrition in apple orchards are evaluated to be behind the schedule due to the delay of assignment of Brazilian counterpart personnel in Soil and Nutrition, the delay of arrival of equipment provided by JICA, and the delay of completion of facilities borne by Brazilian side.

Therefore, in order to obtain conclusive data, continuation of intensive works on soil and nutrition in apple orchards is recommended.

#### (5) Other

Technical events such as seminars, demonstrations etc, publication, production of technical videos and illustrative banners etc., have been successfully planned and conducted to disseminate knowledge and technologies introduced and/or developed in the Project to technicians, extension officers, and leading farmers.

Therefore, it is evaluated that the activities in this field are well progressing.

### 3 - 4. Prospects for Sustainability

Recognizing the following facts at this moment, it is expected that the sustainability of the Project will be secured.

- 1) Most of counterpart personnel of São Joaquim and Caçador Experiment Stations are experienced researchers on temperate fruit trees and these personnel have been stationed stably in necessary research fields.
- 2) The association of Brazilian apple growers has been funding the research activity of the experiment stations and it may expectedly continue.
- 3) Promotion of apple and Japanese pear cultivation is supported by the Government of the State of Santa Catarina.
- 4) Equipment necessary for research works, mainly on laboratory analysis are provided by JICA, and necessary technologies are transferred through Japanese experts and training of counterparts in Japan. Thus, the

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functions of the experiment stations are strengthened.

However, the following measures are necessary to ensure the sustainability.

- 1) Close cooperation among the project sites namely, both Epagri Experiment Stations of São Joaquim and Caçador; the Temperate Climate Agricultural Research Center (CPACT) of the Brazilian Agricultural Research Corporation (Embrapa) may be further strengthened and continued.
- 2) Allocation of necessary budget by the state government is indispensable to strengthen the project activities.

### 3 - 5. Impact

At the moment of this evaluation, following positive impacts are recognized.

#### (1) Apple

Through the Japanese technical cooperation for the past 28 years, apple production in Brazil has increased at a large extent.

Since the Project type cooperation was commenced in 1996, activities are targeted on the development and dissemination of technology for improvement of productivity and quality. Many growers are introducing technologies developed and recommended by the Project.

#### (2) Japanese pear

Japanese pear cultivation has been continued by a few growers since 1964 in a region of the State of Santa Catarina, however, the growing areas showed less increase because of technical problems in cultivation. After the Project started in 1996, growers began to have a keen interest in planting Japanese pear trees because that there are technical supports by the Project and market is offering a good price. Recently growing area of Japanese pear began to increase. It was 38.1ha in 1995, but increased 78.5ha in 1999.

For the information, the growing area of Japanese pear in Rio Grande Do Sul State is also increasing significantly.

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### 3 - 6. Amendment of TDIP

As the result of discussions and evaluation, it can be concluded that the amendment of TDIP is necessary in order to achieve the objectives of the Project during the rest period of cooperation.

#### 3 - 6 - 1. Extension of Experimental Period

Item in TDIP:

IV. Enhancement of studies on fertilization techniques and physiological disorders in southern Brazil

1. Developing soil management systems and methods of fertilizer application

Apple

1) Diagnosis of soil condition

Japanese pear

4) Diagnosis of soil condition

2. Investigating the actual conditions and the factors associated with the occurrence of physiological disorders

Apple

1) Survey and diagnosis on physiological disorders

Japanese pear

3) Survey and diagnosis on physiological disorders

Extend the experiment period of above items until the final year of the cooperation period.

#### 3 - 6 - 2. Allotment of Item

Item in TDIP:

V. Other

1. Disseminating the techniques and knowledge developed in the Project to small-scale horticulturists in the region

2) Producing audio-visual teaching materials

Add both Experiment Stations of São Joaquim and Caçador as the implementation sites of this item.

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#### 4. RECOMMENDATIONS

The following issues and necessary measures are recommended by the Joint Evaluation Committee as a conclusion.

- (1) Close cooperation among the project sites namely, São Joaquim Experiment Station and Caçador Experiment Station of Epagri, CPACT of Embrapa should be continued and further strengthened.
- (2) Strengthening of investigation on floral bud abortion of Japanese pear is required.
- (3) Continuation of intensive research works on soil and nutrition of apple orchards is recommended.
- (4) Securing necessary budget by the Brazilian side is strongly required to strengthen the project activities.
- (5) Formulation and implementation of promotion plan on Japanese pear cultivation by the State Government is recommended as indispensable countermeasures besides development and improvement of cultivation techniques by the Project.

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ATTACHED SHEET 1

Data on the Input by Japanese and Brazilian Sides  
from Dec. 1996 to Nov. 1999

The Research Project on Small-Scale  
Horticulture in Southern Brazil

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Input by Japanese Side 01 (Dispatch of Long and Short-Term Experts)

Fiscal year		1996	1997	1998	1999	2000
Name and field of expert	month	12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
<Long-Term Expert>						
Haruo Yanase	(Team Leader)	_____ (02.12.96~01.12.00) _____				
Katsuhisa Honda	(Coordinator)	_____ (01.12.96~30.11.98) _____				
Yoshio Yoshida	(Breeding)	_____ (02.12.96~24.09.98) _____				
Hiroyuki Fukuda	(Cultivation-Japanese pear)	_____ (02.12.96~01.12.97) _____				
Tetsuya Sugiura	(Plant Protection-pests)	_____ (08.01.97~07.01.01) _____				
Tatsuo Ozawa	(Plant Protection-diseases)	_____ (21.05.97~20.05.00) _____				
Masahiro Watanabe	(Cultivation-apple)	_____ (11.06.97~10.06.00) _____				
Koichi Yoshinari	(Coordinator)	_____ (11.11.98~10.11.00) _____				
Shigeru Shiba	(Cultivation-Japanese pear)	_____ (10.11.97~09.11.99) _____				
Shichiro Tsuchiya	(Breeding)	_____ (15.03.99~14.03.01) _____				

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Name and field of expert	Fiscal year	1996	1997	1998	1999	2000
	month	12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
<Short-Term Expert>						
Hitoshi Honjo			———— (11.06.97~31.10.97)			
(Agricultural Meteorology)						
Sakumi Kato			———— (14.07.97~04.09.97)			
(Cultivation-Japanese pear)						
Masahiro Osakabe			—— (13.10.97~06.12.97)			
(Plant Protection-pests)						
Hiroshi Kawasaki			———— (19.01.98~17.05.98)			
(Soil and Fertilization)						
Yuji Inomata				—— (03.08.98~30.09.98)		
(Cultivation-Japanese pear)						
Hitoshi Iwaya					———— (18.01.99~17.03.99)	
(Soil and Fertilization)						
Hidekazu Iwasaki					— (18.01.99~06.02.99)	
(Machine Installation)						

Input by Japanese Side 02 (Local Cost, Equipment Supply)

Fiscal year	1 9 9 6	1 9 9 7	1 9 9 8	1 9 9 9	2 0 0 0
1) Local Cost					
(1) General Local Cost	¥1,800,000 (US\$15.950)	¥4,000,000 (US\$33.200)	¥5,000,000 (US\$38.500)	¥5,000,000 (US\$43.500)	
(2) Cost for Enlightenment Activities		¥1,500,000 (US\$12.371)	¥3,500,000 (US\$25.325)	¥3,800,000 (US\$33.000)	
(3) Cost for Emergency Measures		¥2,631,000 (US\$22.900)			

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Fiscal year	1 9 9 6	1 9 9 7	1 9 9 8	1 9 9 9	2 0 0 0
2) Equipment Supply (C.I.F.)					
(1) Purchase in Japan	¥53,607,768 (US \$ 474,825)	¥36,288,000 (US\$301,220)	¥22,091,263 (US\$170,076)	¥24,689,000 (US\$214,687)	
(2) Purchase in Brazil	¥17,756,159 (US\$157,273)	—	¥2,480,000 (US\$17,944)	¥4,680,000 (US\$40,696)	
(3) Equipment for Expert's Use	¥4,546,440 (US\$40,269)	¥1,495,000 (US\$12,400)	¥998,140 (US\$7,680)	¥1,600,000 (US\$13,913)	

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# List of Achievement per Activity

Description of Activity	Fiscal Year Month	1 9 9 6	1 9 9 7	1 9 9 8	1 9 9 9
		12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
<Breeding> 1. Introduction and evaluation of cultivars and rootstocks of apple and Japanese pear 2. Selection of disease- and pest-resistant cultivars and rootstocks of apple 3. Selection of disease- and pest-resistant cultivars and rootstocks of Japanese pear					
<Cultivation Technique> 1. Investigation of planting distance (apple) 2. Development of tree training system (apple, Japanese pear) 3. Judgement of suitable harvest time (apple) 4. Investigation of the factors on occurrence of floral bud abortion and its control (Japanese pear)					

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<p>&lt;Plant Protection&gt;</p> <ol style="list-style-type: none"> <li>1. Survey of occurrence of main diseases and pest and identification of their causal agents (apple and Japanese pear)</li> <li>2. Establishment of control methods for spot disease on cv. Gula</li> <li>3. Study of virus-free technology (apple)</li> <li>4. Establishment of control methods for mite. (Japanese pear)</li> </ol>	<hr/> <hr/> <hr/> <hr/>
<p>&lt;Soil and Fertilization&gt;</p> <ol style="list-style-type: none"> <li>1. Diagnosis of soil condition (apple, Japanese pear)</li> <li>2. Establishment of recommended method of fertilizer application (apple, Japanese pear)</li> <li>3. Improvement of soil condition using organic substance (apple, Japanese pear)</li> </ol>	<hr/> <hr/> <hr/>

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Description of Activity	Fiscal Year	1 9 9 6	1 9 9 7	1 9 9 8	1 9 9 9
	Month	12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3	4 5 6 7 8 9 10 11 12 1 2 3
<Physiological Disorders>					
1. Survey and diagnosis on physiological disorders (apple, Japanese pear)					
2. Investigation of the factors on occurrence of physiological disorders and its control (apple, Japanese pear)					
<Diffusion>					
1. On-the-spot guidance and course			(1997)	(1998)	(1999)
1) Training of apple and Japanese pear growers			15	5	4
2) Management of apple pruning and cultivation			19	31	24
3) Apple cultivares				1	1
4) Control of diseases and pests			1		
2. Study circle · seminar · exhibition					
1) Seminar on apple and Japanese pear				1	
2) Seminar on temperate zone fruits				1	1
3) Fruit symposium				1	
4) Meeting for tasting of Japanese pear					1

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Input by Brazilian Side 01 Running Cost\*, C/P, Trainee

Fiscal year **	1 9 9 6	1 9 9 7	1 9 9 8	1 9 9 9
São Joaquim Experimental Station—Epagri	Running cost R\$67.150 Total C/P 15 Trainee 1	Running cost R\$67.150 Total C/P 15 Trainee 2	Running cost R\$106.650 Total C/P 15 Trainee 2	Running cost R\$102.200 Total C/P 14 Trainee 2
Caçador Experimental Station—Epagri	Running cost R\$325.850 Total C/P 10 Trainee 1	Running cost R\$325.850 Total C/P 10 Trainee 1	Running cost R\$356.550 Total C/P 10 Trainee 2	Running cost R\$272.000 Total C/P 10 Trainee 1
CPACT—Embrapa	Running cost R\$1.568.650 Total C/P 12 Trainee 2	Running cost R\$1.568.650 Total C/P 11 Trainee 1	Running cost R\$1.704.800 Total C/P 12 Trainee 1	Running cost R\$1.200.400 Total C/P 11 Trainee 2

\* Salary of employees not included

\*\* Fiscal year of the above establishments begins on 1<sup>st</sup> January and ends on 31<sup>st</sup> December.

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Input by Brazilian Side 01 – Complementary Data 01

1. Running Cost of Epagri São Joaquim Experimental Station (Currency : R\$)

1) Annual expenditure\*

	1 9 9 7	1 9 9 8	1 9 9 9**
Water	6,855.09	4,498.05	3,884.17
Telephone	6,598.52	8,552.14	6,940.41
Fuel	8,856.60	13,641.72	12,671.01
Electricity	8,599.48	9,360.10	8,518.73
Others	36,234.00	70,592.36	70,195.18
Total	67,143.69	106,644.37	102,209.50

\* Not included salary and construction costs of soil, nutrition and physiology laboratory for which Epagri spent about US\$203,000 in 1997 and 1998.

\*\* Estimation

2) Annual Income

	1 9 9 7	1 9 9 8	1 9 9 9*
Sales of its own products**	55,015.31	35,328.41	62,339.96
Research on consignment	4,648.25	49,977.50	30,799.99
Remittance from Head Office	5,791.12	9,738.79	0.00
Others	348.47	4,613.80	84.32
PRONAF***	—	18,000.00	18,000.00
Total	65,803.15	117,658.50	111,224.28

\* Estimation

\*\* Sales of apple, pear, seed potato, sapling, etc.

\*\*\* [Programa Nacional de Agricultura Familiar] which was created by the Federal Government of Brazil to fund the research and the diffusion of technique for small farmers.

Input by Brazilian Side 01- Complementary Data 02

1. Running Cost of Epagri Caçador Experimental Station (Currency : R\$)

1) Annual expenditure\*

	1 9 9 7	1 9 9 8	1 9 9 9**
Purchase of materials for research	159,265.33	176,619.44	124,500.00
Telephone	18,340.42	11,055.99	14,000.00
Electricity	19,816.91	15,243.45	16,000.00
Others	128,432.00	153,617.00	117,500.00
Total	325,854.66	356,535.88	272,000.00

\* Salary not included

\*\* Estimation

2) Annual Income

	1 9 9 7	1 9 9 8	1 9 9 9*
Sales of its own products**	45,172.00	44,491.00	40,000.00
Research on Consignment	84,812.00	68,395.00	57,000.00
Chemical analysis fee	56,357.00	51,592.00	50,000.00
Remittance from Head Office	79,357.33	68,799.44	0.00
P R O N A F	60,155.00	122,857.00	125,000.00
Total	325,853.33	356,134.44	272,000.00

\* Estimation

\*\* Sales of fry, sapling of apple, etc.

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Input by Brazilian Side 01 - Complementary Data 03

1. Running Cost of CPACT/EMBRAPA (Currency : R\$)

1) Annual expenditure\*

	1 9 9 7	1 9 9 8	1 9 9 9**
Purchase of materials for research	455,280.00	554,185.00	325,000.00
Telephone	92,756.00	98,245.00	102,000.00
Fuel	99,685.00	109,423.00	125,000.00
Electricity	107,733.00	126,104.00	170,000.00
Others	813,187.00	816,861.00	478,405.00
Total	1,568,641.00	1,704,818.00	1,200,405.00

\* Salary not included

\*\* Estimation

2) Annual income

	1 9 9 7	1 9 9 8	1 9 9 9*
Sales of its own products	310,573.00	416,765.00	369,000.00
Research on consignment	185,280.00	487,765.00	—
Remittance from Head Office	1,072,788.00	800,687.00	831,405.00
Total	1,568,641.00	1,704,818.00	1,200,405.00

\* Estimation

TS

Input by Brazilian Side 02

List of Allocation of C/P 01 (Breeding)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996 12 1	1997 4 7 10 1	1998 4 7 10 1	1999 4 7 10 1	2000 4 7 10 1	2001 4 7 10 1	Year	Main training place	
Emilio Brighenti Epagri São Joaquim	_____→△△△						99	National Institute of Fruit Tree Science 28.07.99~03.11.99	Apple
L.G.Ribeiro Epagri São Joaquim	_____								Apple
Eduardo.Humeres Epagri São Joaquim	_____								Apple
Ivan.D.Faoro Epagri Caçador	_____						96	National Institute of Fruit Tree Science 15.07.96~16.10.96	Japanese pear
Anisio.P.Camilo Epagri Caçador	_____								Japanese pear

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List of Allocation of C/P 02 (Cultivation Technique)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996	1997	1998	1999	2000	2001	year	Main training place	
	12 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1			
Adilson Pereira Epagri São Joaquim	—△△△—						97	National Institute of Fruit Tree Science 01.09.97~29.11.97	Apple (Breeding also)
José L. Petri Epagri Caçador	—△△						99	National Institute of Fruit Tree Science 01.09.99~03.11.99	Japanese pear
Gabriel B. Leite Epagri Caçador	—△△△—						98	National Institute of Fruit Tree Science 03.08.98~31.10.98	Japanese pear
Flávio G. Herter CPACT-Embrapa	—△△△—						98	National Institute of Fruit Tree Science 16.09.98~21.12.98	Japanese pear (Physiology also)
Bonifacio H. Nakasu CPACT-Embrapa	—								Japanese pear
Angela D. Campos CPACT-Embrapa	—								Japanese pear (Physiology also)

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List of Allocation of C/P 03 (Plant Diseases and Pests- 1)

Fiscal year Name of C/P month	配 置 状 況						Training in Japan		Observation
	1996 12 1	1997 4 7 10 1	1998 4 7 10 1	1999 4 7 10 1	2000 4 7 10 1	2001 4 7 10 1	Year	Main training Place	
Yoshinori Katsurayama Epagri São Joaquim			△△△△				98	National Institute of Fruit Tree Science 01.06.98~30.09.98	Apple diseases
José I. Boneti Epagri São Joaquim			△△△△				97	National Institute of Agrobiological Resources 14.07.97~15.11.97	Apple diseases (Breeding also)
Antonio.A.Neto Epagri São Joaquim									Apple diseases
Reinaldo Krueger Epagri São Joaquim									Apple diseases
Valdir Bonin Epagri São Joaquim				△△△			99	National Institute of Fruit Tree Science 28.07.99~03.11.99	Apple diseases
Julio Daniels CPACT-Embrapa									Apple diseases

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List of Allocation of C/P 04 (Plant Diseases and Pests - 2)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996 12 1	1997 4 7 10 1	1998 4 7 10 1	1999 4 7 10 1	2000 4 7 10 1	2001 4 7 10 1	Year	Main training place	
Luiz A.S. Castro CPACT-Embrapa	_____△△						99	National Institute of Fruit Tree Science 28.07.99~29.09.99	Apple diseases
Gerson R.L. Fortes CPACT-Embrapa	_____△△△						97	National Institute of Fruit Tree Science 01.09.97~15.11.97	Apple diseases (Tissue Culture also)
Eliane Augustin CPACT-Embrapa	_____								Apple diseases (Tissue Culture also)
Walter F. Becker Epagri-Caçador	_____								Japanese pear diseases (Breeding also)
Ildebrando Nora Epagri-Caçador	_____△△△						98	National Institute of Fruit Tree Science 15.06.98~17.09.98	Japanese pear pests

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List of Allocation of C/P 05 (Soil and Fertilization)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996	1997	1998	1999	2000	2001	Year	Main training place	
	12 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1			
Masanori Katsurayama Epagri São Joaquim	_____		_____				96	National Institute of Fruit Tree Science 15.07.96~17.11.96	Apple
Névio João Nuernberg Epagri São Joaquim		_____							Apple
Gilberto.Nava Epagri São Joaquim			_____△△				99	National Institute of Fruit Tree Science 01.09.99~03.11.99	Apple
Atsuo.Suzuki Epagri Caçador	_____△△△△△_____						97	National Institute of Fruit Tree Science 14.07.97~20.12.97	Japanese pear
Clori.Basso Epagri Caçador	_____								Japanese pear

T.P. JM

List of Allocation of C/P 06 (Physiology)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996 12 1	1997 4 7 10 1	1998 4 7 10 1	1999 4 7 10 1	2000 4 7 10 1	2001 4 7 10 1	Year	Main training place	
Takeshi Iuchi Epagri São Joaquim	—————△△△△△—————						98	National Institute of Fruit Tree Science 01.06.98~30.11.98	Apple (Cultivation Technique also)
Vera L. Iuchi Epagri São Joaquim	—————								Apple (Cultivation Technique also)
Darcy Camelatto CPACT-Embrapa	—————						96	National Institute of Fruit Tree Science 12.08.96~11.12.96	Japanese pear (Cultivation Technique also)
Claudio J. Freire CPACT-Embrapa	—————						97		Japanese pear (Cultivation Technique also)

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List of Allocation of C/P 07 (Diffusion)

Fiscal year	Allocation						Training in Japan		Observation
	1996	1997	1998	2000	2001	2002	year	Main training place	
Name of C/P month	12 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1	4 7 10 1			
Nazaro Vieira Epagri São Joaquim									
Amador Tomazelli Epagri Caçador									
Paul.F.da.Silva Epagri Caçador									
Antonio Heberle CPACT-Embrapa									
Marcio Magnani CPACT-Embrapa									

T.S.P. Ju

List of Allocation of C/P 08 (Others)

Fiscal year Name of C/P month	Allocation						Training in Japan		Observation
	1996 12 1	1997 4 7 10 1	1998 4 7 10 1	1999 4 7 10 1	2000 4 7 10 1	2001 4 7 10 1	Year	Main training place	
Laércio Nunes e Nunes CPACT-Embrapa	_____						96	National Institute of Fruit Tree Science 16.10.96-01.11.96	The head of CPACT at that time. Course for semi- higher officials.

T.P. Ju

ATTACHED SHEET 2

Attainment of activities in TDIP  
of  
The Research Project on Small – Scale  
Horticulture in Southern Brazil

December 3, 1999

Japan-Brazil Joint Evaluation Committee

TP JM

# Attainment of Activities in Tentative Detailed Imp. mentation Plan (TDIP) (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
I . Improvement of evaluation and selection techniques for cultivars and rootstocks in southern Brazil									
1. Evaluating the adaptability of the cultivars and rootstocks to the soil, climate, and social conditions of southern Brazil									
Apple									
1) Selecting early and middle season cultivars	X	X	X	X	X	To select earlier ripening cultivars than Gala and cultivars ripening between Gala and Fuji, and to establish continuous supply of apples all the year around using them (SJ).	About 150 cultivars have been evaluated. Among the early cultivars, Sansa ripens 15 days prior to Gala and showed good flavor conditions for immediate consumption. Kizashi was even earlier than Sansa, but its taste is too sour for Brazilian consumers. Among middle-season cultivars it is safe to recommend some apple scab-resistant cultivars as pollinators of Catarina. Storage quality of late ripening cultivars was compared in the conventional cold storage and in CA storage. The storage of Fuji, Catarina, and Braeburn under controlled atmosphere lasted up to 8 months. Catarina had good quality as late maturing cultivar, however, the flesh was merely hard as compared with Fuji. The fruits which had been stored for 3 to 5 months, were more suitable for the consumption. In the two types of cold storage, Catarina showed a better performance, its sugar contents and flesh firmness was higher than the other two cultivars. Despite its good appearance, Braeburn was considered to be too sour for the Brazilian consumer.	Introduction of new cultivars (early and mid-season) to assess blossoming period and other characteristics for further recommendation.  To continue the evaluation on resistance to diseases, and fruit qualities mainly on middle maturing cultivars.  Evaluation and selection of pollination- compatible with Gala and Fuji to be recommended to grower (Catarina etc.).  To follow up the evaluation of fruit qualities in the conventional cold storage and CA storage (Catarina etc.).	B
2) Evaluating the adaptability of newly bred rootstocks	X	X	X	X	X	To select new rootstocks instead of M, MM strains (SJ).	Among 21 CG series rootstocks, 4 clones, such as 7603R5-213 (CG-213), 76PKR-056, 7603R5-874, and 74R5M9-30 (CG-30), were taken notice as dwarfing and semi-dwarfing rootstocks. They were showing effective size controlling ability, high field resistance to collar rot, high precocity and productivity, and high fruit qualities.	To continue the evaluation on tree behavior, cropping and fruit qualities of Fuji trees grafted onto 29 clonal rootstocks, mainly CG clones, to select adequate rootstocks in southern Brazilian soil and climatic conditions.	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

Project Sites SJ: São Joaquim CD: Caçador PE: Pelotas

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Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
Japanese pear 3) Evaluating the adaptability of cultivars	X	X	X	X	X	To select cultivars and rootstocks adapted to conditions in southern Brazil (CD).	<p>About 30 mother plants were established from each of five JM clones, by grafting onto domestic seedlings and each clones has been multiplied to obtain many scionwoods for propagation by cutting and to raise Fuji trees for rootstock trials.</p> <p>Eleven Japanese pear cultivars grafted on two rootstocks, <i>Pyrus betulaefolia</i> and <i>P. calleryana</i> were planted in 1997. On the third year, a higher diameter width in Housui was recorded. Up to date no incompatibility between cultivars and rootstocks was observed.</p> <p>Evaluation of the characteristic of the cultivars will be done in the years to come due to the fact that the trees are too young.</p> <p>In order to obtain self-fertile cultivars, cross between Kousui and Osanijisseiki resulted in 109 seedlings.</p>	<p>To be detected on B/W ratio of 29 clonal rootstocks, mainly CG series rootstocks, to confirm the truthful dwarfing ability.</p> <p>Fuji trees grafted onto JM series rootstocks will be planted into rootstock trial field to evaluate the adaptabilities to southern Brazilian soil and climatic conditions.</p> <p>To evaluate the characteristics of the cultivars regarding to phenology and fruit quality during the upcoming years.</p> <p>To evaluate the agricultural characteristics of the seedlings.</p>	B
4) Investigating propagation methods of rootstocks	X	X	X	X	X	To establish method of hardwood cutting for pear rootstocks (CD).	<p>In 1997, six rootstocks were tested for rooting ability of hardwood cuttings using indolbutyric acid (IBA). Among the rootstocks tested, <i>P. calleryana</i> D12 has shown higher rooting potential. In 1998 the experiment was damaged because of abnormal and heavy rainfall, thus causing the death of numerous roots. Soil conditions are heavy clay with poor drainage that needs improvement or even irrigation during draught periods.</p>	<p>The experiment will be repeated on improved growth conditions for rooting of hardwood cuttings.</p>	C

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

2

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

SJ  
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Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
2. Selecting disease- and pest- resistant cultivars and rootstocks Apple 1) Selecting scab resistant cultivars	X	X	X	X	X	To select scab resistant cultivars and decrease the number of fungicide sprays using them (SJ).	Many crosses involving a cultivar with Vf gene and commercial cultivars have been doing in these years. So far, more than 760 resistant seedlings have been selected. Now, these materials were grafted on M9 and planted in the field in order to evaluate the other important agricultural characteristics.	To continue the inoculation to seedlings in order to get more genetic variability. To evaluate the agricultural characteristics of apple scab resistant selections in the field.	B
2) Selecting collar rot resistant rootstocks	X	X	X	X	X	To select collar rot resistant and semidwarf rootstocks (SJ).	Many crosses involving Marubakaido and M9 have been doing in these years. So far, more than 400 seedlings resistant to collar rot have been selected. Now, these materials have been planted in the field in order to evaluate the other agricultural characteristics.	To continue the inoculation to seedlings in order to get more genetic variability. Also, the resistant materials must be evaluated for rooting capacity, anchorage, vigor, incidence of burr knots, sprouting of suckers and leaf size. The agricultural characteristics of the cultivars that are grafted on them need to be evaluated, too.	B
3) Selecting pest resistant cultivars and rootstocks	X	X	X	X	X	To select cultivars showing low multiplication of mite and woolly aphid resistant rootstocks (SJ).	Catarina, Fred Hough, and D1R99T115 were susceptible to infestation by the European red mite and there were no difference on the multiplication of mite among them. Open pollinated seedlings of M.9 and Marubakaido have been inoculated with woolly aphid and then a total of 123 rootstocks were selected as non-infected ones.	To compare with cultivars showing low susceptibility of mite and to assess the procreativity on them. To continue the selection of rootstocks resistant to woolly aphid.	B
Japanese pear 4) Selecting disease resistant cultivars and rootstocks		X	X	X	X	To select cultivars resistant to Fabraea leaf spot and rootstocks resistant to collar rot (CD).	In 1998, survey on Fabraea leaf spot in Housui, Kousui, and Nijisseiki were carried out. Light symptoms similar to Fabraea leaf spot were observed on Kousui and Housui under natural infection.	To check on resistance by natural infection. To ascertain the importance and the effect of Fabraea leaf spot on Japanese pears.	C

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

3

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

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Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
II. Elaboration of cultivation techniques suitable for the soil, climate, and social conditions of southern Brazil							The rootstocks <i>Pyrus calleryana</i> D6 and other three were evaluated resistance to collar rot by inoculation to dormant shoots. Due to high moisture, it was not possible to evaluate typical lesions caused by the disease.	The experiment will be repeated by changing soil moisture conditions and other forms of inoculation.	
1. Developing planting and training systems									
Apple									
1) Investigation of rootstock, interstem, and planting distance	X	X	X	X	X	To determine appropriate planting distance in several combinations of cultivars and rootstocks (SJ).	<p>The use of M-9 as interstem has been reducing vigor and height of Fuji and Gala trees on Marubakaido rootstock. The tendency was the longer the M-9 interstem, the lower the vigor and height of the trees.</p> <p>In case of 20cm length of the interstem, the appropriate spacing trees was estimated to be 2 by5 m based on the size of 8 years old trees.</p> <p>On planting density, M-9 was suited for high density planting than M-26. It was estimated that the trees grafted onto dwarfing rootstocks, such as M9, should fall into less longevity than interstemmed trees.</p>	<p>To assess fruit size, tree's nutritional condition, productivity.</p> <p>Upon data collection, they shall be statistically analyzed for publication of results attained.</p>	B
2) Development of tree training system	X	X	X	X	X	To establish tree training system of central leader (SJ).	<p>Modified central leader system with limbs showed higher productivity comparing with traditional training system. The yield of ten-years-old trees recorded 70 tons/ha, and the ratio of well colored fruit reached over 80%.</p>	<p>To compare productivity and fruit qualities between modified central leader system with limbs arranged crosswise and the traditional training/pruning system.</p> <p>To establish recommendable technique of the modified central leader system for growers.</p>	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

4

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

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# Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
Japanese pear 3) Development of tree training system	X	X	X	X	X	To determine advantages and disadvantages of central leader, open center, V shape, and trellis training system on their productivity (CD).	In 1996 the experiment was established at the Caçador Experiment Station with three training systems, central leader, open center and V shape with Nijisseiki, Housui and Kousui. Significant response for the upcoming season was obtained by topping the main branches according each training system. Tree growth of the first year was normal and with no difference between systems. On the second and third year, there was dead of flower buds. Due to the growth of trees, it was impossible to reach the final training shape on the different systems	To look for a more practical management system. To test other systems, such as Latada, Manjedoura, and Tatura, with alternate trees.	B
4) Investigation of the factors on occurrence of floral bud abortion and its control	X	X	X	X	X	To identify position of buds in the tree and sites where major abortions occur (CD).	Lateral buds have been showing a higher abortion rate. The buds of Kousui show a lower abortion rate. Other cultivars vary widely depending on site and plant age.	To identify abortion rate of buds on different cultivars and conditions.	C
						To establish ways to minimize bud abortion (CD).	Manual pollination was used with good results on fruiting increase. In 1999, an experiment with screen cover was installed to assess the effect of temperature and radiation on floral bud abortion.	To study on control methods for temperature and sunlight on buds. To study on the use of a growth regulator to identify the abortion effects on buds.	C
	X	X	X	X	X	To identify factors causing floral bud abortion (PE)	Both drought and defoliation on January or February increased bud abortion, but weren't causal factors on European cultivars. Ethephon, GA3 and TDZ applied end of autumn increased bud abortion. Neither chilling hours nor temperature fluctuation affected on European pear cultivars. Temperature over 25°C during the last ten days in August increased the bud abortion.	To continue the study of the relationship between dormancy breaking and the temperature, water stress and other effects interfering in the abortion of buds.	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

5

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

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Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
2. Studying pre- and post-harvest physiology Apple 1) Judgment of suitable harvest time		X	X	X	X	To determine the time of initiation of floral bud abortion (CD, PE).	In 1998, temperature data collectors were installed in seven sites in Santa Catarina. It was observed that large thermal variation during the month prior to blooming shows a significant abortion rate (CD). On Japanese pear cultivars bud abortion increased at the end of winter (PE).	To continue the study to determine the initiation time of floral bud abortion (CD, PE)	B
						To examine metabolic compounds involved in floral bud abortion and on defective flowers (PE).	Flower buds and stem tissue have been collected for analysis.	To examine carbohydrate and hormone involved in the collected tissue.	D
	X	X	X	X	X	To determine accurate harvest time (SJ).	Gala and Fuji fruits from two different sites in Santa Catarina were sampled five times with 7 days interval, respectively. In 1997 to 1998, suitable harvest day of Gala was around 128 days after full bloom in Lages, around 135 days in Sao Joaquim. For Fuji, it was around 175 days in Lages and around 180 days in Sao Joaquim. Under the cold storage, Gala fruits harvested around in the suitable harvest time could store in desirable conditions for six months. The storage life of Fuji and Gala fruits decreased on and after the fourth sampling.	To continue the experiments on determination of suitable harvest time.	B
III. Development of plant protection techniques 1. Diagnosing and identifying main diseases and pests Apple 1) Survey of occurrence of main diseases and identifying its causal agents	X	X	X	X	X	To identify causal fungi of main diseases, especially Gala leaf spot for development of their control (SJ).	Three species of <i>Colletotrichum</i> were frequently isolated from lesions on leaves of Gala. They were identified as <i>C. gloeosporioides</i> , <i>C. acutatum</i> , <i>C. sp.</i> , respectively. The isolates of each species induced the same symptoms on fruits and leaves of Gala as Gala leaf spot and were reisolated from lesions. The results showed that three species of <i>Colletotrichum</i> are causal fungi of Gala leaf spot.	To elucidate relationships between <i>Colletotrichum</i> isolates obtained from fruits infected with bitter rot (Gala and Fuji) and isolates from Gala leaf spot (leaf and fruit).	A

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

6

Project Sites SJ: São Joaquim CD: Caçador PE: Pelotas

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Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
Japanese pear 2) Survey of occurrence of main diseases and identifying its causal agents	X	X	X	X	X	To identify main diseases on Japanese pear and its causal agents (CD).	It was found that the causal agent of a canker was <i>Dothiorella</i> sp., and of the leaf spot was <i>Entomosporium mespili</i> .	To survey on the diseases.  To do pathogenicity tests of 6 fungi isolated from lesions. To index diseased trees showing necrotic spot using an indicator, HN-39 for Japanese pear necrotic spot.	B
3) Survey of occurrence of main pests	X	X	X	X	X	To identify the species and ecology of the pests on main cultivars for establishment of control methods (CD).	Luminous trap installed in July 1999. In the 98/99 seasons the occurrence of <i>Grapholita molesta</i> was detected in all the Japanese pear production region, in shoots and fruits. It damages buds and fruits. Another pest, leafroller larvae ( <i>Bonagota cranaodes</i> ) damages foliage and fruits. The Chrysomelideans damage flowers, foliage, shoots, and fruits, and usually occur at the blossoming season. <i>Diabrotica speciosa</i> is one of the main pests, however, many other species occur at blooming. Aphids infest shoots at blooming. The main species is <i>Aphis citricola</i> and the second is <i>Aphis gossipi</i> . The south-American fruit fly <i>Anastrepha fraterculus</i> is the main fruit pest. It occurs in orchards from November to April and its peak infestation is December to February. Its monitoring is made with Mcphail traps. If no control is used, loss of fruits can be 100%.  San Jose Scales are common pests in the orchards. Main scales are <i>Quadraspidiotus perniciosus</i> and <i>Lepidosaphes ulmi</i> . Main pests found during the research period were <i>Anastrepha fraterculus</i> , <i>Bonagota cranaodes</i> , <i>Grapholita molesta</i> , <i>Tetranychus urticae</i> , <i>Panonychus ulmi</i> , <i>Quadraspidiotus perniciosus</i> , <i>Lepidosaphes ulmi</i> , <i>Diabrotica speciosa</i> , <i>Aphis citricola</i> , and <i>Aphis gossipi</i> . – Predators: <i>Amblyseius</i> spp. and <i>Phytoseiulus</i> sp.	To carry out an arthropodes survey during the 1999/2001 season. To conclude studies on populational fluctuation of the leafroller larvae and shoot mites. To study on its biology.  There are other species of chrysomelideans to be identified.  To establish sampling method and identification of predators. To define the beginning of infestation, number of traps per hectare, and control level. To define generations, monitoring.	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

7

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

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# Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
2. Establishment of control methods for main diseases and pests Apple									
1) Establishment of control methods for spot disease on cv. Gala		X	X	X	X	To establish of effective control methods of Gala leaf spot (SJ).	<p>The starting time and progress of disease was monitored for two growing seasons (1997/99) in three regions where were different in microclimate. In 1997/98 season sever epidemics and losses occurred due to warm and wet weather from spring to autumn, whereas in 1998/99 season, epidemics were light due to dry and cool weather from spring to early summer.</p> <p>Monitoring data of disease progress and weather data will be utilized for disease forecasting .</p> <p>The effects of temperature and leaf wetness period on the disease severity were studied in controlled conditions.</p> <p>The survival mode of <i>Colletotrichum</i> spp. was monitored.</p>	<p>To continue the monitoring of weather conditions and to associate the data to start and progress of the disease.</p> <p>To examine survival mode of <i>Colletotrichum</i> spp. in fields.</p> <p>To study on susceptibility of the main cultivars.</p> <p>To test more combinations of leaf wetness period and temperature in green house.</p> <p>To determin incubation period and latent period.</p> <p>To elaborate the forecasting model for Gala leaf spot.</p>	B
Japanese pear									
2) Establishment of control methods for mites	X	X	X	X	X	To identify species of mites and their natural enemy, and elucidating the extent of resistance of mites to acaricides to establish integrated control for mites (CD).	<p>The European Red Mite (<i>Panonychus ulmi</i>) and the Twospotted Spider Mite (<i>Tetranychus urticae</i>) are among the main pests affecting pear trees, damaging foliage. In the early season appear the larvae during a long period, what makes chemical control difficult, which is based on various miticides. In the season 97/98 there had been a heavy infestation of <i>T. urticae</i> from January to March. This population became resistant to Dicofol. However, after three generations, it is possible to use Dicofol again because they lost resistance. The growth in population is due to excessive pyrethroids applications.</p> <p>It is developed a biological control method for mites with Phytoseiidae. Two species were identified: <i>Amblyseius californicus</i> and <i>Phytoseiulus macropilis</i>.</p>	<p>The mite control is based on spraying with miticides. It is necessary to define the groups of miticides by their efficiency, phytotoxicity and correct application time.</p> <p>To identify other species of predators and to monitor biological control method.</p>	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

JS  
JM

Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
3. Studying virus-free technology Apple 1) Obtaining of virus-free materials using antiviral compounds and shoot tipculture.	X	X	X	X	X	To obtain cultivars and rootstocks free from topworking disease viruses (SJ, PE).	<p>The potted young apple trees infected with apple chlorotic leaf spot virus were sprayed with ribavirin (500ppm) twice in a week for one month and then shoot tips were grafted in the healthy apple seedlings. These trees were indexed using an indicator MO-84 for ACLSV in the second season. The indexing results showed that ACLSV was eliminated from shoot tips by chemotherapy (SJ).</p> <p>Six thousand cleaned plantlets of Marubakaido rootstock was obtained through shoot tip culture and thermotherapy (PE1).</p> <p>Apple stem grooving virus was found to spread widely in apple trees in commercial orchards. 37% of the indexed samples were infected with ASGV. On the other hand ASPV was not detected in samples collected from apple orchards (PE2).</p> <p>168 indicator plants of 13 species of <i>Malus</i> and <i>Pyrus</i> were planted in an orchard (PE3).</p>	<p>To index the trees treated with ribavirin in 1988, using two indicator plants, MO-65 and MO-84 for ACLSV and apple stem pitting virus (ASPV) (SJ).</p> <p>To make antisera for main apple and pear viruses (PE).</p> <p>To establish detection methods of apple viruses using electronic microscopy (PE).</p> <p>To examine influence of the main viruses to the productivity of apple trees (PE)</p>	A
	X	X	X	X	X	To assure purity of propagated plants by molecular characterization of cultivars and rootstocks of apple germplasm (PE).	<p>It was possible to characterize the cultivar and also detect varietal mixtures by isoenzymes.</p>	<p>To develop other isoenzyme systems in order to assure purity of propagated plants.</p>	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

9

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

T.S.  
J.M.

Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score																																		
IV. Enhancement of studies on fertilization techniques and physiological disorders in southern Brazil 1. Developing soil management systems and methods of fertilizer application Apple																																											
1) Diagnosis of soil condition	X	X	X			To determine relationship between soil fertility and tree growth (SJ)	Chemical properties of the soil (pH, amount of Ca, Mg, K, P, Al and organic matter) did not show any relationship with plant vigor. On the other hand, in some plots it was observed high resistance to the penetrometer and high clay content. Such soil condition may cause low oxygen availability and root development. Some diagnosed plots showed few roots below 30 cm depth.	Chemical analysis of soil, foliage and fruits suspended in 1998/99 is to be continued. The evaluations scheduled for the years 1999 /2000 and 2000/2001 are as follows: • Physicochemical analysis of the soil; • Foliage and fruit analysis; • Root expansion and distribution analysis in the soil profile; • Plant growth parameters; • Productivity and fruit quality.	C																																		
2) Establishment of recommended method of fertilizer application	X	X	X	X	X	To determine appropriate amount and time of application of fertilizer (SJ)	Nitrogen and potassium dosages were used on an increasingly basis (0, 50, 100 and 200 kg/ha; and 0, 50, 100 and 200 kg K <sub>2</sub> O/ha), respectively. The amount of N increased in the foliage in proportion to the quantity of this nutrient applied to soil. Table 1. Leaf N content as a function of N and K <sub>2</sub> O rates applied on the soil <table><tr><th rowspan="2">Nitrogen rates (kg/ha)</th><th colspan="4">K<sub>2</sub>O rates (kg/ha)</th><th rowspan="2"> (%)</th></tr><tr><th>0</th><th>50</th><th>100</th><th>200</th></tr><tr><td>0</td><td>2.09</td><td>2.06</td><td>2.02</td><td>2.14</td><td></td></tr><tr><td>50</td><td>2.16</td><td>2.14</td><td>2.10</td><td>2.11</td><td></td></tr><tr><td>100</td><td>2.20</td><td>2.16</td><td>2.29</td><td>2.25</td><td></td></tr><tr><td>200</td><td>2.29</td><td>2.33</td><td>2.33</td><td>2.36</td><td></td></tr></table>	Nitrogen rates (kg/ha)	K <sub>2</sub> O rates (kg/ha)				(%)	0	50	100	200	0	2.09	2.06	2.02	2.14		50	2.16	2.14	2.10	2.11		100	2.20	2.16	2.29	2.25		200	2.29	2.33	2.33	2.36		Chemical analysis of soil, foliage and fruits suspended in 1998/99 is to be continued. Future evaluations schedule for the years 1999 /2000 and 2000/2001 are as follows: • Soil physical-chemical analysis ; • Fruit and leaf analysis; • Root expansion and distribution analysis in the soil profile; • Plant growth parameters; • Productivity and fruit quality.	C
Nitrogen rates (kg/ha)	K <sub>2</sub> O rates (kg/ha)				(%)																																						
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200	2.29	2.33	2.33	2.36																																							

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
- : Out of Evaluation

10

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

Handwritten signature/initials.



Attainment of Activities in TDIP (1997-1999)

Attainment of Activities in IDIP (1997-1999)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

11

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

*Handwritten signature/initials*

# Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
5) Establishment of recommended method of fertilizer application	X	X	X	X	X	To determine the reaction of Japanese pear tree to increasing dosage of nitrogen fertilization (CD).	<p>In 1997 it was established an experiment at the Caçador Experiment Station with Housui /<i>Pyrus calleryana</i>, with levels of N associated to P and K.</p> <p>In 1997, another N-fertilization experiment in a bearing Japanese pear orchard, with Housui /<i>Pyrus betulaefolia</i> in production was installed. Because of problems, it had to be transferred to another site in 1998, consequently delaying information reports.</p> <p>Results available up to date show a greater growth related to higher N levels.</p>	To continue the experiment to evaluate the N response and to obtain data for N fertilizer recommendation.	B
6) Improvement of soil conditions using organic manure.		X	X	X	X	To assess the results of organic manure in Japanese pear orchards (CD).	<p>In 1997 an experiment was established at the Caçador Experiment Station to verify the effects of poultry manure under clean, grassed and mulch cultivation on Housui /<i>Pyrus calleryana</i>.</p> <p>In 1998 and 1999, the results have shown that organic manure and mulch cover led to higher N and K leaf content and plant growth.</p>	To continue the experiment to obtain useful data on plant growth, chemical and physical properties of soil, and others.	B
2. Investigating the actual conditions and the factors associated with the occurrence of physiological disorders. Apple 1) Survey and diagnosis on physiological disorders.	X	X	X			To identify physiological disorders occurred in orchards and grasping actual occurrence condition of bitter pit (SJ).	<p>It was observed occurrence of several physiological disorders in orchards and cold storages, such as water core, lenticel blotch spot, boron deficiency, bitter pit, and internal breakdown. The main problem in Fuji was water core as well as lenticel blotch spot in Gala. Disorders were photographed for revision and further publication.</p>	To sample and register the fruits showing typical symptoms of physiological disorders for further publication in bulletins.	C

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
- : Out of Evaluation

TS  
JM

Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
2) Investigation of the factors on occurrence of physiological disorders and its control.	X	X	X	X	X	To establish control methods of bitter pit (SJ).	<p>Occurrence of bitter pit was not reported in 1998, but in 1999.</p> <p>One of factors associated with bitter-pit was the excess of nitrogen in soils which caused oversize of fruits. The nutritional unbalance in fruits led to rotting even under cold storage. In Fuji the different sources of Ca did not give any influence in russetting on fruits. However, in Gala the calcium nitrate and Ca+Boron increased the occurrence of russetting on the calyx end of the fruits.</p> <p>Further data have been collected regarding lack of irrigation.</p>	<p>Similar experiments will be carried out in 2000 and new products are to be used in 2001.</p>	B
	X	X	X	X	X	<p>To determine metabolic substances involved in physiological disorders and development of methods of control by the following research :</p> <p>Determine of accumulation curves for N, P, K, Ca, Mg and B in fruits of cvs Gala, Golden and Fuji, from petal fall to harvest (PE).</p>	<p>Accumulation curves for N, P, K, Ca, Mg and B in fruits of cvs. Gala, Golden Delicious and Fuji, from petal fall to harvest were determined. Since bitter pit in the fruits of these cultivars in Vacaria-RS did not occur, it was impossible to establish any relationship between level of nutrients and bitter pit. However, severe bitter pit was observed in the fruits of Gala and Rainha harvested in Pelotas. Those fruits contained very high Mg (&gt;10 mg.100<sup>-1</sup>g of flesh) in the flesh, whereas there was no difference in the contents of N, P, K, Ca and B between healthy and affected fruits.</p>	<p>To examine the effect of ratios of Ca and other nutrients to Mg in flesh to the occurrence of bitter pit.</p> <p>To test application of surfactants in order to increase absorption of calcium into fruits.</p>	C
Japanese pear 3) Survey and diagnosis on physiological disorders	X	X	X			To record all kinds of physiological disorders occurred in orchards (CD).	<p>The survey on the occurrences of physiological disorders together with the survey of the nutritional condition revealed the occurrence of following disorders in commercial orchards of Santa Catarina: Russetting on fruits, Mg deficiency and K excess on leaves, and B deficiency on fruits.</p>	<p>After detection of physiological disorders, to define corrective measures.</p> <p>To continue the experiments in order to obtain more information.</p>	B

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
- : Out of Evaluation

TS  
JM

Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
4) Investigation of the factors on occurrence of physiological disorders	X	X	X	X	X	To determine factors relating to the occurrence of disorders in orchards and to establish their control methods (CD).	Russeting is reduced in Nijisseiki by bagging the fruits.  Regarding Mg deficiency, by soil analysis, it was shown that it was due to the antagonism with the excess of K in the soil. Growers were instructed on corrective measures accordingly.	To obtain corrective measures for B deficiency by carrying out the experiment with soil and leaf B application.	B
	X	X	X	X	X	To identify metabolic substances involved in physiological disorders and to establish control methods (PE).	No physiological disorders on fruits have occurred so far.	Intensive survey in all area about the occurrence of disorders in fruit.	—
V. Other									
1. Disseminating the techniques and knowledge developed in the Project to small-scale horticulturists in the region									
1) Conducting technical seminars for horticultural researchers and technicians, extension officers, and leading farmers, and producing technical publications	X	X	X	X	X	To improve techniques for cultivation of apple and Japanese pear which are being done by growers through implementation of technical guidance for cultivation technique.  To intensify research and extension activity by conducting seminars and publication of reports (SJ, CD, PE).	As per scheduled, knowledge and cultivation techniques developed in the Project for past three years were diffused to growers through the following events: • Farmers courses on apples and pears • Field demonstrations on pruning and other orchard management • Annual meetings on plant protection • Tasting to evaluate apple cultivars • Tasting demonstration of Japanese pear • Seminar on temperate fruit trees • Brazilian congress on fruit production In total, 6,309 persons (growers, researchers and technicians included) attended to those events.	Activities to be scheduled, are as follows: • Publication of a technical book on the cultivation of Japanese pear; • Continuation of tasting demonstration of apple and Japanese pear; • Publication of half year technical information paper.	A

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

14

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

KS  
JM

Attainment of Activities in TDIP (1997-1999)

Item	97	98	99	00	01	Goal of achievement	Present status and attainment	Activities in remaining period	Score
2) Producing audio-visual teaching materials		X	X	X	X	To help understanding cultivation techniques of apple and Japanese pear using audio-visual teaching materials (PE).	<p>Following publications were made:</p> <ul style="list-style-type: none"> <li>Annual report of the Project 300 copies</li> <li>The report of Plant Protection Meeting 650 copies</li> <li>Handbook (The Apple Pests and Diseases) 1000 copies</li> <li>Study Notes(Course on Pear Cultivation) 150 copies</li> <li>20 kinds of technical-illustrative banners on the cultivation of apples and Japanese pear</li> <li>Folders showing works being in the Project</li> </ul> <p>The following has been planned and produced for dissemination of cultivation techniques of apples and Japanese pears and for public relations of the Project:</p> <ul style="list-style-type: none"> <li>A video presentation on apple harvesting, sorting and packing;</li> </ul>	<p>Schedule for the next period are production of:</p> <ul style="list-style-type: none"> <li>Technical videos on pollination, pruning, plant protection and general activities on Project (SJ, CD);</li> <li>Reproduction of technical illustrative banners and folders etc. (SJ).</li> </ul>	A

TS  
Ju

Score A: Further Progressing B: On Schedule C: Less Progressing D: Delay  
—: Out of Evaluation

15

Project Sites

SJ: São Joaquim CD: Caçador PE: Pelotas

## ANNEX 2 Project Design Matrix for the Research Project on Small-Scale Horticulture in Southern Brazil

Term of Cooperation: 1996.12.01-2001.11.30

Target Area: The State of Santa Catarina

Target Group: Small-Scale Horticulturist

1999.12.06

Narrative Summary	Verifiable Indicator	Means of Verification	Important Assumptions
(Overall Goal) The appropriate and sustainable cultivation techniques for horticulture crop production in southern Brazil will be developed and introduced, thus contributing to the improvement of the farming of small-scale horticulturists.	1. Yield of apple and Japanese pear increases. 2. Growing areas of apple and Japanese pear trees increases. 3. The number of small-scale Japanese pear growers increases.	1. Yearly regional statistics of production and shipment of horticulture crops.	1. There is no change of policy on temperate fruit culture of the federal government and state government.
(Project Purpose) The research and dissemination activities on the development of cultivation techniques of apples and Japanese pears at Epagri will be enhanced..	1. The number of technical publications increases. 2. Yield per hectare of apple and Japanese pear increases. 3. The ratio of upper grade apple and Japanese pear fruits increases. 4. Production of nursery trees of Japanese pear increases.	1. Yearly regional statistics of cultivation of horticulture crops. 2. The publications, such as technical reports, research journals, books etc.	1. The support for producer cooperatives of apple and Japanese pear by both federal and state governments is conducted. 2. There is no change of research institute systems of horticulture in southern Brazil.
(Results/Output) 1. The evaluation and selection techniques for cultivars and rootstocks will be improved. 2. The cultivation techniques suitable for the soil, climate and social conditions in southern Brazil will be elaborated. 3. The plant protection techniques will be developed. 4. The studies on fertilization techniques and physiological disorders will be enhanced. 5. The techniques and knowledge developed in the Project will be used for dissemination to small-scale horticulturists in the region.	1. Introduced or newly bred superior cultivars and rootstocks in the Project spread. 2. Stable and high yields of apple and Japanese pear continue. 3. Occurrence of apple and Japanese pear pests decrease 4. Occurrence of physiological disorders decrease. 5. The number of participants of seminars for new producing techniques is reached at adequate numbers.	1. Annual reports of the Project, technical reports, and books etc. 2. Yearly regional statistics of cultivation of horticulture crops. 3. Report of results of disseminating activities in each of the institutes.	1. The close relationship among each project sites is kept.
(Project Activities) 1. Evaluation and selection of cultivars and rootstocks. 1-1. Evaluating the adaptability of the cultivars and rootstocks to southern Brazil. 1-2. Selecting disease-resistant cultivars and rootstocks.  2. Cultivation techniques for southern Brazil. 2-1. Developing planting and training systems 2-2. Studying pre-and post-harvest physiology.  3. Plant protection 3-1. Diagnosing and identifying main diseases and pests. 3-2. Studying methods to control main diseases and pests. 3-3. Studying virus-free technology.  4. Fertilization techniques and physiological disorders. 4-1. Developing soil management systems and methods of fertilizer application. 4-2. Investigating the actual conditions and the factors associated with the occurrence of physiological disorders.  5. Other 5-1. Disseminating the techniques and knowledge developed in the Project to small-scale fruit growers in the region.	(Input) I. Japanese side 1. Dispatch of Japanese experts 1-1. Long-term experts. 1-2. Short-term experts. 2. Provision of machinery and equipment 2-1. Research equipments. 2-2. Vehicles. 2-3. Office facilities. 3. Training of Brazilian personnel in Japan. 4. Expenditure of local cost of the Project.  II. Brazilian side 1. Arrangement of counterpart personnel. 1-1. Project Director. 1-2. Project Coordinator. 1-3. Project Manager. 1-4. Researchers in the necessary fields. 1-5. Other necessary supporting staff. 2. Provision of land and facilities for the Project. 3. Expenditure of local cost of the Project. 4. Establishment of Joint Coordination Committee.	1. Counterpart personnel do not transfer from the Project during the term of cooperation. 2. The Brazilian side's budget, including the cost of assignment of full-time counterpart personnel, is allocated appropriately. 3. Unusual weather harmful for the implementation of the Project does not occur.	(Preconditions) 1. The federal and state governments, research institutes concerned with the Project, regional agricultural cooperatives etc. support the Project.

2. 分野別活動項目達成状況表 (和訳)

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
I. 南ブラジルにおける品種及び台木の選抜・評価									
1. 土壌、気候及び社会条件に適した品種及び台木の適応性評価									
リンゴ									
1) 早生・中生品種の導入・選抜						「ガラ」より早い品種、及び「ふじ」と「ガラ」をつなぐ中生品種を選抜し周年供給を可能にする。(SJ)	約 150 品種・系統の品種比較試験を実施した。 早生品種・系統の内、「さんさ」は「ガラ」より 15 日早く熟し、良い品質であった。 「きざし」は「さんさ」より更に早生であるが、ブラジルの消費者にはやや酸味が強い。中生の選抜に当っては、「カタリーナ」と交雑和合性で、黒星病耐病性形質を持つ品種が好ましい。 晩生品種の貯蔵性試験では、普通冷蔵と CA 貯蔵で比較を行った。CA 貯蔵された晩生品種の「ふじ」、「カタリーナ」、「プレイバーン」の果実は 8 カ月間良い状態に保たれた。 「カタリーナ」は晩生品種として品質が良好であるが、肉質が「ふじ」に比べるとやや硬く、3～5 カ月間貯蔵された果実が消費に適する。「カタリーナ」は糖度、硬度が他の 2 品種より高い傾向を示した。「プレイバーン」は、外観は良好であるが、ブラジルの消費者にとっては酸味が強すぎる。	国内外より新品種（主に、早生、中生品種）を導入し、既導入品種とあわせて特性調査を継続し、有望な早生及び中生品種を選抜する。 「カタリーナ」等有望品種・系統について、「ふじ」や「ガラ」に交雑和合性を示すかの検討を行う。 「カタリーナ」等有望品種・系統について、普通冷蔵や CA 貯蔵における果実品質の調査を継続する。	B
2) 新育成台木の適応性評価						M, MM 系台木に変わる新台木を選抜する。(SJ)	CG 系台木 21 系統の内、7603R5-213 (CG-213)、76PHR-056、7603R5-874、74R5M9-30 (CG-30) はわい性、半わい性台木として注目された。これらの台木は樹の大きさ、カラーロッド耐性、早熟性、収量、果実品質の点で優れていた。 JM 系台木 5 系統については、穂木取り用母樹として各々 30 樹を養成した。	CG 系台木を中心とした 29 系統の台木について、「ふじ」を接木した樹の樹特性、栽培性、果実品質の調査を継続し、南ブラジルに適した台木を選抜する。 29 系統の台木について、特に、選抜した CG 系台木についての B/W 比を測定して、わい化度との関連を調査する。 JM 台木については、「ふじ」を接木して、圃場に定植後、各種特性を調査して、南ブラジルにおける適応性を調査する。	B

評価： A 計画以上、B 計画通り、C 計画より遅れている、D 殆ど進捗していない、- 評価不能 - l - プロジェクト名： SJ サンジョアキン、CD カサドル、PE ペロータ

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
ニホンナシ 3) 品種の地域適応性評価						南ブラジルの環境に適した品種及び台木を明らかにする。(CD)	1997 年にマンシュウマメナシ及びマメナシの台木に 1) 品種のニホンナシを接ぎ木した。 3 年生の段階では「豊水」の生育が優れた。 現段階では供試した台木 2 系統と穂品種との間に接ぎ木不親和性の兆候は見られない。 若木のため地域適応性の評価等は今後の課題となる。 自家和合性品種育成のため、「幸水」と「おさ二十世紀」との交雑を行い、109 個体の実生を得た。	各品種の生育特性や果実品質を評価する。 得られた実生の農業形質を評価する。	B
4) 台木の繁殖法の検討						ナシ台木の挿し木繁殖法を確立する。(CD)	1997 年に台木 6 系統の挿し木繁殖を発根促進剤である IBA を用いて試みた。その結果、マメナシ D12 の発根率を高めることができた。 1998 年は多雨のため根腐れ病が多発し実験は不良に終わった。 土壌条件が重粘で排水性に乏しいため、土壌改良や寡雨期には灌水が必要である。	挿し木繁殖の条件を改善し再検討する。	C
2. 病害虫抵抗性品種及び台木の選抜 りんご 1) 黒星病抵抗性品種の選抜						黒星病抵抗性品種を選抜し、それを用いて薬剤散布回数の軽減する。(SJ)	黒星病抵抗性遺伝子 (Vf gene) を保有する品種・系統を片親とする交雑を実行し、多くの実生個体を得た。その中で強度の抵抗性を示す 760 個体を、M9 台に接いでほ場に定植し、栽培上重要な形質の調査を行っている。	より多くの有用形質を持つ品種を得るため、苗木の選抜を引き続き行う。 定植した抵抗性個体の有用形質の評価を継続する。	B
2) 土壌病害抵抗性台木の選抜						疫病抵抗性のわい性台木を選抜する。(SJ)	マルバカイドウと M9 の交雑を行い、得られた多くの実生の中から約 400 個体が抵抗性と判定され、ほ場に定植し、栽培上重要な形質の調査を行っている。	より多くの有用形質を持つ品種を得るため、苗木の選抜を引き続き行う。 わい化度を判定するための（根の皮部／木部）比を、調査する段階まで育ったものから順次調査を実施する。 定植した抵抗性個体の有用形質の評価を継続する。	B

評価： A 計画以上、 B 計画通り、 C 計画より遅れている、 D 殆ど進捗していない、 - 評価不能 - 2 - プロジェクトサイト： SJ サンジョアキ、 CD カナドール、 PE ベロータス



分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
3) 虫害抵抗性品種・台木の選抜						ハダニの増殖率の低い品種およびワタムシ抵抗性台木を選抜する。(SJ)	「カタリーナ」、「フレッドホフ」、および DIR99T115 はリングハダニの増殖率が低い傾向が見られたが、品種間に統計的有意差はなかった。 マルバカイドウと M9 の自然交雑実生にワタムシを接種し、123 個体が抵抗性を示した。	ハダニの増殖が少ない品種間で、増殖率を比較する。 ワタムシ抵抗性実生の選抜を継続する。	B
ニホンナシ 4) 病害抵抗性品種及び台木の比較・選抜						ごま色斑点病抵抗性品種及びカラーロット抵抗性の台木を選抜する。(CD)	1998 年に「豊水」、「幸水」及び「二十世紀」についてごま色斑点病の発生を調査した。自然感染下において、「幸水」と「豊水」でごま色斑点病に似た軽微な症状が観察された。 マメナシ D6 他 3 系統を供試し、休眠枝にカラーロットの病原菌を接種して抵抗性を評価した。高湿度のために病斑を確認評価することはできなかった。	自然感染下での抵抗性を調査する。ニホンナシにおけるごま色斑点病の重要性について確認する。 土壌水分条件や接種条件を改善し、実験を継続する。	C
II. 南ブラジルの土壌、気候及び社会条件に適した栽培技術の開発 1. 栽植及び仕立て法の確立 リング 1) 台木の種類と栽植密度の検討						各種の台木と穂品種の組合せ試験により適性な栽植距離を決定する。(SJ)	マルバカイドウを台木、M.9 を中間台木とした「ふじ」及び「ガラ」樹は、いずれもわい化し、そのわい化傾向は、M.9 の中間台木の長さが長くなる程顕著であった。 中間台木の長さが 20cm の場合、8 年生樹の生育から判断すると、2 x 5 m の栽植距離が適当であると推定された。 栽植密度としては、M.9 台樹が M.26 台樹より密植栽培が可能である。経済栽培樹齢としては、M.9 等のわい性台木に直接接木した樹に比べ、中間台樹の方が長いであろうと推定される。	果実の大きさ、樹の栄養条件、生産性等の調査を行い、統計処理を行って、適正な栽植距離を策定する。	B
2) 仕立て法の確立						主幹形仕立て法の整枝・剪定法を確立する。(SJ)	主枝を十字に配置する主幹形仕立て法は、従来の主幹形仕立て法に比べて、収量が高いことが明らかになった。10 年生樹で、収量は ha 当たり約 70 トンで、着色良好な果実の割合は 80% を超えており、優良な仕立て法と評価される。	十字主幹形と従来の主幹形仕立てについて、収量性や果実品質について比較する。 十字主幹形が、生産者に普及し得る技術となる様に、整枝剪定法等の技術を確立する。	B

評価： A 計画以上、B 計画通り、C 計画より遅れている、D 殆ど進捗していない、- 評価不能 -3- プロジェクトサイト： SJ サンジョアキン、CD カサドール、PE パローラ

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
ニホンナシ 3) 仕立て法の確立						主幹形、開心形、V 字型及び平棚仕立て の生産性から種々の 樹形の有利性、不利 性を確定する。(CD)	1996 年からカサドル試験場において主幹形、開心 形及び V 字型の仕立て法を「二十世紀」、「幸水」、「豊 水」の 3 品種で検討している。 1997 年度は骨格枝の切戻し程度を変化させた結果、 各仕立て法で次年度の生育量に優位な差が見られた。 初年度は生育良好で各仕立て法の間に違いは見られ なかったが、2 年目と 3 年目には芽ばけが多発した。 現在の生育状況からは最終的な仕立て法の確立まで は至っていない。	より実用的な仕立て法を模索する。 さらに供試樹を増やして、Latada, Manjedoura, Tatura の仕立て法についても 検討する。	B
4) 芽(花)ばけに関与 する要因の解明と被 害軽減法の確立						樹体内部位別及び地 域の中で主に芽ばけ が発生する場所を明 らかにする。(CD)	えき花芽が高い芽ばけ発生率を示した。 「幸水」が比較的芽ばけ率の少ない傾向を示した が、他品種では場所や樹齢によって大きく変動した。	さらに異なる品種や条件下における芽 ばけの発生について検討する。	C
						芽ばけの被害軽減法 を確立する。(CD)	人工授粉によって着果率が向上した。 1999 年に寒冷紗掛けを実施し、芽ばけに対する温度や 日射量の影響について検討している。	芽に対する温度や日射の制御法について 検討する。 成長調節剤の芽ばけへの効果を明らかに する。	C
						芽ばけに関与する要 因を明らかにする。 (PE)	セイヨウナシにおいて、1 月か 2 月に人工乾燥及び 摘葉処理を行った結果、芽ばけ率が増加したが、それ が芽ばけの原因とはならなかった。 エテホン、GA3、TDZ を晩秋に処理すると芽ばけが 増加した。 セイヨウナシにおいては低温も温度変化も芽ばけに 影響を与えなかった。 8 月下旬の 10 日間における 25℃以上の高温が芽ば けを増加させた。	引き続き休眠打破や温度、水分ストレス 及び他の要因と芽ばけ発生との関係につ いて検討する。	B
						芽ばけの発生時期を 明らかにする。(CD, PE)	1998 年にサカガリナ州の 7 ヶ所に温度計測器が設置さ れた。それによると開花前 1 ヶ月間の急激な温度変化 と芽ばけとの間に有意な関係が見られた。(CD) ニホンナシは冬の終期に芽ばけの発生が増加した。 (PE)	引き続き芽ばけの発生時期について検 討し、明らかにする。	B

評価：A 計画以上、B 計画通り、C 計画より遅れている、D 殆ど進捗していない、— 評価不能 -4- プロジェクトサイト：SJ サンジョアキン、CD カサドル、PE ベロータス

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
2. 収穫技術の開発 リンゴ						芽ばけ芽や不健全花に含まれる代謝産物を明らかにする。(PE)	花芽や枝をサンプリングし、保存している。	保存した試料に含まれる炭水化物やホルモンについて分析する。	D
1) 収穫適期の判定						正確な収穫適期を判定するために、熟期の判定技術を開発する。(SJ)	サンタカタリーナの2カ所で、「ふじ」と「ガラ」について、7日間隔で、5回にわたり果実を収穫・調査した。1997、1998年の2カ年の結果では、「ガラ」はラージェスで満開後128日、サンジョアキンでは135日後、「ふじ」はラージェスで175日後、サンジョアキンでは180日後であった。 普通冷蔵条件で、収穫適期に収穫された「ガラ」果実は約6カ月間、良好な品質を保った。第4回目以降に収穫した「ガラ」、「ふじ」共に貯蔵可能な期間は短くなった。	適期判定に関する研究を継続する。	B
III. 植物保護技術の開発									
1. 主要病害虫の診断及び 同定 リンゴ									
1) 主要病害の発生実態 調査及び病原の分類 同定						ガラ斑点病を中心に病害の発生状況及び病原を明らかにし、防除法の確立に結び付ける。(SJ)	3種の <i>Colletotrichum</i> が「ガラ」の斑点病罹病葉から分離され、それぞれ <i>C. gloeosporioides</i> , <i>C. acutatum</i> , <i>C. sp.</i> と同定された。いずれの菌株も葉と果実に病原性を示したが、特に病原性の強い菌株は <i>C. gloeosporioides</i> に多く認められた。	「ガラ」、「ふじ」の各炭そ病から分離した <i>Colletotrichum</i> と「ガラ」の斑点病罹病葉から分離された <i>Colletotrichum</i> の種と寄主との関係を解明する。	A
ニホンナシ									
2) 主要病害の発生実態 調査及び病原の分類 同定						ニホンナシの主要病害の発生生態及び病原を明らかにし、防除法の確立に結び付ける。(CD)	胴枯れ病からは <i>Dothiorella sp.</i> が、ごま色斑点病の罹病葉からは <i>Entomosporium mespili</i> が分離された。	発生生態調査の継続。 病徴から分離した6菌株の病原性の確認。 えそ斑点病の発病樹が発見された品種については、指標植物 HN-39 による検定を行い、保毒の有無を確認する。	B

評価： A 計画以上、 B 計画通り、 C 計画より遅れている、 D 殆ど進捗していない、 - 評価不能 - 5 - プロジェクトサイト： SJ サンジョアキン、 CD カサドル、 PE ベロータス

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
3) 主要害虫の発生消長調査及び分類同定						発生状況調査を実施し、主要害虫の種類およびその発生生態を解明し、防除体系の確立に結びつける。(CD)	<p>1999年7月にライトトラップを設置した。</p> <p>1998/99には全てのニホンナシ栽培地において、新梢、果実にナシハダニの発生が見られた。葉と果実にハマシ (Bonagota cranaodes) の発生が見られた。</p> <p>開花期にハムシ類 (Chrysomellidae) による花、新葉、新梢、幼果の食害が見られた。主要種は <i>Diabrotica speciosa</i> であるが、その他に多くの種が見られる。</p> <p>アブラムシ類は開花期の新梢に見られ、主要種はエキヤキアブラムシとワタアブラムシであった。</p> <p>最大の害虫は、メジロカハエ (<i>Anastrepha fraterculus</i>) である。Mc Phail トラップによる消長調査では、11月から4月まで発生が見られ、12月から2月が加害のピークで、無防除下の被害率は100%であった。</p> <p>ナシハダニが最も多く見られ、リンゴカキカガラムシも多い。</p> <p>1997-99に見られた主要害虫は、<i>Anastrepha fraterculus</i> (メジロカハエ), <i>Bonagota cranaodes</i>, <i>Grapholita molesta</i> (ナシハダニ), <i>Tetranychus urticae</i> (ナシハダニ), <i>Panonychus ulmi</i> (リンゴハダニ), <i>Comstockaspis perniciosus</i> (ナシハダニ), <i>Lepidosaphes ulmi</i> (リンゴカキカガラムシ), <i>Diabrotica speciosa</i>, <i>Aphis citricola</i> (エキヤキアブラムシ), <i>Aphis gossippi</i> (ワタアブラムシ) であった。</p> <p>捕食性天敵としては、<i>Amblyseius</i> 属と <i>Phytoseiulus</i> 属のカブリダニが発見された。</p>	<p>害虫の発生調査を継続。</p> <p>ハマシとハダニの発生消長を明らかにする。</p> <p>ハムシ類の同定を行う。</p> <p>捕食性天敵のサンプリング法の確立と種の同定。</p> <p>ミバエのモニタリングと必要トラップ数の決定、加害開始時期の判定と防除水準の決定。モニタリングによる世代数の判定。</p>	B
2. 主要病害虫の防除法の開発									
リンゴ									
1) ガラ斑点性病害防除法の確立						ガラ斑点病の効果的防除法を確立する。(SJ)	<p>感染と発病を気象条件の異なる3地域で調査した。</p> <p>1997/98は春から秋にかけて温暖、湿潤な気候で多発生となった。1998/99は乾燥と低温によって少発生となった。</p> <p>病害の発生状況調査と気象データが発生予察に有効であった。</p> <p>温度と葉の濡れ時間が発病程度に関与していることを実験的に明らかにした。</p> <p><i>Colletotrichum</i> の生存条件を調査した。</p>	<p>感染と発病に関与する気象条件のモニタリングを継続する。</p> <p>野外における <i>Colletotrichum</i> の生存条件を調査する。</p> <p>主要品種の感受性を検定する。</p> <p>ガラス室内で温度と葉の濡れ時間の好適条件を検索する。</p> <p>潜伏期に温度条件を明らかにする。</p> <p>以上を総合してガラ斑点病の発病予測モデルを作製する。</p>	B

評価: A 計画以上、B 計画通り、C 計画より遅れている、D 殆ど進捗していない、- 評価不能 - 6 - プロジェクトサイト: SJ サンジョアキン、CD カサドル、PE ベロータス

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
ニホンナシ									
2) ハダニ類の防除法の確立						ハダニ類の種構成を把握すると共に、その天敵、薬剤抵抗性程度を解析し、総合的防除技術を確立する。(CD)	リンゴハダニおよびナミハダニがニホンナシ葉を加害する主要種であった。 1997/98 は多雨で少発生傾向であったが、一部でナミハダニの多発が見られ、Dicohol 抵抗性が疑われた。しかし、系統飼育後 3 世代めには感受性を取り戻した。したがって、この多発の原因は合成ピレスロイド剤の多用によるリサージェンス現象にあると判断された。 天敵によるハダニ類の防除については、カブリダニ類として Amblyseius californicus と Phytoseiulus macropilis が同定された。	ハダニの防除は基本的に殺ダニ剤によるので、剤の特性、薬害などによってグループ別けし、使用時期などを修正する必要がある。 カブリダニ類の他の種を同定し、生物的防除のモニタリングを行う。	B
3. ウイルスフリー化技術の開発									
リンゴ									
1) 抗ウイルス剤及び茎頂培養法によるウイルスフリー化						品種及び台木の高接病原ウイルスのフリー化技術を確立する。(SJ, PE)	ポット植えの ACLSV 罹病幼木に 500ppm のリバビリンを週 2 回、1 ヶ月散布し、茎頂を健全実生苗に接ぎ木した。その結果を指標植物 MO-84 で検定したところ、高いウイルス除去効果が得られた。(SJ)  マルバカイドウを熱処理後に茎頂培養を行い、6000 個体の幼苗を獲得した。(PE1) リンゴ園のウイルス分布調査を行った結果、37% が SGV に感染していたが、spv に感染しているものはなかった。(PE2) Malus 属および Pyrus 属の 13 種の指標植物 168 個体を定植した。(PE3)	1988 年にリバビリン処理をした幼木について、指標植物 MO-84 および MO-65 を用いて、ACLSV と ASPV の検定を行う。  リンゴおよびニホンナシの主要ウイルスのフリー化を行う。 電顕を用いたリンゴのウイルス検知法の確立 リンゴの主要ウイルスの生産性に対する影響調査	A
						リンゴの品種及び台木の茎頂点培養によるウイルスフリー化個体の変異を分子生物的手法により確認する。(PE)	電気泳動によるアイソザイム分析で品種を判別する手法を確立した。(PE)	異なるアイソザイム分析を検索し、茎頂点培養個体の変異を調査する。	B

評価: A 計画以上、B 計画通り、C 計画より遅れている、D 殆ど進捗していない、- 評価不能 -7- プロジェクトサイト: SJ サンジョアキン、CD カサドル、PE ベロータス

分野別活動項目達成度 (1996-1999)

対象活動項目達成度 (1999-2001)																																						
項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価																													
IV. 南ブラジルにおける施肥技術と生理障害に関する研究																																						
1. 土壌管理及び施肥法の開発 リンゴ																																						
1) 土壌診断						土壌肥沃度と樹体生育との関係を解明する。(SJ)	土壌の化学性 (pH と Ca, Mg, K, P, Al 及び有機物の各含量) と樹勢の間には一定の傾向が認められなかった。 一方、土壌硬度計で測ると密度が高く、粘土組成の多い圃地があり、このような土壌条件では酸素不足と根の伸長抑制が懸念された。一部の調査ほ場では、30cm 以下の土層に根がほとんど見られなかった。	1998/99 年に分析未完了の土壌、葉及び果実の化学分析は継続して行うこと。 1999/2000 年、2000/2001 年に予定している調査項目は以下の通り ・土壌の物理性と化学性の分析 ・葉及び果実分析 ・土壌断面における根の伸長及び分布 ・樹体生育 ・生産性及び果実品質	C																													
2) 施肥基準の設定						施肥の適量及び施用時期を把握する。(SJ)	処理は、窒素、加里ともに 0、50、100、200kg/ha と増加する水準で施用した。葉中窒素は、土壌への窒素施用量に比例して増加した。  表 1. 土壌に施用された N、K <sub>2</sub> O 量と葉中窒素 <table><tr><th rowspan="2">N 施用量 (kg/ha)</th><th colspan="4">K<sub>2</sub>O 施用量(kg/ha)</th></tr><tr><th>0</th><th>50</th><th>100</th><th>200</th></tr><tr><td>0</td><td>2.09</td><td>2.06</td><td>2.02</td><td>2.14 (%)</td></tr><tr><td>50</td><td>2.16</td><td>2.14</td><td>2.10</td><td>2.11</td></tr><tr><td>100</td><td>2.20</td><td>2.16</td><td>2.29</td><td>2.25</td></tr><tr><td>200</td><td>2.29</td><td>2.33</td><td>2.33</td><td>2.36</td></tr></table>	N 施用量 (kg/ha)	K <sub>2</sub> O 施用量(kg/ha)				0	50	100	200	0	2.09	2.06	2.02	2.14 (%)	50	2.16	2.14	2.10	2.11	100	2.20	2.16	2.29	2.25	200	2.29	2.33	2.33	2.36	1998/99 年に分析未完了の土壌、葉及び果実の化学分析は継続して行うこと。 1999/2000 年、2000/2001 年に予定している調査項目は以下の通り ・土壌の物理性と化学性の分析 ・葉及び果実分析 ・土壌断面における根の伸長及び分布 ・樹体生育 ・生産性及び果実品質	C
N 施用量 (kg/ha)	K <sub>2</sub> O 施用量(kg/ha)																																					
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200	2.29	2.33	2.33	2.36																																		
3) 有機物施用による土壌改良						樹勢に及ぼす堆肥の効果判定する。(SJ)	処理は、鶏ふん堆肥施用に 4 水準 (0、5、10、20 t/ha)、樹冠下管理に 2 方法 (草刈り区と除草剤散布区) を設定し行った。予備試験の結果では、葉中窒素は堆肥施用量に比例して増加したが、樹冠下管理法の差は認められなかった。	1998/99 年に分析未完了の土壌、葉及び果実の化学分析は継続して行うこと。 1999/2000 年、2000/2001 年に予定している調査項目は以下の通り ・土壌の物理性と化学性の分析 ・葉及び果実分析 ・土壌断面における根の伸長及び分布	C																													

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価																						
							<p>表2. 鶏ふん堆肥施用量、樹冠下管理と葉中窒素</p> <table><tr><th rowspan="2">堆肥施用量 (t/ha)</th><th colspan="2">樹冠下管理</th><th rowspan="2"></th></tr><tr><th>除草剤区</th><th>草刈り区</th></tr><tr><td>0</td><td>2. 2 6</td><td>2. 2 3</td><td>(%)</td></tr><tr><td>5</td><td>2. 3 7</td><td>2. 1 5</td><td></td></tr><tr><td>1 0</td><td>2. 3 9</td><td>2. 4 1</td><td></td></tr><tr><td>2 0</td><td>2. 5 1</td><td>2. 4 9</td><td></td></tr></table>	堆肥施用量 (t/ha)	樹冠下管理			除草剤区	草刈り区	0	2. 2 6	2. 2 3	(%)	5	2. 3 7	2. 1 5		1 0	2. 3 9	2. 4 1		2 0	2. 5 1	2. 4 9		・生産性及び果実品質	
堆肥施用量 (t/ha)	樹冠下管理																														
	除草剤区	草刈り区																													
0	2. 2 6	2. 2 3	(%)																												
5	2. 3 7	2. 1 5																													
1 0	2. 3 9	2. 4 1																													
2 0	2. 5 1	2. 4 9																													
ニホンナシ 4) 土壌診断						ニホンナシ園の樹体の栄養状態、及びこれと土壌条件、樹体生育との関係について実態を把握する。(CD)	1997 年以降、サンタカタリーナ州の異なる 8 カ所のニホンナシ園 (「二十世紀」、「豊水」) から、土壌の分析用試料を集めた。土壌 pH は、5.5~7.0 に分布した。 1998 年と 1999 年に、葉に Mg 欠乏の症状がみられると報告した。土壌分析では K 含量が多かったため、養分吸収において Mg と K の拮抗作用が起きたものと推定した。 調査期間を通して、葉中 K と Mn 含量が多かったが、後者は施用された殺菌剤から混入したものであった。また、Zn と B は欠乏または低レベルにあると毎年報告した。 土壌・葉分析の結果に基づき、改善策を勧告した。	予定では試験期間は最初の 3 年間であったが、正常でない状況が続いているので、試験を継続して行うこと。 次年度に行うべき土壌構造に関わる調査を行うこと。 得られた結果を生産者につなぐ適切な方法を検討すること。	B																						
5) 施肥基準の設定						ニホンナシにおいて施肥窒素増量に対する反応を調査する。(CD)	1997 年に、P, K との組み合わせで N 水準を変えた「豊水」の試験ほ場をカサドル試験場に設置した。 1997 年に、別の窒素施肥試験ほ場を、「豊水」の結果園に設置したが、事情により、1998 年に別の場所に変更したため、遅れて報告することになる。 これまでの結果では、N 水準が高いほど旺盛な生育を示している。	窒素の施肥反応を解明し、施肥基準を策定するために、試験を継続して行うこと。	B																						
6) 有機物施用による土壌改良						ニホンナシ園における堆肥の施用効果を調査する。(CD)	1997 年に、鶏ふん堆肥の施用効果を清耕、草生、マルチ栽培下で実証するため、「豊水」の試験ほ場をカサドル試験場に設置した。 1998 年と 1999 年の結果では、堆肥のマルチ区は葉中 N と K が高い値を示し、生育旺盛であった。	樹体の生育、土壌の化学性・物理性などに関して有用なデータを得るために、試験を継続して行うこと。	B																						

評価： A 計画以上、 B 計画通り、 C 計画より遅れている、 D 殆ど進捗していない、 - 評価不能 - 9 - プロジェクトサイト： SJ サンジョアキ、 CD カドル、 PE ペロダス

分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
2. 生理障害発生の実態と要因の検討 リンゴ									
1) 生理障害の実態調査と診断						園地で発生する生理障害を識別するとともに、ビタービットの発生実態を把握する。(SJ)	生理障害は園地と低温貯蔵庫で、蜜症、レンティセルブロッチビット、ほう素欠乏、ビタービット、内部褐変などの発生が認められた。主な障害は、「ふじ」では蜜症、「ガラ」はレンティセルブロッチビットであった。改訂版や他の印刷物用に、障害の写真をとった。	報告書に印刷できるように、生理障害の典型的な症状を示す果実を標本とし記録すること。	C
2) 生理障害要因の検討及びその防止法						ビタービット防止法を確立する。(SJ)	ビタービットの発生は、1998 年には報告しなかったが、1999 年には報告した。 ビタービットに関連する要因の一つは、果実が大きくなり過ぎる原因となる土壌窒素の過剰であった。果実における養分の不均衡は、低温貯蔵下でも腐敗を招いた。「ふじ」では散布剤の Ca 源が異なっても、果実のさび発生に差がなかったが、「ガラ」では硝酸石灰 Ca+ほう素散布により、果実がくあ部のさび発生が増加した。 かん水をしないことの影響について、情報収集を行っている。	これまでと同様の試験を 2000 年に行い、2001 年には新しい Ca 剤の利用を検討すること。	B
						生理障害に関与する代謝物の検討及びその防止法の確立に、以下の調査を実施：「ガラ」、「ゴールデン」及び「ふじ」について、花弁落下期から収穫期までの果実中の N, P, K, Ca, Mg 及び B 含量の推移を調査した。パカリア地域のこれらの品種にはビタービットの発生がなかったため、各成分レベルとビタービットとの相関は調査できなかった。しかし、ペロータス地域で収穫された「ガラ」と「レインハ」種の果実にはビタービットが発生し、重症の果実は果肉中の Mg がかなり多かったが（果肉 100 g 当たり 10mg 以上）、N, P, K, Ca, Mg 及び B 含量は健全果と障害果との間で差がなかった。	「ガラ」、「ゴールデン」及び「ふじ」について、花弁落下期から収穫期までの果実中の N, P, K, Ca, Mg 及び B 含量の推移を調査した。パカリア地域のこれらの品種にはビタービットの発生がなかったため、各成分レベルとビタービットとの相関は調査できなかった。しかし、ペロータス地域で収穫された「ガラ」と「レインハ」種の果実にはビタービットが発生し、重症の果実は果肉中の Mg がかなり多かったが（果肉 100 g 当たり 10mg 以上）、N, P, K, Ca, Mg 及び B 含量は健全果と障害果との間で差がなかった。	ビタービット発生に対し、果肉中の Ca、その他の成分と Mg との比の関連を検討すること。 Ca の果実への吸収を高める界面活性剤の散布試験を行うこと。	C
ニホンナシ									
3) 生理障害の実態調査と診断						園地で発生する生理障害の全ての種類を記録する。(CD)	サンタカタリーナ州の生産者の園地で、生理障害の発生状況を栄養状態と併せて調査した結果、サビ果、Mg 欠乏と K 過剰の葉、ほう素欠乏果が認められた。	見つけた生理障害に対しては、改善策をはっきりさせること。 より多くの情報を得るため、試験を継続して行うこと。	B

評価： A 計画以上、 B 計画通り、 C 計画より遅れている、 D 殆ど進捗していない、 - 評価不能 - 10 - プロジェクトサット： SJ サンジョアキン、 CD カサドル、 PE ペロータス



分野別活動項目達成度 (1996-1999)

項目	97	98	99	00	01	到達目標	活動内容及び実績	終了時までの活動計画	評価
4) 生理障害要因の検討						園地でみられる生理障害の発生要因を調査し、防止法を確立する。(CD)	「二十世紀」のさび果は、果実に袋を掛けることで少なくなった。 Mg欠乏は、土壌分析により、土壌中のK過剰下での拮抗作用によることが判明したので、改善策を生産者に教示した。	Bの土壌及び葉面散布試験を行い、B欠乏の改善策を明らかにすること。	B
V. その他						生理障害に関与する代謝物を特定し、その防止法を確立する。(PE)	果実の生理障害はこれまで発生していない。	果実に発生する生理障害について、管内での実態調査を徹底的に行うこと。	—
1. プロジェクトを通じて開発された技術・知識の小規模園芸農家への普及						栽培技術指導の実施を通じて農家のリンゴ、ニホンナシの栽培技術を改善する。	過去3年間にプロジェクトで開発された栽培技術及び知識は以下のイベントを通じて予定どおり農家に普及された。 ・リンゴ、ニホンナシ農家研修 ・剪定等の果樹管理技術の実地指導 ・植物保護年次会議 ・リンゴ試食会(品質評価) ・ニホンナシ試食会(PR) ・温帯果樹セミナー ・ブラジル果樹生産者大会 計6309人(生産者、研究者、技術者)が以上のイベントに参加した。	ニホンナシ栽培技術書の出版。 リンゴ、ニホンナシ試食会の継続実施。 技術情報紙の発行(半年毎)。	A
1) 園芸研究者、技師、普及員及び先導的な農家を対象とする技術セミナーの開催、及び技術情報誌の制作						セミナーの開催、報告書の出版を通じて研究普及活動を活性化する。(SJ, CD, PE)	以下の出版物が作成された。 ・プロジェクト年次報告 300部 ・植物保護会議報告書 650部 ・ハンドブック(リンゴ病虫害) 1000部 ・ニホンナシ研修の手引き 150部 ・リンゴ、ニホンナシ栽培技術図解垂れ幕 20種40枚 ・プロジェクト活動紹介用しおり		
2) 視聴覚教材の制作						視聴覚教材を用いてリンゴ、ニホンナシの栽培技術の理解を助ける。(PE)	以下の教材が企画作成された。 ・技術ビデオ(リンゴ収穫・選別・包装)	受粉、剪定、植物保護及びプロジェクト活動にかかる技術ビデオの作成。 垂れ幕、しおりの増刷。	A

評価： A 計画以上、 B 計画通り、 C 計画より遅れている、 D 殆ど進捗していない、 — 評価不能

南ブラジル小規模園芸研究計画 PDM (日本語仮訳)

協力期間: 1996.12.01-2001.11.30

対象地域: サンタカタリーナ州

ターゲットグループ: 小規模園芸農家

1999.12.06

プロジェクトの要約	指標	指標データ入手手段	外部条件
(上位目標) 南ブラジルにおける園芸作物生産のための適正栽培技術が開発、紹介され、小規模園芸農家の営農改善に貢献する。	1. リンゴとニホンナシの生産量が増加する。 2. リンゴとニホンナシの栽培面積が増加する。 3. 小規模ニホンナシ生産者数が増加する。	1. 地域の園芸作物生産及び輸出に関する年次統計	1. 連邦及び州政府の温帯果樹栽培に関する政策が変わらない。
(プロジェクト目標) サンタカタリーナ州農牧研究普及公社におけるリンゴとニホンナシの栽培技術開発に関する研究普及活動が強化される。	1. 技術出版物の数が増加する。 2. リンゴとニホンナシのヘクタールあたり収量が増加する。 3. リンゴとニホンナシの高品質果実の割合が増加する。 4. ニホンナシの苗木生産量が増加する。	1. 地域の園芸作物栽培に関する年次統計 2. 技術報告書、研究誌、書籍その他の出版物	1. 連邦及び州政府のリンゴ・ニホンナシ生産者組合に対する支援が実施される。 2. 南ブラジルの園芸関係の研究機関体制が変わらない。
(成果) 1. 品種及び台木の選抜・評価が改善される。 2. 南ブラジルの土壌、気候及び社会条件に適した栽培技術が洗練される。 3. 植物保護技術が開発される。 4. 施肥技術及び生理障害にかかる研究が強化される。 5. プロジェクトで開発された技術及び知識が地域の小規模園芸農家への普及に使用される。	1. プロジェクトで導入・育種した優良品種及び台木が広まる。 2. リンゴとニホンナシの高位安定した生産量が持続する。 3. リンゴとニホンナシの病虫害発生が減少する。 4. 生理障害発生が減少する。 5. 新しい生産技術に関するセミナーの参加者が適当数に至る。	1. プロジェクト年次報告書、技術報告書、書籍等 2. 地域の園芸作物栽培に関する年次統計 3. 各機関の普及活動実績報告書	1. 各プロジェクトサイトの緊密な連携が維持される。
(活動) 1. 品種及び台木の選抜・評価 1-1. 品種及び台木の南ブラジルでの適応性を評価する。 1-2. 病害抵抗性の品種及び台木を選抜する。 2. 南ブラジルに適した栽培技術 2-1. 栽植及び仕立て法を開発する。 2-2. 収穫前後の果実生理を研究する。 3. 植物保護 3-1. 主要病害虫を診断・同定する。 3-2. 主要病害虫の防除法を研究する。 3-3. ウイルスフリー化技術を研究する。 4. 施肥技術及び生理障害 4-1. 土壌管理及び施肥法を開発する。 4-2. 生理障害発生要因を検討する。 5. その他 5-1. プロジェクトで開発した技術及び知識を地域の小規模果樹生産者へ普及する。	(投入) I. 日本側 1. 日本人専門家の派遣 1-1. 長期専門家 1-2. 短期専門家 2. 機材の供与 2-1. 研究機材 2-2. 車輛 2-3. 事務機器 3. ブラジル人 C/P の日本での研修 4. 0-コストの負担 II. ブラジル側 1. C/P の配置 1-1. プロジェクトディレクター 1-2. プロジェクトコーディネーター 1-3. プロジェクトマネージャー 1-4. 各分野の研究者 1-5. その他支援要員 2. 土地、施設の提供 3. 0-コストの負担 4. 合同委員会の開催	1. プロジェクト年次報告書、技術報告書、書籍等 2. 地域の園芸作物栽培に関する年次統計 3. 各機関の普及活動実績報告書	1. 協力期間中に C/P がプロジェクトを離れない。 2. 常勤の C/P の給料を含めたブラジル側の予算が適正に配分される。 3. プロジェクトに悪影響を及ぼす異常気象が起こらない。  (前提条件) 1. 連邦及び州政府やプロジェクトに関連する研究機関、地域の農業組合などがプロジェクトを支持する。