CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture

CIRAD

FONDO LATINOAMERICANO Y DEL CARIBE PARA ARROZ DE RIEGO
FLAR

Collaborative Project
Between
CIRAD-CA, CIAT, and FLAR

Rice Improvement: Using Gene Pools and Populations with Recessive Male-Sterile Gene, and Conventional Breeding

1998 Report

Marc Châtel, Yolima Ospina, and Jaime Borrero




CIRAD

The Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) is a French research organization that specializes in agriculture in the tropics and subtropics. It is a state-owned body and was established in 1984, following the consolidation of French agricultural, veterinary, forestry, and food technology research organizations for the tropics and subtropics.

CIRAD's mission is to contribute to the economic development of these regions through research, experiments, training, and dissemination of scientific and technical information.

The Center employs 1800 persons, including 900 senior staff, who work in about 50 countries. Its budget amounts to approximately 1 billion French francs, more than half of which comes from public funds.

CIRAD is made up of seven departments: CIRAD-CA (annual crops), CIRAD-CP (tree crops), CIRAD-FLHOR (fruits and horticultural crops), CIRAD-EMVT (livestock production and veterinary medicine), CIRAD-Forêt (forestry), CIRAD-SAR (food technology and rural systems), and CIRAD-GERDAT (management, common services and laboratories, documentation). CIRAD operates through its own research centers, national agricultural research systems, or development projects.

CIAT

The International Center for Tropical Agriculture (CIAT, its Spanish acronym) is dedicated to the alleviation of hunger and poverty in developing countries. CIAT applies science to agriculture to increase food production while sustaining the natural resource base.

CIAT is one of 16 international agricultural research centers sponsored by the Consultative Group on International Agricultural Research (CGIAR).

The Center's core budget is financed by 25 donor countries, international and regional development organizations, and private foundations. In 1997, the donor countries include Australia, Belgium, Brazil, Canada, Colombia, Denmark, France, Germany, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America. Donor organizations include the European Union (EU), the Ford Foundation, the Inter-American Development Bank, the International Development Research Center (IDRC), the International Fund for Agricultural Development (IFAD), the Nippon Foundation, the Rockefeller Foundation, the United Nations Development Program (UNDP), and the World Bank.

Information and conclusions reported in this document do not necessarily reflect the position of any donor agency.

FLAR

The Fund for Latin American and Caribbean Irrigated Rice (FLAR) is a means by which the public and private sectors of Latin American and Caribbean (LAC) countries can control and take responsibility for irrigated rice activities.

FLAR began in January 1995, after an Act of Acceptance was signed by delegates from Brazil, Colombia, Venezuela, the International Center for Tropical Agriculture (CIAT), and the International Rice Research Institute (IRRI). In 1996, Costa Rica, Panama, and the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) became members.

FLAR's mission is to promote sustainable development of irrigated rice production in LAC, that is, to make it competitive, profitable, and efficient while lowering relative prices of rice for the consumer. FLAR's objectives are:

- To provide up-to-date information on market needs and opportunities of member countries through a permanent forum.
- To pursue a broad approach in regional rice activities that are of interest to all members.
- Increase sustainable rice production, that is, ensure the efficiency of production, equitable distribution of benefits, and resource conservation.
- To focus mainly on irrigated rice.

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1998 Report: Summary

1. BACKGROUND

Genetic uniformity, or lack of genetic diversity, is of major concern to breeders, geneticists, and the agricultural community in general. In many crops, genetic improvement is usually accomplished by reducing genetic diversity in the gene pools used to develop new varieties. But genetic uniformity is now considered as increasing a crop's potential vulnerability to disasters caused by biotic or abiotic constraints.

One way of broadening the genetic base of Latin American rice and assessing the genotype-by-environment interaction is to identify specific potential parents and pool them to develop new, genetically broad-based, breeding material.

CIAT and CIRAD's new breeding strategies focus on developing and improving populations to provide sources of potential parents with specific traits required by national breeding programs. One suitable breeding method to achieve this goal is recurrent selection.

2. RECURRENT SELECTION FOR UPLAND RICE IN THE SAVANNAS AND HIGHLANDS

2.1. Introduction

The upland rice recurrent selection project aims to adapt, develop, and select upland rice gene pools and populations.

The main characteristics of germplasm for savanna conditions are:

- Tolerance of soil acidity
- Resistance to diseases, mainly rice blast (*Pyricularia grizea* Sacc.)
- Resistance to pests, mainly rice plant hopper (*Tagosodes orizicolus* Muir.)
- Good grain quality (translucent, long, slender grain)
- Early maturity (total cycle about 115 days)

For highland areas, we are looking for:

- Tolerance of cold temperatures
- Grain yield potential
- Grain quality

2.2. Upland Savanna Rice

The activities reported here were conducted at Palmira Experiment Station (PES) and at "La Libertad" Experiment Station (LES).\

2.2.1. Line development from recurrent populations: Generation S2 Populations PCT-5\PHB\1\0,PHB\1; PCT-A\PHB\1\0, PHB\1; and PCT-4\PHB\1\1,PHB\1

From the 69 lines evaluated at LES, 8 were selected (11.6%). From each selected line, we chose 6 individual fertile plants. The 48 S3 lines (8 families of 6 lines) will be grown at PES during 1998 B.

2.2.2. Line development from recurrent populations: Generation S4 Populations PCT-5\PHB\1\0, PCT-A\PHB\1\0, and PCT-4\PHB\1\1

From the 150 S4 lines evaluated at LES, 35 were selected (23.3%). From each selected line, we chose 6 individual plants. The 210 S5 lines will be grown at PES during 1998 B.

2.2.3. Line development from recurrent populations: Generation S6

2.2.3.1. Populations PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1

From the 282 S6 lines evaluated at LES, 64 were selected (22.7%). From each selected line, we chose 6 individual plants.The 384 S7 lines (64 families of 6 lines) will be grown at PES during 1997 B.

2.2.3.2. Population PCT-4\0\0\1>S2

From the 96 S6 lines evaluated at LES, 12 were selected (12.5%). In each selected line, we harvested 6 individual plants. The 72 S7 lines (12 families of 6 lines) will be grown at PES during 1997 B.

2.2.3.3. Populations PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1. Plant selection in S3 lines at PES, 1996 B

From the 18 S6 lines evaluated at LES, 2 lines (11.1%) were selected from the population PCT-4\0\0\1. From each selected line, we chose 6 individual plants. The 12 S7 lines (3 families of 6 lines) will be grown at PES during 1997 B.

2.2.4. Line development from recurrent populations: Advanced generations

2.2.4.1. From populations with a male-sterile gene

The best advanced lines were used to set-up the INGER LAC VIOAL acisd soil nursery, to be distributed to the regional NARDS..

2.2.4.2. From populations with no male-sterile gene

Four (4) lines showing very good adaptation to acid soil condition were evaluated and seed increased at LES.

2.3. Population Enhancement - Recurrent Selection

The CIAT rice project emphasizes the enhancement of populations and is phasing out the production of fixed lines for direct release by the region's national programs (NARS). The

strategy is to develop and enhance gene pools and populations for well-targeted trait(s) to be used as sources of potential parents by national breeding programs.
In the first 2 years of the recurrent selection project, we concentrated on introducing germplasm from Brazil (EMBRAPA Arroz e Feijão [formerly CNPAF] and CIRAD) and French Guiana, characterizing and mass selecting it. From 1995 onward, we concentrated our activities on enhancing and developing new populations.

2.3.1. Recurrent selection based on S2 line evaluation: Population PCT-4\0\0\1

During 1997 A, the population PCT-4\SA\1\1 was grown at LES to go through a second selection cycle.

2.3.1.1. Selecting fertile plants, and S2 evaluation

In 1997 A, a total of 155 S0 plants were selected. A sample of each S0 seed was kept in the cold chamber. The S1 generation was grown during 1997 B at PES, and S2 seeds harvested. The S2 lines were evaluated during 1998 A at LES.

The set of S2 lines was remited to Brazil, Bolivia and Venezuela for evaluation and line development by the respective Institutions of these countries.

2.3.1.2. Harvesting male-sterile plants

During 1997 A, male-sterile plants were harvested individually and their seeds mixed in equal proportions to complete the second cycle of recombination of the population selected once. The second cycle of recombination, identified as PCT-4\SA\2\1 was grown at LES during 1998 A.

2.3.2. Mass recurrent selection for both sexes for major agronomic traits, blast, and "hoja blanca": Populations, PCT-5\0\0; PCT-A\0\0\0; and PCT-4\0\0\1

During 1997 A, the seed mixture of each population with two mass recurrent selection cycles was grown at LES. To make the third recurrent selection cycle, 218, 253, and 165 healthy male-sterile plants, fertilized by the pollen of fertile healthy plants, were selected from each population.
In 1998 A, each population with three cycles of recurrence was grown at LES. Healthy male-sterile plants were selected ((180, 200, and 240, respectively).
Fertile plants (30, 24, and 55, respectively) were selected for line development from the third cycle of recurrence.

2.4. Development of New Populations

The development of new populations is a basic activity of the project. It forms the main source of new recombined variability for population enhancement and line development.
In 1996 B, we decided to build, at PES, two new Japonica populations, targeting upland savannas and hillside ecosystems. The source of male-sterility background is the best Japonica population previously developed by the project.

2.4.1. Upland savanna population

The idea in developing that population is to pool the best lines of the CIAT conventional rice breeding project and the commercial varieties released in Brazil, Colombia, and Bolivia.

In 1996 B, 18 lines were selected, based on their performance for early maturity, blast and acid-soil tolerance, and grain quality. Male-sterile plants from the best-adapted upland Japonica population (PCT-4) were used as female parents.
During 1997 A, at PES, each resulting F1 was grown individually and evaluated, and individual plants selected. The basic population PCT-11\0\0\0 is the result of the mixture of the F2 seed.

For the Savannas, the population PCT-11 was evaluated at LES, during 1998 A. 95 fertile plants So were selected for line development. The S1 generation will be grown at PES during 1998 B.

2.4.2. Upland hillside population

The idea is to develop a population for the Andean highlands of Colombia, with early maturity and cold tolerance for high altitude, 1300-1600 meters above sea level.

In 1996 B, 11 lines from Madagascar, CIAT and IRAT were selected, based on their previous evaluation at high altitudes. The best-adapted upland Japonica population (PCT-4) was used as the source for male-sterility.

During 1997 A, at PES, each resulting F1 was grown individually and evaluated, and individual plants chosen. The basic population PCT-13\0\0\0 is the result of the mixture of F2 seed.
During 1997 B, at PES, the basic population will be recombined once. The identification of the first cycle of recombination of the basic population will be PCT-13\0\0\1.
During1998 A, at PES, the second cycle of recombination was made. The recombined population was then remitted to Dr. Michel Valès for further evaluation in the Colombian Andeas.

3. USE OF RECURRENT UPLAND GERMPLASM BY LAC PARTNERS

3.1. Bolivia.

The populations PCT-4 and PCT-5 from CIAT and PCNA-16 from EMBRAPA, were characterized. Mass selection of male-sterile plants was made. Fertile So plants were selected in the population PCT-4 for line development.

3.2. Venezuela.

The population PCT-11 was remitted to UNELLEZ and is under characterization

3.3. Cuba.

In 1996, the populations PCT-4 was introduced and characterized fro different agronomic traits. In 1997, the germplasm was recombined one more time, and 19 So fertile plants selected for line development.
The development of a local population is under way, by introducing 4 Cuban lines in the population PCT-4.

4. CONVENTIONAL BREEDING FOR UPLAND RICE FOR SAVANNAS AND HIGHLANDS

4.1. Savannas Upland Rice

4.1.1. Upland lines from Brazil.

We received from CNPAF a set of Brazilian lines for evaluation under acid-soil conditions

4.1.2. Use of CIAT/CIRAD savanna lines in Brazil

On average, 89%, 28%, and 19% of the lines evaluated in the Advanced, Preliminary, and observation trials are CT lines. The main characteristics they like from our lines are grain quality and plant type.

4.1.3. Line release in Brazil

Three new CT lines are very promising candidates to be released in 1999.

4.1.4. Line release in Bolivia

The line named IRAT 170 ids to be released for small farmers.

4.1.5. Use of CT and IRAT lines in China

The line IRAT 359 is to be released in the Yunnan Province of China. A great number of CT lines are used as promising parents by the Chinese upland breeding program.

4.2. Upland Rice for the Highlands

In 1993, upland lines developed by CIRAD/FOFIFA for the highlands of Madagascar were introduced to Colombia and seed increased. The new germplasm was distributed to CENICAFE and CIAT's hillsides project. In 1994, line evaluation started in the Department of Cauca.

In 1995, the Centro Internacional de Agricultura Orgánica (CIAO) started evaluations at 1600 masl. The first results were presented at the Conference on Rice for the Highlands in Madagascar in April 1996.

4.2.1. The Coffee Region – CENICAFE and CIAO

Line CT 10069-27-3-1-4, well adapted to the mid-altitudes, was used in a trial with young coffee trees. The potential of this line over time is very promising (average grain yield is 4 t/ha). Forty-one new lines were introduced from Madagascar and seed increased at CIAT, Palmira. Eleven single crosses were made at PES, between line CT 10069-27-3-1-4 and 10 lines from Madagascar and CIRAD. The F1 generation was grown during 1997 A at PES.

Dr. Michel Valès arrives at CIAT in August 1997 and took the responsibility of the breeding activities for the Highlands of Latin America. For more information about the activities developed during 1998, please report to his annual report.

4.2.2. Department of Cauca and Central America

In the Department of Cauca, the five best lines of the previous year's selection and one savanna upland check (CIRAD 409) were tested on farm by five smallholders. The best line (Latsidahy/FOFIFA 62-3) yielded 1400 kg/ha at La Laguna (1600 masl). The savanna upland check showed complete sterility.
The 41 introduced lines were dispatched to the CIAT hillsides project for testing in Colombia and Central America.
Dr. Michel Valès arrives at CIAT in August 1997 and took the responsibility of the breeding activities for the Highlands of Latin America. For more information about the activities developed during 1998, please report to his annual report.

5. RECURRENT SELECTION FOR LOWLAND RICE

5.1. Introduction

The recurrent selection breeding project was started by introducing different gene pools and populations developed in Brazil, by EMBRAPA Arroz e Feijão and CIRAD in French Guiana.

The germplasm was characterized at CIAT, Palmira, and the best-adapted populations were used to develop new populations by incorporating new variability. This resulted in three populations that were registered in the recurrent selection catalog as PCT-6, PCT-7, and PCT-8. A gene pool was also built up by using a different gene for male sterility. The gene pool was registered as GPCT-9. Finally, a second gene pool from CIRAD was registered as GPIRAT-10.

5.2. Recurrent Selection: Recurrent Selection for Both Sexes for "Hoja Blanca"

The objective was to use the recurrent selection breeding method for existing germplasm for "hoja blanca" virus and blast resistance. Three populations, PCT-6\0\0\2, PCT-7\0\0\0, and PCT-8\0\0\0, and the gene pool GPCT-9\0\0\0F were evaluated for "hoja blanca" virus according to the methodology developed at CIAT. Healthy plants of each germplasm were transplanted separately for recombination with male-sterile plants. The recombined populations, after the first cycle of selection, were identified as PCT-6\HB\1\2, PCT-7\HB\1\0, PCT-8\HB\1\0, and GPCT-9\HB\1\0F.
During 1998, two more recurrent cycles were performed at PES for PCT-7 and PCT-8. The population PCT-6 better adapted to the tropics was remitted to Dr. Michel Valès. The enhanced population is the starting point of his recurrent selection project for partial blast resistance.

5.3. Recurrent Selection in Colombia

In 1996, Dr. Hernando Delgado from CORPOICA attended the International Course on Rice Recurrent Selection Breeding held at CIAT and selected four germplasm materials (populations PCT-6\0\0\2, PCT-7\0\0\0, and PCT-8\0\0\0, and the gene pool GPCT-9\0\0\0F). Each material was grown separately at LES for recombination, characterization, and selection of fertile plants for line development. The four materials performed well. The populations PCT-6 and PCT-7 presented the highest potential for the future.

The two populations were grown at Villavicencio and evaluated for blast resistance.

5.4. Recurrent Selection in Costa Rica

In 1996, we sent Costa Rica the Indica gene pool GPCT-9 and population PCT-7. That same year, Dr. Randolph C. Morera, of the National Rice Program, attended the International Course on Rice Recurrent Selection Breeding held at CIAT. The germplasm was characterized under Costa Rican conditions and was maintained by harvesting male-sterile and fertile plants, independently. In 1997, the germplasm was used for line development by selecting S0 fertile plants.

For 1998, the results are not yet available

5.5. Recurrent Selection in El Salvador

In 1995, we sent three populations (PCT-6, PCT-7, and PCT-8) and the gene pool GPCT-9 to the Centro Nacional de Tecnologia Agropecuaria y Florestal (CENTA), where the following activities were carried out:

- Line development: in 1996, 141 and 97 S0 fertile plants were selected from the populations PCT-7 and PCT-8, respectively.
- Population enhancement: based on S2 progeny evaluation and recombination from the remnant S0 seeds.
- New population development: the population CNA IRAT ES 1/0/2 was developed by introduction four lines (X-10, CENTA A-1, CENTA A-2, and CENTA A-5) into the Brazilian population CNA IRAT 4/0/6

For 1998, the results are not yet available

5.6. Recurrent Selection in Panama

In 1996, we sent Panama the Indica gene pool GPCT-9 and population PCT-7. That same year, Dr. Ariel E. Jaén Sánchez of the Faculty of Agricultural Sciences, Universidad de Panama, attended the International Course on Rice Recurrent Selection Breeding held at CIAT. The introduced germplasm was grown and characterized. For each material, the earliest S0 fertile plants were harvested for line development.

For 1998, the results are not yet available

5.7. Recurrent Selection in Venezuela

After he attended the International Course on Rice Recurrent Selection Breeding, three populations (PCT-6, PCT-7, and PCT-8) and three gene pools (IRAT 1/420P, IRAT MANA, and GPCT-9) were sent to Dr. E. Graterol for characterization under the local conditions of Calabozo, Guárico State. The objective was to select the best-adapted germplasm to start a recurrent selection program. Two populations, PCT-6 and PCT-7, were selected as male-sterile background to develop two new local populations, identified as PFD-1 and PFD-2.

During 1998, at DANAC-Venezuela, and at CIAT Palnira, the built-up of the populations is on-going as planed.

5.8. Recurrent Selection in Cuba

In 1996, the gene pool GPIRAT-10 and the population PCT-7 were introduced to Cuba, and characterized. The germplasm was seed increased through recombination. Fertile So plants were selected for line development.

5.9. Recurrent Selection in Argentina

In December 1996, we supplied the Universidad de Corrientes with the populations PCT-6\0\0\0, PCT-7\0\0\0, and PCT-8\0\0\0. The germplasm was observed and characterized.

A total of 171 lines was selected from the three populations. The populations were recombined and seed increased.

The Chilean population PQUI-1 was remitted to the Universidad de la Plata, for evaluation in the Pampas region of the province of Buenos Aires.

Development of new local populations:

PARG-1, is a population with narrow genetic base for short term breeding.

PARG-2, is a population with oriented variability from PARG-1 introduced into PCT-8 (the best introduced germplasm)

PARG-3, is a population coming from the introduction of 6 Argentinean lines into PCT-8. This work will be done at CIAT Palmira.

5.10. Recurrent Selection in Chile

In 1996, we sent Chile the Japonica gene pool GPIRAT-10, developed by CIRAD specifically for temperate climates. That same year, Dr. Santiago Hernaiz from INIA-Quilamapú attended the International Course on Rice Recurrent Selection Breeding held at CIAT.

In 1997, the gene pool was grown to characterize and select fertile plants for line development. It was also used as a source of male sterility to build up a local population by crossing five Chilean lines (Qui. 67108, Diamante, Buli, CINIA 609, and CINIA 606) with male-sterile plants of the gene pool. Part of the hybrid seed was sent to CIAT, Palmira, for growing the F1 generation. F2 seed was shipped back to Chile. The basic Chilean population was identified as PQUI-1\0\0\0.

In 1998, the Chilean population was split in two part. The first one was grown at Chillan, and the second one Northern. These two sites correspond to two different agroclimatic situations.
After recombination, the two populations were shipped to CIAT Palmira for the second recombination.

5.11. Recurrent Selection in Uruguay

In 1996, we sent Chile the Japonica gene pool GPIRAT-10. That same year, Dr. Fernando Pérez de Vida attended the International Course on Rice Recurrent Selection Breeding held at CIAT.

In 1997, the gene pool was grown to characterize and select fertile plants for line development. It was also used as a source of male sterility to build up a local population by crossing selected Uruguayan lines with male-sterile plants of GPIRAT-10.
In 1998, at CIAT, we received the F1's seeds from the different crosses, for seed increase (F1 generation and harvest of the F2's).
Three populations will be set-up:

PURG-1 from the introduction of 17 lines with short grain into GPIRAT-10,

PURG-2 from the introduction of 60 lines with long grain quality into GPIRAT-10, and

PURG-3 with broad genetic base resulting of the mixture of the two previous populations, with the best selected progenies selected from GPIRAT-10.

5.12. Line Development through Anther Culture

In 1994, we introduced from French Guyana, the population IRAT-CT. This population comes from the enhancement of the Indica gene pool GPCNA-18 for anther culture response.
From 1995, the CIAT anther culture laboratory processed the population IRAT-CT, and R2 lines were developed. The lines were evaluated by FLAR at the Santa Rosa Experiment Station and five lines were selected.
During 1998, the five lines were evaluated and seed increased for future multilocal evaluation.

5.13. Conventional breeding and anther culture for Romania

In the framework of the collaboration between the CIRAD's rice project in Montpellier and the Romanian Institution FUNDULEA, two crosses from Romania are being processed by the CIAT's anther culture laboratory.

Double Haploids lines will be remitted to FUNDULEA, and we will keep some seeds for shipping to Chile, Argentina and Uruguay. These lines can also be useful as donors for cold tolerance in the hillsides of Colombia.

PROYECTO COLABORATIVO ENTRE CIRAD, CIAT Y FLAR

Mejoramiento en Arroz usando Acervos Genéticos y Poblaciones con un Gen Recesivo de Androesterilidad y Mejoramiento Convencional

Marc Châtel, Yolima Ospina y Jaime Borrero

Resumen 1998

1. ANTECEDENTES

Uniformidad genética, o falta de diversidad genética, es la preocupación mayor de mejoradores, genetistas, y de la comunidad agrícola en general. En muchas cosechas el avance genético usualmente va acompañado por una reducción de variabilidad genética en los acervos utilizados para el desarrollo de nuevas variedades. Pero la uniformidad genética es ahora considerada como un potencial de incremento de vulnerabilidad a desastres bióticos y abióticos constrastantes.

Una manera de ampliar la base genética del arroz en América latina y evaluando la interacción de genotipo por ambiente, es identificando padres específicos potenciales y acervos que desarrollen materiales de base genética amplia.

El proyecto colaborativo entre el CIAT y el CIRAD, enfoca una estrategia en desarrollar y mejorar poblaciones que prevén fuentes de padres potenciales con características específicas requeridas por los programas nacionales. Un método satisfactorio para alcanzar esta meta, es la selección recurrente.

2. SELECCION RECURRENTE PARA ARROZ DE SECANO Y ZONA DE LADERAS

2.1 Introducción

El proyecto de selección recurrente en arroz proyecta adaptar, desarrollar y seleccionar acervos y poblaciones de arroz.

Las características principales del germoplasma para condiciones de sabanas son:
. Tolerancia a la acidez del suelo
. Resistencia a enfermedades, principalmente piricularia (*Pyricularia grisea* Sacc.)
. Resistencia a plagas, principalmente Hoja blanca (*Tagosodes orizicolus* Muir.)
. Calidad del grano Buena (grano translúcido, largo, delgado)
. Precocidad (ciclo total aproximadamente de115 días)

Para áreas de laderas:

. Tolerancia a temperaturas frías
. Potencial de rendimiento
. Calidad del Grano

2.2. Arroz de sabanas

Las actividades fueron conducidas en La Estación Experimental de palmira (EEP) y en "La Estación Experimental La Libertad" (EELL).

2.2.3. Desarrollo de Líneas de las poblaciones recurrentes, Generación S2, Poblaciones PCT-5\PHB\1\0, PHB\1; PCT-A\PHB\1\0, PHB\1 y PCT-4\PHB\1\1, PHB\1

De las 69 líneas evaluadas en la EELL, se seleccionaron 8 (11.6%). De cada línea se escogieron 6 plantas individuales fértiles. Las 48 líneas S3 (8 familias de 6 líneas) se sembrarán en la EEP durante 1998 B.

2.2.2. Desarrollo de Líneas de poblaciones recurrentes: Generación S4, Poblaciones PCT-5\ PHB\1\0; PCT-A\PHB\1\0; y PCT-4\PHB\1\1

Las 150 líneas S4, fueron evaluadas en la EELL y se seleccionaron 35 (23.3%). De cada línea seleccionada, se seleccionaron 6 plantas individuales. Las 210 líneas S5 se sembraran en la EEP durante 1998 B.

2.2.3. Desarrollo de Líneas de poblaciones recurrentes: Generación S6:

2.2.3.1. Poblaciones PCT-5\0\0\0; PCT-A\0\0\0; y PCT-4\0\0\1

De las 282 líneas S6 evaluadas en la EELL, se seleccionaron 77 (27.3%). De cada línea se escogió 6 plantas individuales, para un total de 462 líneas S7 (77 familias de 6 líneas) El material se sembrará en la EEP en 1998 B.

2.2.3.2. Población PCT-4\0\0\1> S2

De las 96 líneas S6 evaluadas en la EELL, se seleccionaron 12 (12.5%). En cada línea se seleccionó 6 plantas individuales. Las 72 líneas S7 (12 familias de 6 líneas) se sembraran en la EEP durante 1998B.

2.2.3.3. Poblaciones PCT-5\0\0\0; PCT-A\0\0\0; y PCT-4\0\0\1. Selección de plantas en líneas S3 (EEP 1996 B)

De las 18 líneas S6 evaluadas en la EELL, 2 líneas (11.1%) se seleccionó de la población PCT-4\0\0\1. De cada una se escogieron 6 plantas individuales. Las 12 líneas S7 (3 familias de 6 líneas) se sembrarán en la EEP, durante 1998 B.

2.2.4. Desarrollo de líneas de poblaciones recurrentes: Generaciones avanzadas

2.2.4.1. De poblaciones con un gen de androesterilidad

Se utilizaron las mejores líneas avanzadas para el ensayo VIOAL, para suelos ácidos, del INGER LAC, distribuidas a los programas regionales.

2.2.4.2. De poblaciones sin gen de androesterilidad

Cuatro líneas se seleccionaron por presentar buena adaptación a las condiciones de suelos ácidos, las cuales fueron multiplicadas en EEP.

2.3. Mejoramiento Poblacional a través de Selección Recurrente

El proyecto colaborativo de Arroz del CIAT/CIRAD, hace énfasis al mejoramiento de poblaciones y extracción de líneas para los programas nacionales de la región.
La estrategia es desarrollar acervos y poblaciones, con buenas características agronómicas, para ser utilizados como fuentes de progenitores potenciales y líneas fijas para los programas nacionales.

En los primeros 2 años de la selección recurrente, el proyecto, se concentró en introducir germoplasma de Brasil (EMBRAPA Arroz e Feijao anteriormente CNPAF) y de la Guyana francesa (CIRAD), caracterizando y seleccionando masalmente. De 1995 en adelante, se concentraron las actividades en reforzar y desarrolla nuevas poblaciones.

2.3.1. Selección Recurrente basado en evaluación de líneas S2 de la Población PCT-4\0\0\1

Durante 1997A la población PCT-4\SA\1\1 se sembró en la EELL, iniciando con el segundo ciclo de la selección recurrente.

2.3.1.1. Selección de plantas fértiles y evaluación de líneas S2

En 1997A, un total de 155 plantas S0 se seleccionaron y se guardó una muestra de cada semilla S0 en el cuarto frío. Las líneas S1 se sembró durante 1997 B en la EEP para avance de generación y se cosechó semilla S2. Las líneas S2 se evaluaron durante 1998 en la EELL.

El juego de líneas S2 fue remitido a Brasil, Bolivia y Venezuela para evaluación y desarrollo de líneas por las Instituciones respectivas de estos países.

2.3.1.2. Cosecha de plantas androesteriles

Durante 1997A, se cosecharon plantas androesteriles individuales y sus semillas se mezclaron en proporciones iguales, para completar el segundo ciclo de recombinación de la población, seleccionada una vez. El segundo ciclo de recombinación, se identificó como PCT-4\SA\2\ y se sembró en la EELL durante 1998 A.

2.3.2. Selección recurrente masal para ambos sexos para características agronómicas, piricularia y "hoja blanca": Poblaciones, PCT-5\0\0; PCT-A\0\0\0; y PCT-4\0\0\1

Durante 1997 A, se mezcló la semilla de cada población con dos ciclos de selección recurrente masal y se sembró en la EELL. El tercer ciclo de selección recurrente se obtuvo con, 218, 253, y 165 plantas androestériles fertilizadas por el polen de plantas fértiles sanas seleccionadas en cada población.

En 1998 A , se sembró cada población con tres ciclos de recurrencia en la EELL. Se seleccionaron plantas androestériles sanas de las poblaciones PCT-5, PCT-A y PCT4 (180, 200, y 240, respectivamente). Se seleccionaron también plantas fértiles (30, 24, y 55, respectivamente) para desarrollo de líneas a partir del tercer ciclo de recurrencia.

2.4. Desarrollo de Nuevas Poblaciones

El desarrollo de nuevas poblaciones es una actividad básica del proyecto. Es la fuente principal de nueva variabilidad , recombinando y al mismo tiempo extrayendo material para desarrollo de líneas.

En 1996 B se sintetizó, en la EEP, dos nuevas poblaciones Japónicas para secano y para el ecosistema de laderas. La fuente de androesterilidad fue obtenida a partir de la mejor población japónica previamente desarrolló por el proyecto.

2.4.1. Población para secano

La idea de desarrollar esta población, fue el de agrupar las mejores líneas del proyecto de arroz del CIAT, obtenidas por mejoramiento convencional, y líneas que fueron lanzadas como variedades comerciales en Brasil, Colombia, y Bolivia.

En 1996 B, 18 líneas se seleccionaron, por precocidad, enfermedades, tolerancia a suelos ácidos y calidad del grano. Las mejores plantas androestériles de la población PCT-4, fueron utilizadas como madres.

Durante 1997A en la EEP, cada F1 resultante se sembró individualmente para evaluación y selección. La población básica PCT-11\0\0\0 es el resultado de la mezcla de la semilla F2.

La población PCT-11 se sembró en la EELL durante 1998 A. 95 plantas fértiles se seleccionaron para desarrollo de líneas. La generación S1, se sembró durante el segundo semestre de 1998 en la EEP durante 1998 B.

2.4.2. Población para Laderas

El propósito fue el de desarrollar una población para la región Andina de Colombia, con precocidad y tolerancia al frío de altitudes altas, 1300-1600 msnm

En 1996 B, 11 líneas de Madagascar, de CIAT e del CIRAD se seleccionaron, basada en su evaluación previa a altitudes altas. La población de secano PCT-4 mejor adaptada se utilizó como fuente de androesterilidad.

Durante 1997 A , en la EEP, cada F1 resultante se sembró individualmente y evaluó, seleccionando plantas individuales. La población básica PCT-13\0\0\0 es el resultado de la mezcla de semilla F2.
Durante 1997 B en la EEP, la población básica fue recombinada una vez. La identificación del primer ciclo de recombinación de la población básica es identificado como PCT-13\0\0\1.

Durante 1998 A en la EEP, se obtuvo el segundo ciclo de recombinación. Se remitió entonces a Dr. Michel Valès para evaluación más amplia en el ecosistema de laderas.

3. UTILIZACIÓN DE GERMOPLASMA DE SECANO POR LOS COLABORADORES DE DIFERENTES PAISES

3.1. Bolivia.

Las poblaciones PCT-4 y PCT-5 de CIAT y PCNA-16 de EMBRAPA, se caracterizó. Se hizo selección de masal de plantas androestériles fecundadas. Se seleccionaron plantas S0 en la población PCT-4 para desarrollo de líneas.

3.2. Venezuela.

La población PCT-11 fue remitida a UNELLEZ y está bajo caracterización

3.3. Cuba.

En 1996, la población que se introdujo fue la PCT-4, la cual se caracterizó para diferentes características agronómicas. En 1997 el germoplasma fue recombinado una vez mas y 19 plantas fértiles, fueron seleccionadas para desarrollo de líneas.
El desarrollo de una población local esta en marcha, introduciendo 4 líneas cubanas en la población PCT-4.

4. MEJORAMIENTO CONVENCIONAL PARA ARROZ DE SECANO Y EL ECOSISTEMA DE LADERAS

4.1. Arroz de secano

4.1.1. Líneas de secano de Brasil.

Recibimos de CNPAF un juego de líneas brasileñas para evaluación bajo condiciones de suelos ácidos.

4.1.2. Utilización de líneas de secano de CIAT/ CIRAD en Brasil.

En promedio 89%, 28%, y 19% de las líneas evaluadas en el ensayo Avanzado Preliminar y ensayos de observación son líneas CT. Las características principales que gustan de nuestras líneas son calidad del grano y tipo de la planta.

4.1.3. Lanzamiento de Líneas en Brasil

Tres líneas CT nuevas son candidatas muy prometedores para ser liberadas en el año de 1999.

4.1.4. lanzamiento de Línea en Bolivia

La línea IRAT 170 esta siendo sembrada por pequeños agricultores.

4.1.5. Utilización de líneas CT e CIRAD en China

La línea IRAT 359 está siendo sembrada en la provincia de Yunnan-China. Un gran número de líneas CT son utilizadas como progenitores en su programa de mejoramiento. Una línea del CIRAD, la IRAT 359 es muy promisoria e debe ser lanzada en 1999.

4.2. Arroz de secano para laderas

En 1993 líneas de secano desarrolladas por CIRAD/FOFIFA, fueron introducidas para el ecosistema de laderas en la región andina de Colombia, material que fue multiplicado en la EEP. Las líneas fueron distribuidas a CENICAFE y al proyecto de laderas del CIAT. En 1994, la evaluación de las líneas comenzó en el departamento del Cauca.
En 1995 el Centro Internacional de Agricultura Orgánica (CIAO) comenzó evaluaciones a 1600 metros sobre el nivel del mar. Los primeros resultados fueron presentados en la Conferencia en Arroz para la región montañosa en Madagascar en abril de 1996.

4.2.1. La Región Cafetera- CENICAFE y CIAO

La línea CT10069-27-3-1-4, se adaptó muy bien a altitudes medias, se utilizó en un ensayo con plantas de café jóvenes. El potencial de esta línea es muy prometedor (rendimiento del grano en promedio es de 4 t/ha). Se introdujeron 41 líneas nuevas de Madagascar y se multiplicó la semilla en CIAT, Palmira. Se realizaron 11 cruces simples en la EEP entre la línea CT10069-27-3-1-4 y 10 líneas de Madagascar y CIRAD. La generación F1, fue sembrada durante 1997 en la EEP.

El Dr. Michel Valès llegó a CIAT en agosto de 1997 y tomó la responsabilidad de las actividades del Mejoramiento para laderas en la región andina de América Latina. Para mayor información acerca de las actividades desarrolladas durante 1998, favor remitirse al informe anual.

4.2.2. Departamento del Cauca y Centro América

En el departamento del Cauca, las mejores cinco líneas, obtenidas de la selección del año anterior, mas una línea de secano (CIRAD 409) utilizada como testigo, fueron probadas en una granjas por cinco propietarios de un minifundio. La mejor línea (Latsidahy/ FOFIFA 62-3) rindió 1400 kg/ha a una altitud de 1600 msnm. El testigo mostró completa esterilidad.

Las 41 líneas introducidas de Madagascar, fueron enviadas al proyecto de laderas del CIAT para ser sembradas en Colombia y Centroamérica.
Para mayor información, reportarse al informe anual.

5. SELECCION RECURRENTE PARA ARROZ RIEGO

5.1. Introducción

EL mejoramiento por selección recurrente, inició con la introducción de diferentes acervos y poblaciones desarrolladas en Brasil, por EMBRAPA Arroz e Feijao y CIRAD en Guyana francesa.

Se caracterizó el germoplasma en CIAT, Palmira y las poblaciones de mejor adaptabilidad, fueron utilizadas por el proyecto, para desarrollar nuevas poblaciones e introducir nueva variabilidad. De este estudio se obtuvieron tres poblaciones que se registraron en el catálogo de selección recurrente como PCT-6, PCT-7 y PCT-8. El acervo desarrollado sirvió como nueva fuente de androesterilidad. El acervo se registró como GPCT-9. Finalmente, el segundo acervo de CIRAD se registró como GPIRAT-10.

5.2. Selección Recurrente: Selección recurrente en Ambos Sexos para "Hoja Blanca"

El objetivo era usar el método de mejoramiento de selección recurrente para el virus de "Hoja Blanca" y resistencia a enfermedades. Tres poblaciones, PCT-6\0\0\2, PCT-7\0\0\0, y PCT-8\0\0\0, y el acervo genético GPCT-9\0\0\,0F, fueron evaluados para el virus de la hoja blanca , según la metodología propuesta por CIAT. Se trasplantaron separadamente por recombinación con plantas androestériles. La recombinación de las poblaciones, después del primer ciclo de selección, se identificó como PCT-6\HB\1\2, PCT-7\HB\1\0, PCT-8\HB\1\0, y GPCT-9\HB\1\0F. Durante 1998 se lograron dos ciclos recurrentes en la EEP para la PCT-7 y PCT-8. La población PCT-6, la que mejor se ajustó a los trópicos y se remitió a Dr. Michel Valès. La población mejorada para Hoja Blanca dará inicio a la selección recurrente para resistencia parcial a piricularia.

5.3. Selección Recurrente en Colombia

En 1996, el Dr. Hernando Delgado de CORPOICA asistió al Curso Internacional en Arroz de Mejoramiento de Selección Recurrente, realizado en CIAT y seleccionó cuatro poblaciones (PCT-6\0\0\2, PCT-7\0\0\0, y PCT-8\0\0\0, y el acervo genético GPCT-9\0\0\0F). El material fue sembrado separadamente en la EELL para recombinación, caracterización y selección de plantas fértiles para desarrollo de líneas. Los cuatro materiales se comportaron bien. Las poblaciones PCT-6 y PCT-7 presentó el potencial más alto para el futuro. En 1998 se sembraron dos poblaciones en Villavicencio y se evaluaron por resistencia a enfermedades.

5.4. Selección Recurrente en Costa Rica

En 1996 se envió a Costa Rica el acervo genético GPCT-9 y la población PCT-7. Ese mismo año, el Dr. Randolph C. Morera, del Programa del Arroz Nacional, asistió al Curso Internacional de Selección Recurrente en Arroz, realizado en CIAT. Se caracterizó el germoplasma, bajo las condiciones de Costa Rica, seleccionando plantas androesteriles y fértiles separadamente. En 1997 se utilizó el material SO para desarrollo de líneas.

Para 1998, los resultados no están todavía disponibles

5.5. Selección Recurrente en El Salvador

En 1995 se envió tres poblaciones (PCT-6, PCT-7, y PCT-8) y el acervo GPCT-9 al Centro Nacional de Tecnología Agropecuaria y Forestal (CENTA), donde se llevaron a cabo las actividades siguientes:

· Desarrollo de líneas: En 1996 141 y 97 plantas S0 se seleccionaron de las poblaciones PCT-7, respectivamente.

· Mejoramiento de la Población: basado en la progenie de líneas S2 evaluación y recombinación con el remanente de semillas SO.

· Nueva población desarrollada: la población CNA IRAT ES 1/0/2 fue desarrollado por introducción cuatro líneas (X-10, CENTA A-1, CENTA A-2, y CENTA A-5) en la población brasileña CNA IRAT 4/0/6.

Para 1998 los resultados no están todavía disponibles

5.6. Selección Recurrente en Panamá

En 1996 se envió a Panamá el acervo indica GPCT-9 y población PCT-7. Ese mismo año, el Dr. Ariel E. Jaén Sánchez de la Facultad de Ciencias Agrícolas, Universidad de Panamá, asistió al Curso Internacional de Selección Recurrente en arroz, realizado en CIAT. El introdujo germoplasma sembró y caracterizó. Cosechó plantas fértiles precoces S0 para desarrollo de líneas.
Para 1998 los resultados no están todavía disponibles

5.7. Selección Recurrente en Venezuela

Después de que asistió al Curso Internacional de Selección Recurrente en arroz, realizado en CIAT, tres poblaciones (PCT-6, PCT-7, y PCT-8) y tres acervos(IRAT 1/420P, IRAT MANA, y GPCT-9) se le envió al Dr. E. Graterol para caracterización bajo las condiciones locales de Calabozo, y estado de Guárico. El objetivo era seleccionar los mejores germoplasmas adaptados e iniciar con el programa de selección recurrente. Dos poblaciones, la PCT-6 y PCT-7, se seleccionaron como fuente de androesterilidad para desarrollar dos poblaciones nuevas locales, identificadas como PFD-1 y PFD-2.

Durante 1998 en DANAC-Venezuela, y en CIAT Palmira, se sintetizaron las poblaciones.

5.8. Selección Recurrente en Cuba

En 1996 se envió el acervo genético GPIRAT-10 y la población PCT-7 a Cuba, y se caracterizó. La semilla se multiplicó para recombinación. Se seleccionaron plantas fértiles S0 para desarrollo de líneas.

5.9. Selección Recurrente en Argentina

En el diciembre de 1996 suministramos a la Universidad de Corrientes, las poblaciones PCT-6\0\0\0, PCT-7\0\0\0, y PCT-8\0\0\0. Se evaluó el germoplasma y se caracterizó.
Un total de 171 líneas se seleccionó de las tres poblaciones. Las poblaciones fueron recombinadas y la semilla se multiplicó.

La población chilena PQUI-1, se remitió al Universidad del la Plata, para evaluación en el Pampas, región de la provincia de Buenos Aires.

Desarrollo de nuevas poblaciones locales:
PARG-1, es una población con base genética estrecha para mejoramiento a corto plazo.
PARG-2, es una población con variabilidad orientada de PARG-1 introducida en PCT-8 (el mejor germoplasma introducido)
PARG-3, proviene de la población PCT8 por introducción de 6 líneas Argentinas. Este se realizará en CIAT Palmira.

5.10. Selección Recurrente en Chile

En 1996 se envió a Chile el acervo Japónico GPIRAT-10, desarrollado por CIRAD específicamente para climas templados. Ese mismo año, Dr. Santiago Hernaiz de INIA-Quilamapú asistió al Curso Internacional de Selección Recurrente en Arroz, realizado en CIAT.

En 1997 el acervo se caracterizó y se seleccionó plantas S0 fértiles para el desarrollo de líneas. Se utilizó también como una fuente de esterilidad masculina, para generar otra población introduciendo cinco líneas chilenas cruzando (Qui. 67108, Diamante, Buli, CINIA 609, y CINIA 606) con plantas androesteriles del acervo. Se envió a CIAT-Palmira parte de la semilla híbrida, obteniendo la generación F1. Se envió la semilla F2 de regreso a Chile. Se identificó la población básica chilena como PQUI-1\0\0\0.

En 1998 se dividió la población Chilena en dos parte. Una parte se sembró en la localidad de Chillan, y la otra en la localidad de Colchagua. Estos dos sitios corresponden a dos situaciones agroclimáticas diferentes. Después de la recombinación se enviaron a CIAT Palmira las poblaciones para el segundo ciclo de recombinación.

5.11. Selección Recurrente en Uruguay

En 1996 se envió a Uruguay el acervo GPIRAT-10. Ese mismo año, el Dr. Fernando Pérez de Vida, asistió al Curso Internacional de Selección Recurrente en Arroz, realizado en CIAT.
En 1997 el acervo se sembró, se caracterizó y se seleccionó plantas fértiles S0 para el desarrollo de líneas. También se utilizó GPIRAT-10 como una fuente de esterilidad masculina, para desarrollar una población local, cruzando líneas uruguayas con plantas androesteriles de GPIRAT-10.

En 1998 en CIAT, se recibió las F1, obtenida de los diferentes cruces para multiplicación de la semilla (F1 generación y cosecha del F2). Tres poblaciones serán obtenidas:
PURG-1 de la introducción de 17 líneas con grano corto en GPIRAT-10,
PURG-2 de la introducción de 60 líneas con calidad del grano largo en GPIRAT-10, y PURG-3 con base genética amplia resultado de la mezcla de las dos poblaciones previas, con las mejores descendencias seleccionadas en GPIRAT-10.

5.12. Desarrollo de la Línea obtenida por cultivo de anteras

En 1994 se introdujo de la Guyana francesa, la población IRAT-CT. Esta población viene del mejoramiento del acervo indica GPCNA-18 por cultivo de anteras.
En 1995 el laboratorio de cultivo de anteras del CIAT procesó la población IRAT-CT, y desarrolló líneas R2. Las líneas fueron evaluadas por FLAR en la Estación Experimental santa Rosa y se seleccionaron cinco líneas.

Durante 1998 se evaluaron las cinco líneas y la semilla se multiplicó para evaluaciones futuras.

5.13. Mejoramiento Convencional y Cultivo de anteras para Rumania

En el ámbito de la colaboración entre el proyecto de arroz del CIRAD en Montpellier y la institución Rumana FUNDULEA, dos cruces de Rumania son procesados en el laboratorio de cultivo de anteras en CIAT.
Las líneas dobles haploides se remitirán a FUNDULEA, y se guardará unas semillas para enviar a Chile, Argentina y Uruguay. Estas líneas pueden también ser útiles como donadores por tolerancia a frío en las laderas de Colombia.

CHAPTER I

PRESENTATION

1. HIGHLIGHTS

- **THE CIRAD/CIAT/FLAR COLLABORATIVE PROJECT**
- **THE CIAT RICE PROJECT**
- **UPLAND SAVANNA CONVENTIONAL RICE BREEDING**
- **UPLAND RICE FOR THE HIGHLANDS OF COLOMBIA**
- **RECURRENT SELECTION BREEDING**
- **FONDO LATINOAMERICANO Y DEL CARIBE PARA ARROZ DE RIEGO (FLAR)**

2. ACKNOWLEDGMENTS

3. BACKGROUND INFORMATION

CHAPTER I
PRESENTATION

1. HIGHLIGHTS

THE CIRAD/CIAT/FLAR COLLABORATIVE PROJECT

The third Collaborative Meeting between CIAT, CIRAD, INRA, and ORSTOM was held at CIAT headquarters in May 1997. At this meeting, the ongoing activities of the CIRAD/CIAT Rice Collaborative Project were confirmed, and the project was reinforced by:

- *The appointment of a new CIRAD-CA scientist at CIAT headquarters.*
- *Starting the adaptation of the ADVENTROP software to Latin America in March.*

The 4th Collaborative Meeting will be held in 1999 at Montpellier, France. We are working at the implementation of a new collaborative initiative between the CIRAD/CIAT/FLAR rice project and EMBRAPA Arroz e Feijao, Brazil; in rice economics, with the appointment of a CIRAD-CA scientist to Latin America.

THE CIAT RICE PROJECT

CIAT is developing its research activities according to a project management system. The rice project code is IP-4, and its breakdown structure is presented in Appendix 1. The individual work plan of the collaborative project for 1998 is presented in Appendix 2.

UPLAND SAVANNA CONVENTIONAL RICE BREEDING

During 1996, the activities developed by the conventional breeding project for upland savanna rice were at first reduced, but then reactivated to a certain extent during 1997.

In 1998 we sent upland lines to the new partners we identified during 1997:

- **Colombia**-Ministry of Agriculture for the small farmers of the Atlantic Coast,
- **Argentina**-Universidad Nacional de Tucumán,
- **Paraguay**- Associacion de productores de Arroz de Itapua,
- **Peru**-Programa Nacional de Maiz y Arroz, Pucallpa, and

- **Venezuela**- FONAIAP, and the Universidad Nacional Experimental de los Llanos Orientales "EZEQUIEL ZAMORA".

We continue maintaining strong relationships with:

- **Brazil** (EMBRAPA Arroz e Feijão, Goiania), and
- **Bolivia** (CIAT Santa Cruz Bolivia).

In the **Caribbean**, new partners were identified (through CRIDNet), during 1998: **Guyana and Belize** and **Cuba.**

UPLAND RICE FOR THE HIGHLANDS OF COLOMBIA

From 1993, we started, as an informal collaborative effort with the Centro Nacional de Investigaciones de Cafe (CENICAFE) and the CIAT hillsides project, to adapt rice as a new crop for the Colombian highland ecosystem. Results so far are very promising (see "Upland Rice Improvement for the Highlands of Colombia, 1996 Report").

Two upland rice lines were proposed for release. One is a CIAT savanna upland rice for the mid-altitudes (about 1300 masl, Colombian Coffee Region), and the other is an introduction from Madagascar (CIRAD/FOFIFA Highlands Breeding Project) for the higher altitudes (1600 masl, Cauca Region).

In 1998, we wrote a project that was presented in June to the Colombian institute COLCIENCIAS, by the Centro Internacional de Agricultura Organica (CIAO).

The hillsides breeding activities developed during 1998 are presented in the annual report by Michel Valès, now in charge of this part of the Collaborative Project.

RECURRENT SELECTION BREEDING

CIAT and CIRAD's breeding strategies focus on developing and improving populations, and phasing out the development of finished lines. Such population development and enhancement aim to provide national programs (NARS) with sources of potential parents having specific traits.

The expertise of the collaborative project on recurrent selection is shared with the NARS through activity reports, didactic documents, field visits, and training courses. The first International Course on Rice Recurrent Selection Breeding was held at CIAT in 1996. Fifteen scientists from 13 countries attended the course. Back *in their home countries, many began using recurrent selection in their breeding programs.*

In 1998, two populations developed by the CIRAD/G4I project in Rio Grande do Sul-Brazil, were registered in the germplasm catalog for recurrent selection as PCIRAD-23 and PCIRAD-24.

We are monitoring with our partners in Latin America, the use of the basic populations developed by the project. We also help them doing special work at CIAT Palmira; development of specific populations for future local use (Argentina, Uruguay and Venezuela) and generation of recombination cycle (Chile).

The first Venezuelan National Course on Rice Recurrent Selection was held at San Felipe – Venezuela, in September 21-26, and organized by Fundacion DANAC, CIRAD/CIAT and EMBRAPA.

The Second International Workshop on Rice Recurrent Selection , to be held in Goiania –Brazil, in September 1999 is in preparation.

Recurrent selection germplasm crosses continents. On request, we have shipped populations to Europe (France) and Asia (China).

FONDO LATINOAMERICANO Y DEL CARIBE PARA ARROZ DE RIEGO (FLAR) ***(FUND FOR LATINAMERICAN AND THE CARIBBEAN IRRIGATED RICE)***

In September 1996, CIRAD signed an agreement with the Fund and became a member. Beginning in 1997, the CIRAD/CIAT collaborative project developed research activities with FLAR on:

- *Recurrent selection breeding.*
- *Adaptation to Latin America of the CIRAD's ADVENTROP software (Thomas Le Bourgeois, Montpellier – France).*
- Durable resistance to blast. The activities developed during 1998 are presented in the annual report by Michel Valès, now in charge of this part of the Collaborative Project.

In 1998, **Bolivia, Guatemala** and **Uruguay** became members of FLAR. Conversations are well engaged with Argentina (State of Corrientes), Chile, Ecuador, and Peru to be members in 1999.

2. ACKNOWLEDGMENTS

This document reports the research activities developed during 1997 B and 1998 A at CIAT headquarters (Palmira, Department of Valle, Colombia), and "La Libertad" Experiment Station (Villavicencio, Department of Meta, Colombia).

In Colombia, we maintain close collaborative ties with CORPOICA and CENICAFE. But it is not so easy because of the changes occurred in the definition of research activities of these institutions.
We could not find out if CORPOPICA Regional 8 in Villavicencio is still interested in doing research in Savanna Upland Rice.
For CENICAFE we know that the project named "Diversificacion del cultivo del café" was reduced. That is why we developed the hillsides activities mainly with CIAO who continues to show great interest in the adaptation of Upland Rice in the Colombian hillsides, and with different CIAT's projects (Hillsides and Participatory Research).

At the regional level (Latin America), we conduct research activities in close collaboration with scientists of different institutions and universities.

We would therefore like to acknowledge the excellent work and collaboration of the following persons:

María Antonia Marassi	Argentina, Universidad de Corrientes
Juan Antonio Marassi	Argentina, Universidad de la Plata
Marta Genoveva Nicosia	Argentina, Universidad de Tucumán
José Alberto Villegas	Argentina, Universidad de Tucumán
Roger Taboada Paniagua	Bolivia, CIAT Santa Cruz
R. Guzmán	Bolivia, CIAT Santa Cruz
Orlando Peixoto de Morais	Brazil, EMBRAPA Arroz e Feijão
Emilio da Maia de Castro	Brazil, EMBRAPA Arroz e Feijão
Elcio Perpetuo Guimarães	Brazil, EMBRAPA Arroz e Feijão
James Taillebois	Brazil, CIRAD/G4I
Roberto Alvarado	Chile, INIA-Quilamapú
Santiago Ignacio Hernaiz Lagos	Chile, INIA-Quilamapú
Hernando Delgado Huertas	Colombia, CORPOICA-Regional 8

Randolph Campos Morera	Costa Rica, Ministry of Agriculture
Ramón Eduardo Servillón	El Salvador, CENTA
Ariel E. Jaén Sánchez	Panamá, Universidad de Panama
Alberto Herrera G.	Venezuela, Universidad (UNILLEZ)
Eduardo Graterol	Venezuela, DANAC – Fundación Polar
Fernando Blaz Pérez de Vida	Uruguay, INIA-Treinta y Trés
Rene Perez Polanco	Cuba, IIA Sancti-Spiritus

3. BACKGROUND INFORMATION

Genetic uniformity, or lack of genetic diversity, is of major concern to breeders, geneticists, and the agricultural community in general. In many crops, genetic improvement is usually accomplished by reducing genetic diversity in the gene pools used to develop new varieties. But genetic uniformity is now considered as increasing a crop's potential vulnerability to disasters caused by biotic or abiotic constraints.

In Latin America, the genetic diversity of rice varieties depends on a small genetic core of landraces (1 in Appendix 6). One way of broadening the genetic base of Latin American rice and assessing the genotype-by-environment interaction is to identify specific potential parents and pool them to develop new, genetically broad-based, breeding material.

CIAT and CIRAD's new breeding strategies focus on developing and improving populations to provide sources of fixed lines or potential parents with specific traits required by national breeding programs. One suitable breeding method to achieve this goal is recurrent selection.

Started in 1992, the CIRAD/CIAT rice improvement collaborative project introduced, from Brazil and French Guiana, and developed in Colombia (CIAT Palmira and Villavicencio) gene pools and populations segregating for a male-sterile recessive gene (2 in Appendix 6). At first, he main objectives of the project were:

- To understand the performance of the introduced germplasm in the upland acid soils of the Colombian savannas.
- To maintain the germplasm by harvesting fecundated male-sterile plants.
- To identify adapted fertile genotypes for use in breeding programs for fixed lines.
- To start recurrent selection by recombining the best selected genotypes in the introduced germplasm.
- To create new populations by incorporating the best locally adapted lines of the CIAT upland-rice breeding program into the best adapted, introduced germplasm that also provides a good source of male-sterile background.

Since 1995, we are mainly focusing with ours regional partners on line development and enhancement of different upland and lowland populations, especially for blast resistance, earliness, tolerance to acid soils and grain yield for upland ecosystem. For lowland conditions (tropical, sub-tropical, and temperate climate) the objectives are resistance to rice blast and Hoja Blaca virus, tolerance to cold, and grain yield and quality.
As International Centers, we also develop germplasm with broad genetic base, in order to gather, and maintain variability. To these germplasms we apply a low selection pressure in order to maintain variability and adaptation to broad ecoregional regions.

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CHAPTER II
RECURRENT SELECTION FOR UPLAND SAVANNA RICE

Marc CHÂTEL, Yolima OSPINA, and Jaime BORRERO

1. INTRODUCTION

The upland rice recurrent selection project aims to adapt, develop, and select upland rice gene pools and populations. The major characteristics that we look for in germplasm for savanna conditions are:

- Tolerance of soil acidity
- Resistance to diseases, mainly rice blast (*Pyricularia grisea* Sacc.)
- Resistance to pests, mainly rice plant hopper (*Tagosodes orizicolus*)
- Good grain quality (translucent, long, slender grain)
- Early maturity (total cycle about 115 days)

2. UPLAND SAVANNA RICE

The activities we report here were conducted at two experiment stations:

- Off season (1997 B): October 1997 to March 1998 at the Palmira Experiment Station (PES)
- Cropping season (1998 A): April to September 1998 at "La Libertad" Experiment Station (LES).

The soil and climatic characteristics of LES experimental station are presented in tables 1, and 2

2.1. Line Development from Recurrent Populations

During the enhancement of gene pools and populations through recurrent selection, we selected fertile plants to develop promising fixed lines or potential parents for regional NARS.

2.1.1. Generation S2

The generation S2 comes from S0 fertile plants selected during 1997 A at LES. The generation S1 was grown during 1997 B, at PES.

2.1.1.1. Populations PCT-5\PHB\1\0,PHB\1 PCT-A\PHB\1\0,PHB\1 and PCT-4\PHB\1\1,PHB\1

Cycles

During 1997 A *, fertile plants were selected for line development. In each population PCT-5\PHB\1\0,PHB\1; PCT-A\PHB\1\0,PHB\1; and PCT-4\PHB\1\1,PHB\1 , 41, 13, and 12 S0 fertile plants, respectively, were harvested.*

During 1997 B, the S1 generation was grown at PES.

Cropping Season 1998 A

The 66 S2 lines were evaluated at LES (table 3) and 8 (12%) were selected, (table 4).
In each selected line 6 fertile plants were harvested.

During 1998 B, the 48 S3 lines (8 families of 6 lines) will be grown at PES.

2.1.1.2. Population PCT-4\SA\1\1

Cycles

During 1997 A, 155 fertile plants were selected in the population. The S1 generation was grown **during 1997 B**, at PES.

Cropping season 1998

153 S2 lines were evaluated (table 5) and 65 (42.5%) were selected (table 6).

2.1.2. Generation S4

The generation S4 comes from S0 fertile plants selected during 1996 A at LES, and the selection of S2 lines during 1997 A at LES. The generation S3 was grown during 1997 B at PES.

2.1.2.1. Populations PCT-5\PHB\1\0, PCT-A\PHB\1\0, and PCT-4\PHB\1\1

Cycles

***During 1996 A**, from the first recurrent selection cycle for leaf blast and "hoja blanca" virus (see 1996 report 4-2), we selected 211 S0 fertile plants, distributed as follows:*

- *49 in PCT-5\PHB\1\0 (11.5% of the total number of fertile plants)*
- *48 in PCT-A\PHB\1\0 (12.4% of the total number of fertile plants)*
- *114 in PCT-4\PHB\1\1 (17.3% of the total number of fertile plants)*

***During 1996 B**, the S1 generation (211 S1 lines) were grown at PES and the S2 seeds sent to LES to grow the S2 generation during 1997 A.*

***During 1997 A**, from the 211 S2 lines evaluated at LES, 25 were selected.*

- *PCT-5\PHB\1\0 -- 1 line selected (2%)*
- *PCT-A\PHB\1\0 -- 2 lines selected (4%)*
- *PCT-4\PHB\1\1 -- 22 lines selected (19%)*

In each selected line, 6 individual plants were selected.

During 1997 B, the 150 S3 lines (25 families of 6 lines) were grown at PES.

Cropping season 1998 A

From the 150 S4 lines evaluated at LES (table 7), 35 (23.3%) were selected (table 8).

- PCT-5\PHB\1\0 no selection
- PCT-A\PHB\1\0 no selection
- PCT-4\PHB\1\1 35 lines selected (23.3%)

In each selected line 6 fertile plants were harvested.

During 1998 B, the 210 S5 lines (35 families of 6 lines) will be grown at PES.

2.1.3. Generation S6

The generation S6 comes from fertile S0 plants selected during 1995 A at LES. The generations S1, S3 and S5 were grown during 1995 B, 1996 B and 1997 B, respectively, at PES. The S2 and S4 generations were selected during 1996 A and 1997 A at LES.

2.1.3.1. Populations PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1

Cycles

During the 1995 A cropping season *at LES, we selected 55, 85, and 18 S0 fertile plants in PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1, respectively, and during the off-season (1995 B), we grew the S1 generation at PES.*

During the 1996 A cropping season, *we observed 158 S2 and 3 checks (Oryzica Sabana 6, IAC 165, and CIRAD 409) at LES, and selected mainly for plant type and yield potential, discarding 102 S2 lines (64.5%). A total of 56 S2 lines (35.4%) were selected:*

- *PCT-5\0\0\0 -- 21 lines (38.1%)*
- *PCT-A\0\0\0 --26 lines (30.6%)*
- *PCT-4\0\0\1 -- 9 lines (50.0%)*

From the 56 selected lines, we harvested 178 fertile plants: 62 from PCT-5\0\0\0, 91 from PCT-A\0\0\0, and 25 from PCT-4\0\0\1.

We applied different selection intensity to each selected S2 line, according to the phenotypic value of the lines (grain yield potential, and plant and grain type). For example, the highest average selection intensity in three PCT-5\0\0\0 S2 lines was 14% and the lowest average was 1.6% in 14 S2 lines.

The S3 generation was grown during 1996 B at PES and the S4 seeds sent to LES, to grow the S4 generation during 1997 A.

During 1997 A, *from the 178 S4 lines evaluated, 47 were selected*

- *PCT-5\0\0\0 -- 3 lines selected (5%)*
- *PCT-A\0\0\0 -- 35 lines selected (38%)*
- *PCT-4\0\0\1 -- 9 lines selected (36%)*

From each selected line, 6 individual plants were selected.

During 1997 B, the 282 S5 lines (47 families of 6 lines) were grown at PES.

Cropping Season 1998 A

From the 282 S6 lines (table 9), 64 (22.7%) were selected (table 10).

- PCT-5\0\0\0 no selection
- PCT-A\0\0\0 45 lines selected (16.0%)
- PCT-4\0\0\1 19 lines selected (6.7%)

In each selected line 6 fertile plants were harvested.

During 1998 B, the 384 S7 lines (64 families of 6 lines) will be grown at PES.

2.1.3.2. Population PCT-4\0\0\1>S2

Cycles

***During 1996 A**, we started enhancing this population by first evaluating the S2 line. We took advantage of the 1996 S2 line trial to select S2 lines and individual fertile plants for line development. From 152 S2 lines evaluated, we selected 19 (12.5%) and 74 individual plants, based on plant and grain type, and grain yield potential.*

***During 1996 B**, the S3 generation was grown at PES and the S4 seeds were sent to LES to grow the S4 generation during 1997 A.*

***During 1997 A**, from the 74 S4 lines evaluated, 16 were selected (22%). In each selected line, we harvested 6 individual plants.*

***During 1997 B**, the 96 S5 lines (16 families of 6 lines) were grown at PES.*

Cropping Season 1998 A

From the 96 S6 lines evaluated (table 11) , 12 (12.5%) were selected (table 12). In each selected line 6 fertile plants were harvested.

During 1998 B, the 72 S7 lines (12 families of 6 lines) will be grown at PES.

2.1.3.3. Populations PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1. Plant Selection in S3 Lines at PES, 1996 B

Cycles

During 1996 B*, at PES, we selected 12 individual fertile plants, with suitable characteristics, from S3 lines. The S4 seed was sown during 1997 A at LES.*

During 1997 A*, from the 12 S4 lines evaluated, only 3 were selected in one population:*

- *PCT-5\0\0\0 -- no selection*
- *PCT-A\0\0\0 -- no selection*
- *PCT-4\0\0\1 -- 3 lines selected (75%)*

In each selected line, 6 individual plants were selected.

During 1997 B, the 18 S5 lines (3 families of 6 lines) were grown at PES.

Cropping season 1998A. The 18 lines were evaluated at LES (table 13), and 2 (11.1%) were selected (table 14).

2.1.4. Advanced Generations

The advanced generations (AGs) came from the S0 fertile plants selected from the germplasm we introduced in 1992 from Brazil (with male-sterile gene) and from the gene pool and populations previously developed at CIAT (no male-sterile gene).

2.1.4.1. AGs from Populations with a Male-Sterile Gene

Cycles

During 1995 B, *at PES, we increased seed of 2 and 4 advanced lines selected from CNA-IRAT 5 and CNA-IRAT A, respectively.*

During 1996 A, *we observed these 6 lines at LES. From each of the 6 lines, we selected 5 individual plants.*

During 1996 B, *we increased seed of the 30 plants at PES to set up a yield trial during 1997 A.*

During 1997 A, *a yield trial was conducted and analyzed.8 lines presented a high yield potential and good milling characteristics.*

Cropping Season 1998 A, the best lines , (tables 15 and 16) were used to set-up the VIOAL acid soil nursery of INGER-LAC, to be dispatched to ours partners and for registration appliance in the Rice catalogue of CIRAD.

2.1.4.2. AGs from Populations without Male-Sterile Gene

Cycles

The first lowland populations used in recurrent selection breeding had been developed by manual crossing by the CIAT Rice Program in the early 1990s (Drs. E. P. Guimarães and F. Correa). The populations were developed from Indica and Japonica parents and used to target blast resistance. One gene pool and three populations were registered in the recurrent selection catalog as GPCT-1, PCT-2, and PCT-3 (Appendix 7).

Fixed lines were selected from GPCT-1 and PCT-3 at the Santa Rosa Experiment Station (a "hot spot" for blast evaluation).

In 1996 A, *we selected 89 individual plants showing good characteristics for savanna conditions.*

During 1997 A, *the 89 progenies were evaluated under savanna, acid-soil conditions at LES. A total of 36 lines were selected. Because these lines come from an Indica-Japonica recombination, Dr. J. Gibbons from FLAR shows interest in this material as having potential for lowland conditions.*

Cropping Season 1998 A

Four (4) lines from PCT-3, showing very good adaptation to acid soil condition were evaluated and seed increased at LES, (table 17).

3. UPLAND LINE REGISTRATION

CIAT does not register lines: when a specific line does well in a given country, the national institution of that country may decide to name and release it for commercial cultivation.

CIRAD has a mechanism by which breeders may register a specific material in a catalog. The line is named CIRAD (and is also given its local synonym, if it is the result of collaborative work), and is registered as "working material".

Cycles

During 1996, *two advanced lines--CNA-IRAT 5 \SA\0\3>127-2-M-2-M and CNA-IRAT A\SA\0\3>1-M-2-M-4-M, selected from the populations CNA-IRAT 5 and CNA-IRAT A--were proposed for registration in the CIRAD rice catalog. They are registered as CIRAD 410 and CIARD 411, respectively.*

During 1997, *the results of a yield trial showed that 3 lines were very promising. They were selected from two recurrent populations. They were remitted to INGER LAC to be part of the VIOAL trial for acid soil condition.*

During 1998, we apply for their registration in the CIRAD rice catalog.

4. POPULATION MAINTENANCE THROUGH RECOMBINATION

Cycles

Until now, the upland populations were maintained under irrigated conditions at Palmira. But, results obtained in Madagascar under similar conditions show that a possible genetic drift toward an increased frequency of the Indica plant type may occur in the population. Such a drift can be explained by a more effective cross-pollination among genotypes with an Indica background. We must remember that the male-sterile line used to build up populations is an irrigated Indica line (IR 36 male-sterile mutant).

During the 1996 A cropping season, *we decided to maintain and increase seed of upland populations under savanna conditions. We maintained the following 6 populations: CNA-IRAT 5/0/4, CNA-IRAT A/0/2, CNA-IRAT P/1/1, PCT-A\0\0\0, PCT-5\0\0\0, and PCT-4\0\0\1.*

All male-sterile plants were identified, harvested individually, and their seeds mixed in equal proportions. Fertile plants were also harvested individually and their seeds mixed in equal proportions.
The populations were sent to CIAT Palmira, and stored in a cold chamber until further use by the project or requested by regional NARS breeding programs.
During 1997 and 1998, no new maintenance of recurrent germplasm was made.

5. POPULATION ENHANCEMENT BY RECURRENT SELECTION

The CIAT rice project emphasizes the enhancement of populations and is phasing out the production of fixed lines for direct release by the NARS of the region. The strategy is to develop and enhance gene pools and populations for well-targeted traits for use as sources of potential parents by national breeding programs.

In the first 2 years of the recurrent selection project, we concentrated on introducing germplasm from Brazil (EMBRAPA Arroz e Feijão and CIRAD) and French Guiana, and characterizing and mass selecting it. From 1995 onward, we concentrated our activities on enhancing and developing new populations.

5.1. Recurrent Selection Based on S2 Line Evaluation: Population PCT-4\0\0\1

Cycles

During 1995 A, *at LES, 159 S0 fertile plants were selected.*

During 1995 B, *the S1 generation was grown at PES.*

During 1996 A, *we started the first recurrent selection cycle:*

- ***Evaluation:*** *152 lines of S2 and 2 checks (Oryzica Sabana 6 and CIRAD 409) were evaluated and selected at LES under the "Augmented Blocks" statistical design (7, Appendix 6).*
- ***Selection:*** *Results of the S2 trial were analyzed and 53 S2 lines were selected.*
- ***Recombination: In 1996 B,*** *at PES, remaining seeds from the S0 plants from which originated the selected S2 lines were mixed and grown to develop the recombined enhanced population.*
- ***Identification:*** *The enhanced recombined population was identified as PCT-4\SA\1\1.*

During 1997 A, *the population PCT-4\SA\1\1 was grown at LES to go through a second selection cycle.*
Harvest of Male-Sterile Plants. *Male-sterile plants were harvested individually and their seeds mixed in equal proportions to complete the second cycle of recombination of the population selected one time. The second cycle of recombination is identified as PCT-4\SA\2\1. Seed will be stored in the cold chamber for future use.*

Selection of Fertile Plants. *A total of 155 S0 plants were selected, and a sample of each S0 seed was stored in the cold chamber.*

During 1997 B, the S1 generation was grown at PES, and S2 seeds harvested.

Cropping Season 1998 A

From the 155 S2 lines, 152 were evaluated during 1998 A at LES in a trial named "Augmented Blocs of Federrer" (BAF), table 5. With a selection index of 39.5% we selected the 60 best lines (table 18) for recombination from the original S0 selected plants.
The recombination will be made at PES during 1998 B by the sowing of the balanced mixture of S0 seed (equal proportion of seed of each S0 plant) and harvest of the seeds produced by the male sterile plants.

Multilocal evaluation of S2's lines
The S2 set of lines was remitted to **Brazil** (EMBRAPA Arroz e Feijão), **Bolivia** (CIAT Santa Cruz), and **Venezuela** (UNELLEZ) for evaluation and selection for line development.

Selection of S0 plants in the second cycle of recombination, after one selection for acid soil.
Seventy five (75) S0 fertile plants from the population PCT-4\SA\2\1 were selected at LES, (table 19). The generation S1 will be grown during 1998 B, at PES.

5.2. Mass Recurrent Selection for Both Sexes for "Hoja Blanca", Blast, and Major Agronomic Traits: Populations PCT-4\0\0\1, PCT-A\0\0\0, and PCT-5\0\0\0

Cycles

During 1995 A, *at LES, we eliminated at the vegetative stage all plants showing symptoms of leaf blast and HBV. At harvest, we selected male-fertile plants. Seeds produced by these plants were the result of fertilization with pollen produced by healthy fertile plants. We selected 102, 99, and 96 male-sterile plants from PCT-5\0\0\0, PCT-A\0\0\0, and PCT-4\0\0\1, respectively, and their seeds were mixed in equal proportions.*
The first mass recurrent selection cycles (selection and recombination) were identified as PCT-5\PHB\1\0 , PCT-A\PHB\1\0 and PCT-4\PHB\1\1, respectively.

During 1996 A, *the seed mixture of each population with one mass recurrent selection cycle was grown at LES.*

To develop the second recurrent selection cycle, the same selection method as that used during 1995 A was applied. We selected 304, 341, and 442 healthy male-sterile plants, fertilized with pollen of fertile healthy plants, from PCT-5\PHB\1\0, PCT-A\PHB\1\0, and PCT-4\PHB\1\1, respectively, and mixed their seeds in equal proportions.

The second mass recurrent selection cycles (selection and recombination) were identified as PCT-5\PHB\1\0,PHB\1, PCT-A\PHB\1\0,PHB\1, and PCT-4\PHB\1\1,PHB\1, respectively.

During 1997 A, *the seed mixture of each population with two mass recurrent selection cycles was grown at LES.*
To make the third recurrent selection cycle, the same selection method as that used during 1995 A and 1996 A was applied (all plants with symptoms of leaf blast and "hoja blanca" were eliminated during their vegetative stage). We selected 218, 253, and 165 healthy male-sterile plants, fertilized with pollen from fertile healthy plants, from PCT-5\PHB\1\0,PHB\1; PCT-A\PHB\1\0,PHB\1; and PCT-4\PHB\1\1,PHB\1, respectively, and their seeds mixed in equal proportions. The third mass recurrent selection cycles (selection and recombination) are identified as PCT-5\PHB\1\0,PHB\1,PHB\1; PCT-A\PHB\1\0,PHB\1,PHB\1; and PCT-4\PHB\1\1,PHB\1,PHB\1.

Cropping Season 1998 A

Fourth Cycle of Recurrent Selection
The seed mixture of each population with 3 mass recurrent selection cycles was grown at LES.
To make the fourth recurrent selection cycle, the same selection method as that used during 1995 A, 1996 A and 1997 A was applied (all plants with symptoms of leaf blast and "hoja blanca" were eliminated during their vegetative stage). We selected 180, 200, and 240 healthy male-sterile plants, fertilized with pollen from fertile healthy plants, from PCT-5\PHB\1\0,PHB\1,PHB\1; PCT-A\PHB\1\0,PHB\1, PHB\1; and PCT-4\PHB\1\1,PHB\1, PHB\1 respectively, and their seeds mixed in equal proportions. The fourth mass recurrent selection cycles (selection and recombination) are identified as PCT-5\PHB\1\0,PHB\1,PHB\1, PHB\1; PCTA\PHB\1\0,PHB\1,PHB\, PHB\1; and PCT-4\PHB\1\1,PHB\1,PHB\1, PHB\1.

Selection of S0 fertile plants
30, 24, and 55 fertile plants were selected in the respective populations PCT-5\PHB\1\0,PHB\1,PHB\1; PCT-A\PHB\1\0,PHB\1,PHB\; and PCT-4\PHB\1\1,PHB\1,PHB\1 for the future development of lines (tables 20, 21 and 22)
The generation S1 will be grown during 1998 B at PES.

6. DEVELOPMENT OF NEW POPULATIONS

The development of new populations is a major activity of the project, and provides the main source of new recombined variability for population enhancement and line development. We need to be well focused in our choice of variability and recombine in new germplasm, as well as in the source of male sterility available (usually a well-adapted existing population or gene pool).

In 1996 B, we decided to build up at PES two new Japonica populations, targeting upland savannas and hillsides. The source of male-sterility background is the best Japonica population previously developed by the project.

6.1. Upland Savanna Population

The idea behind developing that population is to pool the best lines from the CIAT conventional rice breeding project and the commercial varieties released in Brazil, Colombia, and Bolivia.

Cycles

***In 1996 B**, 18 lines were selected according to their performance for early maturity, blast and acid-soil tolerance, and grain quality. Male-sterile plants from the best-adapted upland Japonica population (PCT-4) were used as female parents. Each line was crossed with at least four male sterile-plants of the population PCT-4.*

During 1997 A, *at PES, each resulting F1 was grown individually, evaluated, and individual plants selected. The F2 seed of the selected F1 plants were bulked in equal proportions. Each F2 bulk was mixed in balanced proportions to build up a new basic population, identified as PCT-11\0\0\0.*

During 1997 B, at PES, the basic population will be recombined once. The first cycle of recombination of the basic population will be identified as PCT-11\0\0\1.

Cropping Season 1998 A
The PCT-11 Population was grown at LES starting its evaluation and selection. 95 So fertile plants were selected for future line development (table 23).

During 1998 B, the 95 S1's were planted at PES, and the S2 seed harvested.

6.2. Upland Hillside Population

The idea is to develop a population for the Andean highlands of Colombia, with early maturity, cold tolerance, and adaptability to high altitudes (1300-1600 masl).

Cycles

***In 1996 B**, 11 lines--6 from the CIRAD/FOFIFA hillsides program of Madagascar, 4 from the CIAT upland savannas program, and 1 IRAT line--were selected according to their previous evaluations at high altitudes for early maturity and spikelet fertility.*

We used the best-adapted upland Japonica population (PCT-4) as a source for male sterility. Each line was crossed with at least 4 male-sterile plants of PCT-4.

***During 1997 A,** at PES, each resulting F1 generation was grown individually, evaluated, and individual plants selected. The F2 seeds of the selected F1 plants were bulked in equal proportions. Each F2 bulk was mixed in balanced proportions to build up the new basic population, identified as PCT-13\0\0\0.*
***During 1997 B,** at PES, the basic population will be recombined once. The first cycle of recombination of the basic population will be identified as PCT-13\0\0\1.*

Cropping Season 1998 A
The second cycle of recombination of the population was made at PES and the recombined population will be remitted to M. Vales for evaluation at medium to high altitude in the Colombian Andes.

7. DISTRIBUTING GERMPLASM TO BRAZIL
Breeding lines were sent to EMBRAPA Arroz e Feijão for evaluation and selection. Unfortunately for unknown reasons, the lines were not delivered to EMBRAPA Rice and Beans Center by EMBRAPA CENARGEN and we don't have enough seed for an other shipment.

8. DISTRIBUTING UPLAND-RICE GERMPLASM BRED BY RECURRENT SELECTION

Since 1995 we started to release recurrent populations and gene pools to NARS in Latin America, West Africa, and Asia.

9. USE OF RECURRENT UPLANDGERMPLASM BY LAC PARTNERS

9.1. Use in Bolivia

R. GUZMAN, R. TABOADA, M. CHÂTEL, Y. OSPINA and J. BORRERO

The populations PCT-4 and PCT-5 from CIAT, were characterized. The population PCT-4 is better adapted to the local conditions. Mass selection of sterile plants was made in the two populations with a respective intensity of selection of 31 and 33% Population breeding through recurrent selection will be continued with the PCT-4 population.
Fertile plants, to develop fixed lines were selected into the population PCT-4.

The population PCNA-16 (CNA-7) introduced from EMBRAPA, Arroz e Feijao, Brazil, was characterized.
Mass selection was made at vegetative stage for leaf blast and after flowering for neck blast.
13 plants with good agronomic characteristics were selected to develop fixed lines

9.2 Use in Venezuela

Alberto HERRERA, Marc CHÂTEL, Yolima OSPINA, and Jaime BORRERO

We sent to UNELLEZ, Venezuela the population PCT-11 in order to initiate a project on recurrent selection in upland rice. The population was observed and characterized. It is a very promising germplasm.

9.3 Use in Cuba

Rene PEREZ POLANCO, Marc CHÂTEL, Yolima OSPINA, and Jaime BORRERO

(Rene Perez Polanco attended the first International course on recurrent selection held at CIAT in 1996).

The results reported here are from the 1996 and 1997 cropping seasons.
In 1996, the population PCT-4 was introduced to Cuba and characterized for plant type, tillering, plant heigh, heading time, grain type and resistance to rice blast. By

harvesting the male-sterile plants the germplasm was recombined and seed increased.
In 1997, the germplasm was recombined a second time, and 19 S0 fertile plants were selected for line development.

For developing a local population for upland condition for tillering hability, grain yield and later heading time, the population PCT-4 was introgresed by 4 Cuban lines (IACuba-14, IACuba-19, IACuba-20, and J-104). Crosses were made between the different lines and male-sterile plants of PCT-4 using the methodology, learned at CIAT, during the recurrent selection course.

10. TRIALS

10.1. Evaluation of S2 Lines from PCT-4\SA\1\1

155 S2 lines selected in the population PCT-1\SA\1\1 were evaluated using a statistical trial named "Augmented (or hoonuiahu) designs.
The trial is made of 8 blocks in witch are randomly distributed 19 S2 lines and 3 checks (O. Sabana 6, O. Sabana 10 and CIRAD 409). Each block is fenced by rows of blast spreaders. The same trial was sent to Brazil, Bolivia and Venezuela.
The results of the trial conducted in Colombia are presented in the table 18.

10.2. Yield Trial

8 advanced lines developed by the project were evaluated for different agronomic traits and yield potential. The results are presented in the table 24.

10.3. INGER-LAC Trial

The 1998 VIOAL "Suelos Acidos" is made of 31 lines coming from our project, (table 15), and was dispatched to different countries in Latin America.
The results in the different countries will be reported by INGER- LAC.

CHAPTER III

CONVENTIONAL BREEDING FOR UPLAND SAVANNA RICE

1. SAVANNA UPLAND RICE

- **1.1. Use of CIAT/CIRAD Savanna Lines in Brazil**
- **1.2. Line release in Brazil**
- **1.3. Line release in Bolivia**
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2. HIGHLAND UPLAND RICE

- **2.1. History**
- **2.2. Coffee Region - CENICAFE and CIAO**
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CHAPTER III

CONVENTIONAL BREEDING FOR UPLAND SAVANNA RICE

1. SAVANNA UPLAND RICE

Marc CHÂTEL, Yolima OSPINA, and Jaime BORRERO

As was stated earlier, we are gradually phasing out most of the activities involved in the development of fixed lines for direct release by NARS.

In 1996 B, we sent savanna upland lines (F4 and F5 generation) to EMBRAPA Arroz e Feijão for observation and seed increase. These lines were sent back to CIAT, Palmira, in 1997.
In 1997 B, the lines were seed increased and dispatched to different countries.

In Colombia, we continue the evaluation and selection of lines for the development of fixed material to be tested by CORPOICA in the "Altillanura" condition.
During 1998 A, we selected 24 lines that presented the best characteristics of adaptation to acid soil condition (table 25).

1.1. Use of CIAT/CIRAD Savanna Lines in Brazil

During our visit to EMBRAPA Arroz e Feijão, we had the opportunity to track back the use of CIAT lines in the breeding program of this Center. The results of the survey, for the 1997/1998 cropping season, showed that the CIAT/CIRAD savanna materials continue to be very useful for the Brazilians at each step of their breeding program.
The participation of CIAT/CIRAD material in the different trials is expressive: 89% in the advanced trials, 28 % in the preliminary trials, and 19% in the observation trials. The main characteristic the Brazilian praised from CIRAD/CIAT material is earlyness, plant and grain type.

Trial type	Nbr. of accessions	CIAT/CIRAD	Participation
ObservaçãoEO-S	168	26	15%
ObservaçãoEO-SF	176	39	22%
Preliminar II	22	5	23%
Preliminar III	24	8	33%
Avançado II	15	13	87%
Avançado M.T	2	2	100%
Avançado III	12	11	92%

1.2. Line release in Brazil

During the period 1994-1997, 4 lines were released in different States of Brazil. They are: CONFIANÇA (States of Roraima and Minas Gerais),
CANASTRA (States of Minas Gerais, Goias, Tocantins, Piaui and Maranhão), MARAVILHA (Goias, Mato Grosso, Tocantins,Para, Roraima and Rondonia), and PRIMAVERA (States of Goias, Tocantins, Maranhão, Piaui, Mato Grosso and Mato Grosso do Sul).
From these 4 released lines, 2 comes from the CIAT breeding program:

CANASTRA	**CT 7415-6-5-1-2-B**
MARAVILHA	**CT 6516-23-10-1-2-2-B**

Three new CIAT lines are very promising candidates to be released in **1999**:

CNA8172	**CT 11614-1-4-1-M**
CNA8305	**CT 11251-7-2-M-M**
CNA8436	**CT 11251-7-2-M-1-M-M**

1.3. Line release in Bolivia

A CIRAD line (IRAT 170) is to be released in Bolivia.

1.4. Use of CT and IRAT Lines in China

In 1995, we sent China the first set of savanna lines from Brazil and CIAT/CIRAD as part of a collaboration between the Foods Crops Research Institute of the Yunnan Academy of Agricultural Science, Kunming (YAAS) and CIRAD. Preliminary results are highly promising, showing good immediate adaptation and acceptability.

In 1997, Dr. Tao Dayun told us that the savanna upland line CT 9278-11-14-2-1-M was very promising as parent for the Chinese upland breeding program.
In 1998, we were invited to China to a monitoring tour. New CT lines are under evaluation in different trials and sites.
The rice project of CIRAD Montpellier has close links with YAAS and have shipped many upland lines in the recent years. After screening, they are used as source of progenitors or for direct release. The line IRAT 104 was released in 1996. In 1998, the line IRAT 359 is conducted in demonstration fields, and will be released in 1999.

1.5. Evaluation of WARDA's lines

From the 100 lines we received and planted at LES, 8 were selected. They present good vigor, acid soil tolerance and acceptable grain type (table 27).

2. HIGHLAND UPLAND RICE

Marc CHÂTEL, Michel VALÈS and Jaime BORRERO

The Andean Mountains range across Colombia from south to north, rising to almost as high as 6000 masl. The most important agricultural activity in the mid-altitudes (1000-2000 masl) of this area is coffee, planted by small farmers. This crop takes at least 3 years to reach commercial productivity, but, in the meantime, farmers must use considerable resources to control weeds and prevent erosion. With this cropping system in mind, CENICAFE has been working on different alternatives for crop diversification to help farmers earn income while waiting for the coffee to reach commercial productivity.

Another area of significant agricultural activity by small farmers is in the Department of Cauca, southwestern Colombia, where new crops are being incorporated into existing cropping systems or new ones developed by CIAT to ensure local food security.

2.1. History

To identify upland germplasm adapted to the hillside areas of Colombia, the CIAT/CIRAD rice project, together with CENICAFE, started, in 1993, to evaluate 31 selected savanna lines in the heart of the coffee-growing area, at 1300 masl. Climatic data collected at the main site show annual average temperatures ranging from 23.1 to 20.6 °C. The monthly average maximum (28.5 °C) occurs in February and the minimum (16.9 °C) in September. The germplasm for this region must therefore tolerate cold (i.e., have high spikelet fertility).
The lines used for the first trial were selected from the savanna upland germplasm collection at CIAT. Selection was based on knowledge previously gained from the CIRAD/FOFIFA Highland Rice Project in Madagascar. Upland lines must be early maturing and tolerate cold (as measured by panicle fertility).

Results obtained in La Catalina, Department of Risaralda, showed that the percentages for empty grains ranged from almost 100% to 12%, indicating that the germplasm presented variability for cold tolerance. Growing period extended to *about 150 days after sowing (DAS), compared with 120 DAS under savanna conditions.*

Selection concentrated on lines with at least 60% fertility. The average grain yield of the six best-adapted lines was higher than expected, ranging from 3775 to 5592 kg/ha.

2.2. Coffee Region - CENICAFE and CIAO

***In 1993**, upland lines developed by CIRAD/FOFIFA for the highlands of Madagascar were introduced to Colombia and seed increased. The new germplasm was distributed to CENICAFE and the hillside project at CIAT.*

***In 1994**, line evaluation started in the Department of Cauca.*

***In 1995**, the Centro Internacional de Agricultura Orgánica (CIAO) began evaluations at 1600 masl.*
The first results were presented at the Conference on Rice for the Highlands in Madagascar in April 1996.

***In 1997**, in the Coffee Region, we identified with CENICAFE and CIAO, the line CT 10069-27-3-1-4, with excellent adaptation to the mid-altitudes. Considering the potential of this line over time (average yield grain production of 4 t/ha), we decided to register it in the CIRAD Rice Catalog.*

***Germplasm Introduction.** Forty-one new lines were introduced from Madagascar to Colombia and seed increased at CIAT, Palmira, and then dispatched to CENICAFE, CIAO, and CIAT's hillsides project.*
***Crosses.** Eleven single crosses were made at PES between line CT 10069-27-3-1-4 and 10 lines from Madagascar and CIRAD, previously selected for their good performance under highland conditions. The F1 generation was grown during 1997 A at PES, and the F2 seed sent to our partners.*

Cropping Season 1998
Dr. Michel Valès from CIRAD, arrives at CIAT in August 1997 and took the responsibility of the breeding activities for the Highlands of Latin America. For more information about the activities developed during 1998, report to his annual report.

2.3. Department of Cauca and Central America

Cropping season 1997

In the Department of Cauca, the five best lines were selected last year and, with one savanna upland check (CIRAD 409), tested this year on farm by five smallholders The best line (Latsidahy/FOFIFA 62-3) from last year's experiment was also the best in this year's on-farm trial, with an average grain production of 1400 kg/ha at 1600 masl. The savanna upland check showed complete sterility at each farm. If these results are confirmed in this semester's trials, we will register line Latsidahy/FOFIFA 62-3 in the CIRAD Rice Catalog.

A survey was conducted with the five farmers to know what are the most desirable characteristics of a rice line. Ranking at first and second places, respectively, are a high number of panicles and a short cycle. At the vegetative stage, the line that scored as having the highest acceptability was also the one that had the highest yield.

The same set of 41 lines introduced from Madagascar was dispatched to the CIAT hillsides project for testing in Colombia and Central America.

Cropping Season 1998

Dr. Michel Valès from CIRAD, arrives at CIAT in August 1997 and took the responsibility of the breeding activities for the Highlands of Latin America. For more information about the research activities developed during 1998, report to his annual report.

CHAPTER IV

RECURRENT SELECTION FOR LOWLAND RICE

CHAPTER IV

RECURRENT SELECTION FOR LOWLAND RICE

1. INTRODUCTION

The recurrent selection breeding project started by introducing different gene pools and populations developed in Brazil to Colombia by EMBRAPA Arroz e Feijão and CIRAD and to French Guiana by CIRAD.

The germplasm was characterized at CIAT, Palmira, and the best-adapted populations were used to develop new populations by introducing new variability. This resulted in three populations that were registered in the recurrent selection catalog as PCT-6, PCT-7, and PCT-8. This work was conducted at CIAT in close collaboration with Drs. C. Martínez and E. P. Guimarães.

A gene pool was also built up, using a different source for the gene of male sterility. The gene pool was registered as GPCT-9.

A second gene pool, developed by CIRAD for temperate climates, was registered as GPIRAT-10.
In 1998, two populations developed by CIRAD in collaboration with G4I, in Brazil, were regeistered as PCIRAD-23 and PCIRAD-24. Descriptions of these populations and gene pools are presented in Appendix 3.

2. FLAR/CIRAD RECURRENT SELECTION: Recurrent Selection on both sexes for "Hoja Blanca Virus"

Jaime BORRERO, Marc CHÂTEL, James GIBBONS, and Monica TRIANA

Introduction

One of FLAR's objectives is to focus on breeding. Recurrent selection is an alternative method to conventional breeding and can be incorporated into FLAR's breeding activities.
We applied the recurrent selection breeding method to existing germplasm for resistance to the "hoja blanca" virus vector (rice plant hopper, *Tagosodes orizicolus*) and the blast fungus, both considered as the most important biotic problems in the tropics.

Cropping Season 1997

Three populations, PCT-6\0\0\2, PCT-7\0\0\0, and PCT-8\0\0\0 and the gene pool GPCT-9\0\0\0F were evaluated for resistance to the "hoja blanca" virus according to the methodology developed by CIAT.

Each germplasm material and check were sown in the "hoja blanca" nursery. At 45 days after sowing, the populations and checks were evaluated and the number of healthy and diseased plants counted. In the nursery, the four original germplasm materials showed intermediate susceptibility to "hoja blanca" (the same level as that of the check Oryzica 1). After transplanting, PCT-7 and GPCT-9 presented a high number of plants with "hoja blanca" symptoms. The two least susceptible germplasm materials were PCT-7 and PCT-8, with 18% and 19% of immune plants, respectively. These plants will be recombined to complete the first cycle of recombination.

Healthy plants of each germplasm material were transplanted separately for recombination with male-sterile plants. The selected populations were PCT-6\HB\0\2, PCT-7\HB\0\0, PCT-8\HB\0\0, and GPCT-9\HB\0\0F. The recombined populations, after the first cycle of selection, were identified as PCT-6\HB\1\2, PCT-7\HB\1\0, PCT-8\HB\1\0, and GPCT-9\HB\1\0F.

Cropping Season 1998

Two more recurrent cycles were performed at PES for PCT-7 and PCT-8 .
The Population PCT-6 after two cycles of recurrence was remitted to Dr. Michel Vales. This enhanced germplasm is the starting point of his recurrent selection breeding project for partial Resistance to rice blast.

3. RECURRENT SELECTION IN COLOMBIA

Hernando DELGADO, Marc CHÂTEL, and Yolima OSPINA

Last year we sent four germplasm materials (PCT-6\0\0\2, PCT-7\0\0\0, and PCT-8\0\0\0 populations and the gene pool GPCT-9\0\0\0F) to CORPOICA Regional 8. Each material was grown separately at LES for recombination, characterization, and selection of S0 fertile plants for line development. The four materials performed well, with the PCT-6 and PCT-7 populations presenting the best potential. Next year, these populations will be evaluated for blast resistance at the Santa Rosa Experiment Station.

Cropping Season 1998: The populations were sown in Villavicencio, and the results are not yet available.

4. RECURRENT SELECTION IN COSTA RICA

Randolph C. MORERA, Marc CHÂTEL, and Jaime BORRERO

In 1996, we sent Costa Rica the Indica gene pool GPCT-9 and the population PCT-7. That same year, Dr. Randolph C. Morera of the National Rice Program attended the International Course on Rice Recurrent Selection Breeding held at CIAT. The germplasm was characterized under Costa Rican conditions and maintained by harvesting male-sterile and fertile plants independently. In 1997, the germplasm was used for line development by selecting S0 fertile plants.

Cropping Season 1998: The results are not yet available.

5. RECURRENT SELECTION IN EL SALVADOR

Ramón Eduardo SERVILLON, Marc CHÂTEL, and Jaime BORRERO

In 1995, we sent three populations (PCT-6, PCT-7, and PCT-8) and the gene pool GPCT-9 to the Centro Nacional de Tecnología Agropecuaria y Florestal (CENTA), El Salvador.

Line development. In 1996, 141 and 97 S0 fertile plants were selected from the PCT-7 and PCT-8 populations, respectively.

Population enhancement for grain yield, plant type, blast resistance, and grain quality. The recurrent selection method used is based on S2 progeny evaluation and recombination from the remaining S0 seeds. One hundred S2 lines from the PCT-7 population were evaluated at two different sites.

New population development. The population CNA IRAT ES 1/0/2 was developed by introducing 4 lines (X-10, CENTA A-1, CENTA A-2, and CENTA A-5) into the Brazilian population CAN IRAT 4/0/6. The new population has already passed through 2 cycles of recombination and S0 fertile plants were selected during 1997 B.

Cropping Season 1998: The results are not yet available.

6. RECURRENT SELECTION IN PANAMA

Ariel E. JAÉN SANCHEZ, Marc CHÂTEL, and Jaime BORRERO

In 1996, we sent Panama the Indica gene pool GPCT-9 and the population PCT-7. That same year, Dr. Ariel E. Jaén Sánchez of the Faculty of Agricultural Sciences, Universidad de Panamá, attended the International Course on Rice Recurrent Selection Breeding held at CIAT. The introduced germplasm was grown and its characterization started. But, because of water shortages, irrigation was a problem. The materials suffered and the work could not be completed. Nevertheless, from each material, the earliest S0 fertile plants were harvested. New samples from the recurrent populations were sent to Panama.

Cropping Season 1998: The results are not yet available.

7. RECURRENT SELECTION IN VENEZUELA

Eduardo GRATEROL, Marc CHÂTEL, Jaime BORRERO, and Yolima OSPINA

After attending the International Course on Rice Recurrent Selection Breeding, three populations (PCT-6, PCT-7, and PCT-8) and three gene pools (IRAT 1/420P, IRAT MANA, and GPCT-9) were sent to Dr. E. Graterol, for characterization under local conditions in Calabozo, Guárico State. The objective of the characterization was to select the best-adapted germplasm to start a recurrent selection program. The traits evaluated in each germplasm material were time to flowering, tillering ability, plant height, and disease tolerance (of leaf-and-neck blast, brown spot, sheath blight, and sheath rot).

Two populations, PCT-6 and PCT-7, were selected as the best introduced material to be used as sources of male-sterile background to develop two new local populations, identified as PFD-1 and PFD-2.

PFD-1

Male-sterile plants of PCT-6 were crossed with 5 lines:

FONAIAP 1 | *CT 9868-3-2-3-1-4P-M-1-1P*
IR 62140-48-3-1-2-3 | *CT 9509-17-3-1-1-M-1-3P-M-1*
CT 10310-15-3-2P-4-3

PFD-2

Male-sterile plants of PCT-6 were crossed with 4 lines:

CT 9868-3-2-3-1-4P-M-1-1P | *IR 62140-48-3-1-2-3*
CT 10310-15-3-2P-4-3 | *CT 9509-17-3-1-1-M-1-3P-M-1*

Cropping Season 1998
At DANAC, Venezuela and at CIAT Palmira the built-up of the populations PFR-1 and PFD-2 is ongoing as planed. The use of this germplasm for the recurrent selection project of DANAC was discussed with Eduardo Graterol.

8. RECURRENT SELECTION IN CUBA

Rene Perez Polanco, Marc CHÂTEL, and Jaime BORRERO

(Rene Perez polanco attended the first International course on recurrent selection held at CIAT in 1996).

The results reported here are from the 1996 and 1997 cropping seasons.
In 1996, the gene pool GPIRAT-10 and the population PCT-7 were introduced to Cuba and characterized for plant type, tillering, plant height, heading time, grain type and resistance to rice blast. GPIRAT-10 presented a better general adaptation. Nevertheless, PCT-7 is earlier witch is a characteristic of interest for the rice growing area in Cuba, mostly for the smallolders. By harvesting the male-sterile plants the two germplasms were recombined and seed increased.
In 1997, was performed the second recombination, and 17 and 18 So fertile plants were selected respectively for line development.

9. RECURRENT SELECTION IN THE SOUTHERN CONE

9.1. Recurrent Selection in Argentina

María Antonia MARASSI, Juan Eduardo MARASSI, Marc CHÂTEL, and Jaime BORRERO

In December 1996, we supplied the Universidad de Corrientes with the populations PCT-6\0\0\0, PCT-7\0\0\0, and PCT-8\0\0\0. They were sown at the experimental field of the Company "La Arrocera Argentina", Villaguay, State of Entre Rios. They were observed and characterized. The populations were multiplied by harvesting male-sterile plants. The resulting populations were identified as: PCT-6\0\0\1, PCT-7\0\0\1, and PCT-8\0\0\1.

Fertile plants showing potential were selected and harvested individually for line development. From the respective populations, 17, 14, and 34 S0 fertile plants were selected and given the following identification: PCT-6>Arg-1 to 17, PCT-7>Arg-1 to 14, and PCT-8>Arg-1 to 34.

For 1997 B, we plan to develop a specific population by crossing 6 varieties (IRGA 417, CYPRESS, R.P.2, TAIM, Don Juan INTA, and CH 4-7) with male-sterile plants of a selected population.

Argentina has a project for developing the Pampas Region, where climatic conditions are similar to those present in Chile, along the latitude with Chillan City, 400 km south of Santiago. The Universidad de la Plata has, consequently, expressed keen interest in our collaborative effort with Chile. The gene pool GPIRAT-10 and the population PQUI-1, together with Chilean and European lines, may be useful for the Pampas.

Cropping Season 1997/ 1998

Line development from the populations PCT-6, 7, and 8.

A total of 171 lines was selected, 65 from PCT-6, 30 from PCT-7 and 76 from PCT-8 respectively.

Recurrent population multiplication.

The 3 populations PCT-6, 7, and 8 were recombined and seed increased. The Chilean population PQUI-1 was shipped to Argentina to be evaluated in the temperate region of the "Pampas"in the province of Buenos Aires.

Development of new populations with local adaptation.

Population PARG-1. This germplasm is a new population with narrow genetic base, and corresponds to the mixture of the best male-sterile plants harvested in the selected progenies from fertile plants of the 3 populations PCT-6, 7, and 8. After some cycles of recombination it will be used as direct source of fertile plants fro line development.

Population PARG-2. This germplasm comes from the mixture of 50% of the population PCT-8\0\0\2 and 50% of PARG-1. The result corresponds to the introduction of oriented variability in the best introduced germplasm; PCT-8.

Population PARG-3. This germplasm will be set-up at CIAT by introduction of 50% of variability from 6 new lines, into the population PCT-8. This new population then will be the starting point or recurrent selection breeding in Argentina

At CIAT Palmira the built-up of the population ARG-3 is going on as planed.

9.2. Recurrent Selection in Chile

Santiago HERNAIZ, Roberto ALVARADO, Marc CHÂTEL, and Jaime BORRERO

In 1996, we sent Chile the Japonica gene pool GPIRAT-10, which was especially developed by CIRAD for temperate climates. That same year, Dr. Santiago Hernaiz from INIA-Quilamapú attended the International Course on Rice Recurrent Selection Breeding held at CIAT.

In 1997, the gene pool was grown for characterization and selection of the best fertile plants for line development. It was also used as a source of male sterility to build up a local population by crossing five Chilean lines (Qui. 67108, Diamante, Buli, CINIA 609, and CINIA 606) with male-sterile plants of the gene pool. Some of the hybrid seeds were sent to CIAT, Palmira, for growing the F1 generation (Chile has only one cropping season per year). The F2 seed was shipped back to Chile in September 1997. The basic Chilean population was named PQUI-1\0\0\0.

At CIAT, Palmira, during 1997 B, we will conduct the first cycle of recombination to ensure seed increase for future use. The first cycle of recombination was identified as PQUI-1\0\0\1.

Cropping Season 1997/1998

The Chilean population PQUI-1 was split in two parts. One sample was sown in Chillan and an other one in the northern part of the rice growing area where climatic conditions are different. The two populations identified as PQUI-1\0\0\1 and PQUI-1\Co\1\0 were sent to CIAT Palmira for completing the second cycle of recombination.

In October, 1998, the second cycle of recombination was shipped to Chile, but the seed transited through Miami and was incinerated by the plant protection service of the USA. Fortunately we have not shipped all the seed produced in Palmira.

Santiago Hernaiz took the right decision to sow the first cycle of recombination in order to go-on with his project. From our part we will use the remanent see of the second recombination to perform the third cycle during the first semester of 1999.

During my meeting (during the recurrent selection course in venezuela, in September), with Santiago we plan the use of recurrent selection breeding for cold temperature. The project will start I during the 1999/2000 cropping season in Chile.

9.3. Recurrent Selection in Uruguay

Fernando PÉREZ DE VIDA, Marc CHÂTEL, and Jàime BORRERO

In 1996, we sent to Uruguay the Japonica gene pool GPIRAT-10. That same year, Dr. Fernando Pérez de Vida from INIA-Treinta y Trés attended the International Course on Rice Recurrent Selection Breeding held at CIAT.

In 1997, the gene pool was grown for characterization and selection of the best fertile plants for line development. It was also used as a source of male sterility to build up a local population by crossing selected Uruguayan lines with male-sterile plants of GPIRAT-10.

Cropping Season 1998

During the 1997 cropping season, Fernando Perez de Vida crosses different lines with sterile plants from the GPIRAT-10 gene pool. The hybrid seed was shipped to CIAT Palmira to grow the F1.

Three (3) populations will be developped:

PURG-1 comes from the introduction of 17 lines with short grain quality into GPIRAT-10. The objective is to develop a local population for short grain quality, witch represents a new target export market for Uruguay.

PURG-2 comes from the introduction of 60 long grain lines into the gene pool GPIRAT-10.

The third population identified as PURG-3 , has a broad genetic base and is the result of the physical mixture of the two previous populations with male-sterile plants selected in the best progenies derived from the original gene pool GPIRAT-10.

9.4. Recurrent Selection by CIRAD, in Rio Grande do Sul, Brazil

James TAILLEBOIS and Marc CHÂTEL

(James TAILLEBOIS is the person that developed the first broad genetic base germplasm and initiated the use of recurrent selection, in the framework of a collaborative project on hybrid rice between CIRAD and EMBRAPA Arroz e Feijão, in Goiania, Brazil).

In 1997, we sent to the CIRAD/G4I collaborative project, the populations IRAT MANA and PCT-6 for evaluation in Pelotas, Rio Grande do Sul, Brazil.

Cropping season 1998

The two germplasms were evaluated under local condition.
- **IRAT MANA** is not adapted to the subtropical condition showing long growing cycle. His main quality of the genotypes present in this population is grain shape and quality (long slender and translucent grains). The segregation ratio between fertile and male-sterile plants was 50% for each genotype.
26 male-sterile plants were harvested to develop a narrow genetic base population identified as 00EP. During the next cropping season the will be recombined, and a new round of selection of male-fertile plants performed.

- **PCT-6** also presented a great number of genotypes showing late maturity. But about 20% of the genotypes presented a cycle inferior or equal to the local commercial variety BR-IRGA 417.
Direct use of this population for line development is possible.
39 male-sterile plants showing good earliness and adapted phenotypes were harvested to develop a new population identified as 00NP. During the next cropping season these genotypes will be recombined and crossed with A lines from the hybrid program, to evaluate the general combining ability (GCA) and restoration ability of the population.

James is interested in receiving the japonica upland population PCT-11 to start some studies on japonica hybrid rice .

10. MAINTAINING GERMPLASM BRED BY RECURRENT SELECTION

Because we manage the catalogue for rice germplasm bred by recurrent selection, we also have the responsibility to ensure the presence of sufficient seed in the germplasm bank. Because of the sufficient disposability of seed, no multiplication was done this year.

11. DISTRIBUTING LOWLAND-RICE GERMPLASM BRED BY RECURRENT SELECTION

Since 1995, we started to release recurrent selection populations and gene pools to NARS in Latin America and in countries of West Africa, Asia, and Europe

12. REGISTERING NEW POPULATIONS

In 1998, two CIRAD populations, developed for lowlands, by Dr. James Taillebois, for yield potential and grain quality were proposed for registration in the Recurrent Selection Catalogue managed by our project. The populations were built up in Brazil as part of the collaborative project between CIARD and G4I. They were registered as PCIRAD-23 and PCIRAD-24.

13. LINE DEVELOPMENT THROUGH ANTHER CULTURE

Zaida LENTINI, Marc CHÂTEL, James GIBBONS, and Yolima OSPINA

In 1994, we introduced the population IRAT-CT from French Guiana. This population comes from the enhancement of the Indica gene pool GPCNA-18 for anther culture response.

Cycles

One cycle of selection-recombination for anther culture response was previously made in Brazil at EMBRAPA Arroz e Feijão. This gave rise to the population identified as IRAT-CT. From 1995, the anther culture laboratory at CIAT processed the population IRAT-CT and R2 lines were developed.

Cropping Season 1997

The R2 lines were evaluated by FLAR at the Santa Rosa Experiment Station and five were selected.

Cropping Season 1998: The 5 lines selected by FLAR were evaluated.

14. RECURRENT SELECTION AND ANTHER CULTURE FOR CHILE

Santiago HERNAIZ, Marc CHATEL, Jaime BORRERO, and Adriana MORA

To fasten the development of fixed lines for Chile where only one cropping season is possible, we decided to process the two Chilean populations with two recurrent selection cycles through anther culture.
The populations will be sown in Palmira and plants processed at the CIAT laboratory.

We hope to ship the DH lines to Chile for sowing during the 1999/2000 cropping season.

15. CONVENTIONAL BREEDING AND ANTHER CULTURE FOR ROMANIA

George ALIONTE, Marc CHATEL, Jaime BORRERO, and Adriana MORA

In the framework of the collaboration CIRAD-CA rice project has with the Romanian institution FUNDULEA, two crosses , from Romania, designed for cold tolerance, grain quality, and yield potential are being processed by the CIAT anther culture laboratory. One hundred (100) double haploid (DH) lines by cross will be produced, observed and dispatched back to FUNDULEA. We will keep a sample of each DH line for seed increase. These lines will be sent to Chile, Argentina, and Uruguay. They can also be useful as parents for the hillside upland rice breeding project.

Cropping season 1998

Dr G. Alionte solicited our project for the processing by anther culture, two very promising Romanian crosses; OLTENITSA / RUBINO and CRISTAL / L 203. The work is going-on as planed. We hope to have about 100 DH lines from each cross. The DH lines will be shipped to Romania, and we will keep some seed for shipping to our partners in Chile and Argentina.

TABLES

Table 1. Soil analysis of the experimental site (Lote Loma 5) at " la libertad " Experimental Station, Colombia, 1998 cropping season.

No	Depth (cm)	O..M (%)	P Bray II (ppm)	pH	Al	Ca	Mg	K	C.I.E	B	Zn	Mn	Cu	Fe	Al Sat. (%)
					Meq./100 gr					ppm					
1	0-20	3.2	8.1	4.7	2.60	0.59	0.25	0.11	3.55	0.26	0.55	12.64	0.68	25.6	73.24
	20-40	2.4	1.6	4.7	2.60	0.29	0.11	0.06	3.06	0.24	0.28	9.19	0.66	14.0	84.97
2	0-20	3.7	8.3	4.8	2.39	0.52	0.22	0.12	3.25	0.31	0.48	10.20	0.45	18.6	73.54
	20-40	2.8	3.6	4.8	2.29	0.29	0.12	0.05	2.75	0.21	0.26	6.40	0.42	11.5	83.27

Table 2. Climatic characteristics of the 1998 cropping season at " La Libertad" Experimental Station, Colombia.

Characteristcs	April	May	June	July	Aug.	Sep.	Total
Rainfall (mm)	425.3	365.5	471.9	369.3	138.6	122.5	1893.1
Days of rain (No.)	17	18	21	27	19	19	121
Temperature (maximum °C)	31.4	30.0	28.6	29.0	30.4	31.0	30.1
Temperature (minimum °C)	23.2	22.6	21.9	21.6	21.6	21.6	22.1
Relative humidity (%)	84	85	86	87	84	82	85

Table 3. Evaluation of S2 lines from the populations PCT-4\PHB\1\1,PHB\1; PCT-5\PHB\1\0,PHB\1 and PCT-A\PHB\1\0,PHB\1. La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S820001	1	PCT-4\PHB\1\1,PHB\1>46-M	5	4	3	82	1	1	1	1
2	S820002	2	PCT-4\PHB\1\1,PHB\1>120-M	7	2	3	71	1	1	1	1
3	S820003	3	PCT-4\PHB\1\1,PHB\1>330-M	7	2	2	65	1	1	1	1
4	S820004	4	PCT-4\PHB\1\1,PHB\1>336-M	7	3	3	70	1	1	3	1
5	S820005	5	PCT-4\PHB\1\1,PHB\1>384-M	7	3	2	86	1	1	1	1
6	S820006	6	PCT-4\PHB\1\1,PHB\1>412-M	5	3	3	74	1	1	3	3
7	S820007	7	PCT-4\PHB\1\1,PHB\1>491-M	5	4	4	82	1	1	1	3
8	S820008	8	PCT-4\PHB\1\1,PHB\1>566-M	5	3	2	71	3	3	1	1
9	S820009	9	PCT-4\PHB\1\1,PHB\1>616-M	5	2	3	71	3	3	1	1
10	S820010	10	PCT-4\PHB\1\1,PHB\1>649-M	3	2	2	79	3	3	1	1
11	S820011	11	PCT-4\PHB\1\1,PHB\1>682-M	9	1	2	84	1	3	3	1
12	S820012	12	PCT-4\PHB\1\1,PHB\1>762-M	7	2	1	81	1	3	1	1
13	S820013	13	PCT-4\PHB\1\1,PHB\1>828-M	7	1	2	74	1	1	1	1
14	S820014	14	PCT-4\PHB\1\1,PHB\1>897-M	7	2	3	92	1	1	1	1
15	S820015	15	PCT-4\PHB\1\1,PHB\1>900-M	7	1	2	85	1	1	1	1
16	S820016	16	PCT-4\PHB\1\1,PHB\1>968-M	5	1	2	77	1	3	3	1
17	S820017	17	PCT-4\PHB\1\1,PHB\1>1035-M	5	2	2	93	3	3	1	1
18	S820018	18	PCT-4\PHB\1\1,PHB\1>1039-M	5	4	3	77	1	3	1	1
19	S820019	19	PCT-4\PHB\1\1,PHB\1>1176-M	7	2	2	82	1	3	1	1
20	S820020	20	PCT-4\PHB\1\1,PHB\1>1213-M	7	3	2	84	1	1	1	1
21	S820021	21	PCT-4\PHB\1\1,PHB\1>1232-M	5	2	2	75	1	3	1	1
22	S820022	22	PCT-4\PHB\1\1,PHB\1>1244-M	5	2	2	74	3	1	1	3
23	S820023	23	PCT-4\PHB\1\1,PHB\1>1262-M	9	3	2	86	1	1	1	1
24	S820024	24	PCT-4\PHB\1\1,PHB\1>1295-M	7	3	3	83	1	1	1	1
25	S820025	25	PCT-4\PHB\1\1,PHB\1>1388-M	5	3	2	77	3	3	1	1
26	S820026	26	PCT-4\PHB\1\1,PHB\1>1400-M	7	2	2	82	3	3	3	1
27	S820027	27	PCT-4\PHB\1\1,PHB\1>1484-M	7	5	5	70	1	1	1	1
28	S820028	28	PCT-4\PHB\1\1,PHB\1>1534-M	3	2	2	67	3	1	1	3
29	S820029	29	PCT-4\PHB\1\1,PHB\1>1537-M	5	1	1	71	1	1	3	1
30	S820030	30	PCT-4\PHB\1\1,PHB\1>1583-M	5	2	3	82	1	1	1	3
31	S820031	31	PCT-4\PHB\1\1,PHB\1>1595-M	3	3	3	74	1	1	1	1
32	S820032	32	PCT-4\PHB\1\1,PHB\1>1607-M	5	2	2	81	1	1	1	1
33	S820033	33	PCT-4\PHB\1\1,PHB\1>1621-M	3	2	2	89	3	3	3	1
34	S820034	34	PCT-4\PHB\1\1,PHB\1>1733-M	5	3	2	67	3	1	1	3
35	S820035	35	PCT-4\PHB\1\1,PHB\1>1737-M	7	5	5	74	1	1	1	1
36	S820036	36	PCT-4\PHB\1\1,PHB\1>1760-M	7	3	3	82	3	3	5	1
37	S820037	37	PCT-4\PHB\1\1,PHB\1>1774-M	5	3	3	87	3	3	1	1
38	S820038	38	PCT-4\PHB\1\1,PHB\1>1776-M	7	2	2	76	3	1	1	1
39	S820039	39	PCT-4\PHB\1\1,PHB\1>1868-M	5	3	2	77	3	3	5	1
40	S820040	40	PCT-4\PHB\1\1,PHB\1>1875-M	5	2	2	82	3	3	1	1
41	S820041	41	PCT-4\PHB\1\1,PHB\1>1970-M	7	1	2	77	3	3	1	3
42	S820042	42	PCT-5\PHB\1\0,PHB\1>175-M	5	3	3	89	3	1	1	1
43	S820043	43	PCT-5\PHB\1\0,PHB\1>201-M	3	4	3	85	3	3	3	1
44	S820044	44	PCT-5\PHB\1\0,PHB\1>569-M	7	3	3	78	3	1	5	1
45	S820045	45	PCT-5\PHB\1\0,PHB\1>798-M	5	3	3	72	1	1	1	1
46	S820046	46	PCT-5\PHB\1\0,PHB\1>1014-M	5	2	1	73	1	1	3	1
47	S820047	47	PCT-5\PHB\1\0,PHB\1>1086-M	7	3	4	85	1	3	3	1
48	S820048	48	PCT-5\PHB\1\0,PHB\1>1125-M	5	4	4	81	3	1	3	1
49	S820049	49	PCT-5\PHB\1\0,PHB\1>1128-M	5	4	4	77	3	1	5	1
50	S820050	50	PCT-5\PHB\1\0,PHB\1>1150-M	7	1	2	84	3	1	3	1

51	S820051	51	PCT-5\PHB\1\0,PHB\1>1162-M	5	2	2	70	5	1	3	1
52	S820052	52	PCT-5\PHB\1\0,PHB\1>1437-M	5	3	3	74	5	1	3	1
53	S820053	53	PCT-5\PHB\1\0,PHB\1>1694-M	3	4	4	88	3	1	1	1
54	S820054	54	PCT-5\PHB\1\0,PHB\1>1996-M	5	3	2	78	5	1	5	3
55	S820055	55	PCT-A\PHB\1\0,PHB\1>53-M	5	3	3	75	3	1	3	1
56	S820056	56	PCT-A\PHB\1\0,PHB\1>330-M	5	3	2	85	5	1	3	3
57	S820057	57	PCT-A\PHB\1\0,PHB\1>368-M	5	1	1	80	3	1	1	1
58	S820058	58	PCT-A\PHB\1\0,PHB\1>478-M	5	3	2	83	3	1	1	1
59	S820059	59	PCT-A\PHB\1\0,PHB\1>654-M	7	3	3	69	3	1	1	1
60	S820060	60	PCT-A\PHB\1\0,PHB\1>811-M	7	1	1	77	5	1	3	1
61	S820061	61	PCT-A\PHB\1\0,PHB\1>817-M	5	2	2	68	3	1	1	3
62	S820062	62	PCT-A\PHB\1\0,PHB\1>853-M	7	2	2	70	3	1	3	1
63	S820063	63	PCT-A\PHB\1\0,PHB\1>988-M	5	3	3	79	3	1	1	1
64	S820064	64	PCT-A\PHB\1\0,PHB\1>1398-M	3	2	2	74	5	1	3	3
65	S820065	65	PCT-A\PHB\1\0,PHB\1>1515-M	5	2	2	80	3	1	1	1
66	S820066	66	PCT-A\PHB\1\0,PHB\1>1768-M	5	3	2	76	3	1	3	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot; NBl = neck blast; Gd = grain discoloration.

Table 4. S2 lines selected in the populations PCT-4\PHB\1\1,PHB\1; PCT-5\PHB\1\0,PHB\1; and PCT-A\PHB\1\0,PHB\1 La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S820001	1	PCT-4\PHB\1\1,PHB\1>46-M	5	4	3	82	1	1	1	1
2	S820002	2	PCT-4\PHB\1\1,PHB\1>120-M	7	2	3	71	1	1	1	1
3	S820003	3	PCT-4\PHB\1\1,PHB\1>330-M	7	2	2	65	1	1	1	1
4	S820028	28	PCT-4\PHB\1\1,PHB\1>1534-M	3	2	2	67	3	1	1	3
5	S820029	29	PCT-4\PHB\1\1,PHB\1>1537-M	5	1	1	71	1	1	3	1
6	S820038	38	PCT-4\PHB\1\1,PHB\1>1776-M	7	2	2	76	3	1	1	1
7	S820052	52	PCT-5\PHB\1\0,PHB\1>1437-M	5	3	3	74	5	1	3	1
8	S820062	62	PCT-A\PHB\1\0,PHB\1>853-M	7	2	2	70	3	1	3	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot; NBl = neck blast; Gd = grain discoloration.

Table 5. S2 line evaluation of the population PCT-4\SA\1\1 (Augmented Designs of Federer)
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Ht	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	890001	1	PCT-4\SA\1\1>33-M	7	105	3	3	81	3	1	1	1
2	890002	2	PCT-4\SA\1\1>45-M	7	104	3	3	79	3	1	1	1
3	890003	3	PCT-4\SA\1\1>95-M	7	100	2	2	70	3	1	1	1
4	890004	4	PCT-4\SA\1\1>109-M	7	104	2	2	71	3	1	1	1
5	890005	5	PCT-4\SA\1\1>115-M	7	96	3	2	75	3	1	1	1
6	890006	6	PCT-4\SA\1\1>126-M	7	99	1	1	70	3	1	1	1
7	890007	7	PCT-4\SA\1\1>147-M	7	100	1	1	71	3	1	1	1
8	890008	8	PCT-4\SA\1\1>150-M	7	97	1	1	75	3	1	1	1
	890009	9	O.S.6	5	92	3	3	88	3	3	3	1
9	890010	10	PCT-4\SA\1\1>153-M	5	103	1	2	87	3	1	1	1
10	890011	11	PCT-4\SA\1\1>162-M	5	116	1	2	87	3	1	1	1
11	890012	12	PCT-4\SA\1\1>171-M	5	115	1	2	86	3	1	1	1
12	890013	13	PCT-4\SA\1\1>179-M	3	116	1	3	87	3	1	1	1
13	890014	14	PCT-4\SA\1\1>188-M	3	104	1	2	86	3	1	1	1
14	890015	15	PCT-4\SA\1\1>193-M	3	118	1	2	84	5	1	1	1
	890016	16	O.S.10	5	111	3	3	91	5	1	1	1
15	890017	17	PCT-4\SA\1\1>195-M	7	88	1	1	82	3	1	1	1
	890018	18	C 409	5	98	1	1	71	3	3	1	1
16	890019	19	PCT-4\SA\1\1>223-M	5	105	1	1	81	3	1	1	1
17	890020	20	PCT-4\SA\1\1>230-M	5	93	1	1	83	3	1	1	1
18	890021	21	PCT-4\SA\1\1>236-M	5	96	1	1	83	3	1	1	1
19	890022	22	PCT-4\SA\1\1>241-M	5	98	1	2	81	3	1	1	1
20	890023	23	PCT-4\SA\1\1>249-M	5	88	1	1	82	3	1	1	1
21	890024	24	PCT-4\SA\1\1>252-M	7	98	2	3	70	3	1	1	1
	890025	25	C 409	7	97	1	1	77	1	1	1	1
22	890026	26	PCT-4\SA\1\1>260-M	7	104	2	3	73	1	1	1	1
23	890027	27	PCT-4\SA\1\1>261-M	7	102	2	3	71	1	1	1	1
24	890028	28	PCT-4\SA\1\1>279-M	7	106	1	2	71	1	1	1	1
25	890029	29	PCT-4\SA\1\1>305-M	7	108	1	3	74	1	1	1	1
26	890030	30	PCT-4\SA\1\1>306-M	7	108	1	3	70	3	1	1	1
27	890031	31	PCT-4\SA\1\1>311-M	5	106	2	4	75	3	1	1	1
28	890032	32	PCT-4\SA\1\1>312-M	5	87	1	3	65	3	1	1	1
29	890033	33	PCT-4\SA\1\1>322-M	7	86	1	3	70	3	1	1	1
30	890034	34	PCT-4\SA\1\1>341-M	7	93	1	4	67	3	1	1	1
31	890035	35	PCT-4\SA\1\1>379-M	5	90	1	3	63	3	1	1	1
32	890036	36	PCT-4\SA\1\1>390-M	5	88	1	3	65	3	1	1	1
33	890037	37	PCT-4\SA\1\1>402-M	5	88	1	3	85	3	1	1	1
34	890038	38	PCT-4\SA\1\1>428-M	5	102	1	3	83	3	1	1	1
35	890039	39	PCT-4\SA\1\1>437-M	5	96	1	3	82	3	3	1	1
	890040	40	O.S.10	5	106	2	3	93	5	3	1	1
36	890041	41	PCT-4\SA\1\1>440-M	5	92	1	3	66	3	3	1	1
37	890042	42	PCT-4\SA\1\1>442-M	5	90	2	3	65	3	3	1	3
	890043	43	O.S.6	5	114	4	4	87	3	1	1	1
38	890044	44	PCT-4\SA\1\1>444-M	7	96	3	4	77	3	3	1	1
39	890045	45	PCT-4\SA\1\1>446-M	7	99	1	3	70	3	1	1	1
40	890046	46	PCT-4\SA\1\1>500-M	7	101	1	3	68	3	1	3	1
41	890047	47	PCT-4\SA\1\1>503-M	5	94	1	2	68	3	1	1	1

42	890048	48	PCT-4\SA\1\1>516-M	5	94	2	2	71	3	1	1	1
43	890049	49	PCT-4\SA\1\1>540-M	5	92	2	2	68	3	1	1	1
44	890050	50	PCT-4\SA\1\1>542-M	5	86	1	2	66	3	1	1	1
45	890051	51	PCT-4\SA\1\1>571-M	5	87	1	2	71	3	3	1	1
	890052	52	O.S.6	5	107	3	4	86	3	1	1	1
46	890053	53	PCT-4\SA\1\1>573-M	5	84	1	2	70	3	1	1	1
47	890054	54	PCT-4\SA\1\1>592-M	5	89	1	2	70	3	1	1	1
48	890055	55	PCT-4\SA\1\1>594-M	5	102	2	2	75	3	1	3	1
49	890056	56	PCT-4\SA\1\1>595-M	5	93	2	2	68	3	1	1	1
	890057	57	O.S.10	3	105	3	3	89	3	3	1	1
50	890058	58	PCT-4\SA\1\1>631-M	3	102	1	2	74	3	1	1	1
	890059	59	C 409	5	99	1	1	70	3	1	1	1
51	890060	60	PCT-4\SA\1\1>632-M	5	104	2	2	75	5	1	1	1
52	890061	61	PCT-4\SA\1\1>659-M	5	100	2	4	75	5	1	1	1
53	890062	62	PCT-4\SA\1\1>669-M	5	96	2	3	75	5	1	1	1
54	890063	63	PCT-4\SA\1\1>674-M	5	99	3	3	70	5	1	1	1
55	890064	64	PCT-4\SA\1\1>701-M	5	93	1	2	75	5	1	1	1
56	890065	65	PCT-4\SA\1\1>721-M	7	94	4	5	75	3	1	1	1
57	890066	66	PCT-4\SA\1\1>722-M	7	85	4	4	71	3	1	1	1
58	890067	67	PCT-4\SA\1\1>723-M	7	85	4	4	68	3	1	1	3
59	890068	68	PCT-4\SA\1\1>763-M	7	84	3	3	71	1	1	1	1
60	890069	69	PCT-4\SA\1\1>781-M	7	86	2	2	75	1	1	1	1
61	890070	70	PCT-4\SA\1\1>783-M	7	79	3	3	66	1	1	1	3
	890071	71	O.S.6	5	112	4	4	86	5	3	3	1
62	890072	72	PCT-4\SA\1\1>813-M	7	89	1	2	73	1	1	1	1
63	890073	73	PCT-4\SA\1\1>881-M	3	93	1	1	71	3	1	3	1
	890074	74	O.S.10	3	103	2	3	89	5	3	1	1
64	890075	75	PCT-4\SA\1\1>895-M	3	103	1	1	74	3	1	1	1
65	890076	76	PCT-4\SA\1\1>910-M	3	101	2	3	75	3	1	1	1
66	890077	77	PCT-4\SA\1\1>911-M	3	98	1	1	70	3	1	1	1
67	890078	78	PCT-4\SA\1\1>948-M	5	105	1	1	74	3	1	1	1
	890079	79	C 409	5	96	1	1	70	5	1	1	1
68	890080	80	PCT-4\SA\1\1>954-M	5	96	2	3	70	3	1	1	1
69	890081	81	PCT-4\SA\1\1>957-M	5	90	2	2	75	3	1	1	1
70	890082	82	PCT-4\SA\1\1>975-M	5	95	2	2	71	3	1	1	1
71	890083	83	PCT-4\SA\1\1>982-M	5	96	1	3	73	3	1	1	1
72	890084	84	PCT-4\SA\1\1>1013-M	5	86	1	2	79	3	1	1	1
73	890085	85	PCT-4\SA\1\1>1019-M	5	84	1	3	75	3	1	1	1
74	890086	86	PCT-4\SA\1\1>1034-M	5	94	1	3	70	3	1	1	1
75	890087	87	PCT-4\SA\1\1>1036-M	5	102	1	3	75	3	1	1	1
76	890088	88	PCT-4\SA\1\1>1044-M	5	96	3	3	78	3	1	1	1
77	890089	89	PCT-4\SA\1\1>1047-M	5	97	3	4	79	5	1	1	1
78	890090	90	PCT-4\SA\1\1>1048-M	5	96	2	3	82	3	1	1	1
79	890091	91	PCT-4\SA\1\1>1108-M	3	100	2	2	75	3	1	1	1
80	890092	92	PCT-4\SA\1\1>1116-M	5	95	2	2	79	3	1	1	1
81	890093	93	PCT-4\SA\1\1>1127-M	5	91	1	1	75	3	1	1	1
82	890094	94	PCT-4\SA\1\1>1128-M	3	101	2	3	66	5	1	5	1
83	890095	95	PCT-4\SA\1\1>1135-M	3	106	3	3	71	5	1	5	1
	890096	96	O.S.6	3	95	4	4	88	5	3	3	1
84	890097	97	PCT-4\SA\1\1>1138-M	5	89	1	1	71	5	1	1	1
85	890098	98	PCT-4\SA\1\1>1145-M	5	84	2	3	69	5	1	1	1
86	890099	99	PCT-4\SA\1\1>1155-M	5	88	1	2	74	5	1	5	1

	890100	100	O.S.10	3	94	2	3	94	5	3	3	1
87	890101	101	PCT-4\SA\1\1>1156-M	5	92	2	2	68	5	1	1	1
	890102	102	C 409	5	96	2	2	76	5	1	1	1
88	890103	103	PCT-4\SA\1\1>1199-M	5	96	1	2	71	5	1	1	1
89	890104	104	PCT-4\SA\1\1>1201-M	5	95	1	3	71	5	1	1	1
90	890105	105	PCT-4\SA\1\1>1206-M	7	95	1	2	70	3	1	1	1
91	890106	106	PCT-4\SA\1\1>1231-M	7	98	1	2	77	3	1	1	1
92	890107	107	PCT-4\SA\1\1>1236-M	7	95	1	2	71	3	1	1	1
93	890108	108	PCT-4\SA\1\1>1241-M	7	94	3	3	71	3	1	1	1
94	890109	109	PCT-4\SA\1\1>1259-M	7	92	2	2	71	3	1	1	1
95	890110	110	PCT-4\SA\1\1>1260-M	7	89	2	3	67	3	1	1	1
96	890111	111	PCT-4\SA\1\1>1270-M	7	93	2	4	70	3	1	1	1
97	890112	112	PCT-4\SA\1\1>1272-M	7	92	1	1	71	3	1	1	1
98	890113	113	PCT-4\SA\1\1>1293-M	7	97	1	1	77	3	3	1	1
99	890114	114	PCT-4\SA\1\1>1302-M	7	96	1	1	75	3	3	1	1
100	890115	115	PCT-4\SA\1\1>1320-M	7	97	1	1	73	3	1	1	1
101	890116	116	PCT-4\SA\1\1>1337-M	7	95	1	1	77	3	3	1	1
102	890117	117	PCT-4\SA\1\1>1344-M	5	96	1	2	75	3	3	1	1
	890118	118	O.S.6	3	95	4	4	88	5	3	3	1
103	890119	119	PCT-4\SA\1\1>1358-M	7	95	2	1	76	3	1	1	1
104	890120	120	PCT-4\SA\1\1>1376-M	7	96	2	1	74	3	3	1	1
105	890121	121	PCT-4\SA\1\1>1377-M	5	78	3	3	85	3	1	1	1
106	890122	122	PCT-4\SA\1\1>1389-M	5	86	4	4	84	3	1	1	1
107	890123	123	PCT-4\SA\1\1>1392-M	5	85	4	4	73	3	1	1	1
108	890124	124	PCT-4\SA\1\1>1414-M	5	89	4	4	70	3	1	1	3
109	890125	125	PCT-4\SA\1\1>1443-M	5	84	4	4	84	3	1	1	3
110	890126	126	PCT-4\SA\1\1>1472-M	5	89	4	5	88	3	1	1	3
	890127	127	O.S.10	5	98	3	4	91	5	3	3	1
11	890128	128	PCT-4\SA\1\1>1475-M	5	102	2	2	75	5	1	1	1
112	890129	129	PCT-4\SA\1\1>1479-M	3	90	2	2	73	3	1	1	1
	890130	130	C 409	3	93	2	1	71	3	1	1	1
113	890131	131	PCT-4\SA\1\1>1486-M	3	102	2	2	74	3	1	1	1
114	890132	132	PCT-4\SA\1\1>1512-M	5	102	4	3	75	3	1	1	1
115	890133	133	PCT-4\SA\1\1>1538-M	5	77	4	4	81	3	1	1	3
116	890134	134	PCT-4\SA\1\1>1549-M	7	92	2	2	76	3	1	1	1
117	890135	135	PCT-4\SA\1\1>1559-M	7	99	2	2	71	5	1	1	1
118	890136	136	PCT-4\SA\1\1>1566-M	5	98	2	2	74	5	1	1	1
119	890137	137	PCT-4\SA\1\1>1576-M	5	98	2	2	74	3	1	1	1
	890138	138	O.S.6	3	93	4	4	87	5	3	3	1
120	890139	139	PCT-4\SA\1\1>1584-M	5	106	2	3	72	5	1	1	1
121	890140	140	PCT-4\SA\1\1>1632-M	7	100	1	2	74	3	3	1	1
122	890141	141	PCT-4\SA\1\1>1642-M	5	96	2	2	71	3	1	1	1
	890142	142	O.S.10	3	95	3	4	86	5	3	1	1
123	890143	143	PCT-4\SA\1\1>1666-M	5	88	1	2	71	3	1	1	1
124	890144	144	PCT-4\SA\1\1>1667-M	5	92	2	2	71	3	1	1	1
125	890145	145	PCT-4\SA\1\1>1689-M	5	89	2	2	71	3	1	1	1
126	890146	146	PCT-4\SA\1\1>1691-M	5	86	3	3	75	3	1	1	1
127	890147	147	PCT-4\SA\1\1>1701-M	5	93	2	2	71	3	1	1	1
128	890148	148	PCT-4\SA\1\1>1702-M	5	91	2	2	72	3	1	1	1
129	890149	149	PCT-4\SA\1\1>1709-M	7	103	2	1	63	3	1	1	3
130	890150	150	PCT-4\SA\1\1>1731-M	5	102	2	1	62	3	1	1	3
131	890151	151	PCT-4\SA\1\1>1732-M	7	102	2	1	62	3	1	1	3

132	890152	152	PCT-4\SA\1\1>1740-M	7	100	2	1	63	3	1	1	3
133	890153	153	PCT-4\SA\1\1>1776-M	7	104	2	1	62	3	1	1	3
	890154	154	C 409	7	100	2	1	75	5	1	1	1
134	890155	155	PCT-4\SA\1\1>1792-M	7	100	2	1	62	3	1	1	3
135	890156	156	PCT-4\SA\1\1>1802-M	7	100	2	1	70	3	1	1	1
136	890157	157	PCT-4\SA\1\1>1837-M	7	104	2	1	71	3	1	1	1
137	890158	158	PCT-4\SA\1\1>1843-M	7	102	2	1	70	3	3	1	1
138	890159	159	PCT-4\SA\1\1>1856-M	7	92	2	2	71	3	3	1	1
	890160	160	O.S.6	5	96	5	4	88	3	1	1	1
139	890161	161	PCT-4\SA\1\1>1861-M	5	88	2	1	70	5	3	1	1
140	890162	162	PCT-4\SA\1\1>1875-M	5	86	2	1	68	5	3	1	1
	890163	163	O.S.10	5	99	2	2	93	5	3	1	1
141	890164	164	PCT-4\SA\1\1>1878-M	5	98	1	1	74	5	1	1	1
142	890165	165	PCT-4\SA\1\1>1880-M	5	100	1	2	71	5	1	1	1
143	890166	166	PCT-4\SA\1\1>1881-M	5	99	1	1	74	3	1	1	1
144	890167	167	PCT-4\SA\1\1>1896-M	5	102	2	2	74	3	1	1	1
145	890168	168	PCT-4\SA\1\1>1915-M	5	110	2	1	75	5	1	1	1
146	890169	169	PCT-4\SA\1\1>1917-M	7	104	2	1	82	3	1	1	1
147	890170	170	PCT-4\SA\1\1>1919-M	7	87	1	2	73	3	1	1	1
	890171	171	C 409	5	96	2	1	71	3	1	1	1
148	890172	172	PCT-4\SA\1\1>1921-M	7	90	2	2	75	3	3	1	1
149	890173	173	PCT-4\SA\1\1>1925-M	7	89	2	1	75	3	1	1	1
150	890174	174	PCT-4\SA\1\1>1928-M	7	88	1	2	71	3	1	1	1
151	890175	175	PCT-4\SA\1\1>1947-M	7	93	2	2	75	3	1	1	1
152	890176	176	PCT-4\SA\1\1>1948-M	7	87	4	3	71	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration; Ht = plant height.

Table 6. S2 lines from the population PCT-4\SA\1\1, selected in the evaluation trial (Augmented Design of Federer)
La Libertad experimental station, 1998A

Nbr..	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Ht	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	890002	2	PCT-4\SA\1\1>45-M	7	104	3	3	79	3	1	1	1
2	890003	3	PCT-4\SA\1\1>95-M	7	100	2	2	70	3	1	1	1
3	890004	4	PCT-4\SA\1\1>109-M	7	104	2	2	71	3	1	1	1
4	890006	6	PCT-4\SA\1\1>126-M	7	99	1	1	70	3	1	1	1
5	890007	7	PCT-4\SA\1\1>147-M	7	100	1	1	71	3	1	1	1
6	890008	8	PCT-4\SA\1\1>150-M	7	97	1	1	75	3	1	1	1
7	890011	11	PCT-4\SA\1\1>162-M	5	116	1	2	87	3	1	1	1
8	890014	14	PCT-4\SA\1\1>188-M	3	104	1	2	86	3	1	1	1
9	890015	15	PCT-4\SA\1\1>193-M	3	118	1	2	84	5	1	1	1
10	890017	17	PCT-4\SA\1\1>195-M	7	88	1	1	82	3	1	1	1
11	890019	19	PCT-4\SA\1\1>223-M	5	105	1	1	81	3	1	1	1
12	890020	20	PCT-4\SA\1\1>230-M	5	93	1	1	83	3	1	1	1
13	890021	21	PCT-4\SA\1\1>236-M	5	96	1	1	83	3	1	1	1
14	890026	26	PCT-4\SA\1\1>260-M	7	104	2	3	73	1	1	1	1
15	890027	27	PCT-4\SA\1\1>261-M	7	102	2	3	71	1	1	1	1
16	890028	28	PCT-4\SA\1\1>279-M	7	106	1	2	71	1	1	1	1
17	890029	29	PCT-4\SA\1\1>305-M	7	108	1	3	74	1	1	1	1
18	890030	30	PCT-4\SA\1\1>306-M	7	108	1	3	70	3	1	1	1
19	890034	34	PCT-4\SA\1\1>341-M	7	93	1	4	67	3	1	1	1
20	890041	41	PCT-4\SA\1\1>440-M	5	92	1	3	66	3	3	1	1
21	890045	45	PCT-4\SA\1\1>446-M	7	99	1	3	70	3	1	1	1
22	890046	46	PCT-4\SA\1\1>500-M	7	101	1	3	68	3	1	3	1
23	890047	47	PCT-4\SA\1\1>503-M	5	94	1	2	68	3	1	1	1
24	890048	48	PCT-4\SA\1\1>516-M	5	94	2	2	71	3	1	1	1
25	890049	49	PCT-4\SA\1\1>540-M	5	92	2	2	68	3	1	1	1
26	890053	53	PCT-4\SA\1\1>573-M	5	84	1	2	70	3	1	1	1
27	890058	58	PCT-4\SA\1\1>631-M	3	102	1	2	74	3	1	1	1
28	890060	60	PCT-4\SA\1\1>632-M	5	104	2	2	75	5	1	1	1
29	890062	62	PCT-4\SA\1\1>669-M	5	96	2	3	75	5	1	1	1
30	890065	65	PCT-4\SA\1\1>721-M	7	94	4	5	75	3	1	1	1
31	890066	66	PCT-4\SA\1\1>722-M	7	85	4	4	71	3	1	1	1
32	890068	68	PCT-4\SA\1\1>763-M	7	84	3	3	71	1	1	1	1
33	890072	72	PCT-4\SA\1\1>813-M	7	89	1	2	73	1	1	1	1
34	890073	73	PCT-4\SA\1\1>881-M	3	93	1	1	71	3	1	3	1
35	890075	75	PCT-4\SA\1\1>895-M	3	103	1	1	74	3	1	1	1
36	890076	76	PCT-4\SA\1\1>910-M	3	101	2	3	75	3	1	1	1
37	890078	78	PCT-4\SA\1\1>948-M	5	105	1	1	74	3	1	1	1
38	890082	82	PCT-4\SA\1\1>975-M	5	95	2	2	71	3	1	1	1
39	890083	83	PCT-4\SA\1\1>982-M	5	96	1	3	73	3	1	1	1
40	890084	84	PCT-4\SA\1\1>1013-M	5	86	1	2	79	3	1	1	1
41	890087	87	PCT-4\SA\1\1>1036-M	5	102	1	3	75	3	1	1	1
42	890088	88	PCT-4\SA\1\1>1044-M	5	96	3	3	78	3	1	1	1
43	890091	91	PCT-4\SA\1\1>1108-M	3	100	2	2	75	3	1	1	1
44	890092	92	PCT-4\SA\1\1>1116-M	5	95	2	2	79	3	1	1	1
45	890093	93	PCT-4\SA\1\1>1127-M	5	91	1	1	75	3	1	1	1
46	890101	101	PCT-4\SA\1\1>1156-M	5	92	2	2	68	5	1	1	1
47	890103	103	PCT-4\SA\1\1>1199-M	5	96	1	2	71	5	1	1	1
48	890105	105	PCT-4\SA\1\1>1206-M	7	95	1	2	70	3	1	1	1
49	890107	107	PCT-4\SA\1\1>1236-M	7	95	1	2	71	3	1	1	1
50	890108	108	PCT-4\SA\1\1>1241-M	7	94	3	3	71	3	1	1	1

51	890110	110	PCT-4\SA\1\1>1260-M	7	89	2	3	67	3	1	1	1
52	890111	111	PCT-4\SA\1\1>1270-M	7	93	2	4	70	3	1	1	1
53	890112	112	PCT-4\SA\1\1>1272-M	7	92	1	1	71	3	1	1	1
54	890128	128	PCT-4\SA\1\1>1475-M	5	102	2	2	75	5	1	1	1
55	890129	129	PCT-4\SA\1\1>1479-M	3	90	2	2	73	3	1	1	1
56	890131	131	PCT-4\SA\1\1>1486-M	3	102	2	2	74	3	1	1	1
57	890134	134	PCT-4\SA\1\1>1549-M	7	92	2	2	76	3	1	1	1
58	890136	136	PCT-4\SA\1\1>1566-M	5	98	2	2	74	5	1	1	1
59	890137	137	PCT-4\SA\1\1>1576-M	5	98	2	2	74	3	1	1	1
60	890140	140	PCT-4\SA\1\1>1632-M	7	100	1	2	74	3	3	1	1
61	890145	145	PCT-4\SA\1\1>1689-M	5	89	2	2	71	3	1	1	1
62	890148	148	PCT-4\SA\1\1>1702-M	5	91	2	2	72	3	1	1	1
63	890157	157	PCT-4\SA\1\1>1837-M	7	104	2	1	71	3	1	1	1
64	890164	164	PCT-4\SA\1\1>1878-M	5	98	1	1	74	5	1	1	1
65	890174	174	PCT-4\SA\1\1>1928-M	7	88	1	2	71	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot; NBl = neck blast; Gd = grain discoloration; Ht = plant height.

Table 7. S4 line evaluation of the populations PCT-5\PHB\1\0; PCT-A\PHB\1\0; and PCT-4\PHB\1\1
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S840001	1	PCT-5\PHB\1\0>1165-M-1-M	5	5	5	78	3	1	1	3
2	S840002	2	PCT-5\PHB\1\0>1165-M-2-M	7	4	5	79	1	1	1	1
3	S840003	3	PCT-5\PHB\1\0>1165-M-3-M	7	3	2	67	1	1	3	1
4	S840004	4	PCT-5\PHB\1\0>1165-M-4-M	3	4	3	79	1	1	1	1
5	S840005	5	PCT-5\PHB\1\0>1165-M-5-M	5	2	2	82	1	1	1	1
6	S840006	6	PCT-5\PHB\1\0>1165-M-6-M	7	3	5	80	1	1	1	1
7	S840007	7	PCT-A\PHB\1\0>161-M-1-M	7	2	3	67	1	1	3	1
8	S840008	8	PCT-A\PHB\1\0>161-M-2-M	7	5	5	71	1	1	1	1
9	S840009	9	PCT-A\PHB\1\0>161-M-3-M	5	5	5	75	1	1	1	1
10	S840010	10	PCT-A\PHB\1\0>161-M-4-M	3	3	4	75	1	1	1	1
11	S840011	11	PCT-A\PHB\1\0>161-M-5-M	7	3	3	82	1	1	1	1
12	S840012	12	PCT-A\PHB\1\0>161-M-6-M	7	4	4	77	3	1	1	1
13	S840013	13	PCT-A\PHB\1\0>1443-M-1-M	5	3	3	69	3	1	1	1
14	S840014	14	PCT-A\PHB\1\0>1443-M-2-M	5	3	3	79	3	1	3	1
15	S840015	15	PCT-A\PHB\1\0>1443-M-3-M	5	2	2	68	3	1	1	1
16	S840016	16	PCT-A\PHB\1\0>1443-M-4-M	5	3	3	77	5	1	1	5
17	S840017	17	PCT-A\PHB\1\0>1443-M-5-M	7	1	1	76	3	1	1	1
18	S840018	18	PCT-A\PHB\1\0>1443-M-6-M	5	1	3	80	3	1	3	1
19	S840019	19	PCT-4\PHB\1\1>145-M-1-M	5	1	1	75	3	1	3	1
20	S840020	20	PCT-4\PHB\1\1>145-M-2-M	7	4	4	79	1	1	1	3
21	S840021	21	PCT-4\PHB\1\1>145-M-3-M	5	5	5	70	3	3	1	1
22	S840022	22	PCT-4\PHB\1\1>145-M-4-M	5	5	5	79	1	1	1	1
23	S840023	23	PCT-4\PHB\1\1>145-M-5-M	7	3	3	70	1	1	1	1
24	S840024	24	PCT-4\PHB\1\1>145-M-6-M	5	3	3	79	3	1	1	1
25	S840025	25	PCT-4\PHB\1\1>196-M-1-M	7	5	4	80	3	1	1	3
26	S840026	26	PCT-4\PHB\1\1>196-M-2-M	7	4	4	81	3	1	1	1
27	S840027	27	PCT-4\PHB\1\1>196-M-3-M	3	5	5	82	3	1	1	1
28	S840028	28	PCT-4\PHB\1\1>196-M-4-M	5	4	4	71	3	1	1	1
29	S840029	29	PCT-4\PHB\1\1>196-M-5-M	5	4	3	82	1	1	1	1
30	S840030	30	PCT-4\PHB\1\1>196-M-6-M	7	4	3	83	3	1	1	1
31	S840031	31	PCT-4\PHB\1\1>209-M-1-M	7	4	4	84	1	1	1	1
32	S840032	32	PCT-4\PHB\1\1>209-M-2-M	7	4	3	79	1	1	1	1
33	S840033	33	PCT-4\PHB\1\1>209-M-3-M	5	5	4	80	1	1	3	3
34	S840034	34	PCT-4\PHB\1\1>209-M-4-M	5	3	3	77	3	3	3	1
35	S840035	35	PCT-4\PHB\1\1>209-M-5-M	7	3	2	71	3	1	1	1
36	S840036	36	PCT-4\PHB\1\1>209-M-6-M	7	2	1	75	3	1	1	1
37	S840037	37	PCT-4\PHB\1\1>231-M-1-M	5	2	2	77	3	1	1	1
38	S840038	38	PCT-4\PHB\1\1>231-M-2-M	7	2	2	75	3	1	1	1
39	S840039	39	PCT-4\PHB\1\1>231-M-3-M	5	5	4	66	3	3	1	5
40	S840040	40	PCT-4\PHB\1\1>231-M-4-M	5	5	4	81	5	1	1	3
41	S840041	41	PCT-4\PHB\1\1>231-M-5-M	5	3	3	87	5	3	3	1
42	S840042	42	PCT-4\PHB\1\1>231-M-6-M	3	3	2	71	3	1	1	1
43	S840043	43	PCT-4\PHB\1\1>277-M-1-M	5	3	2	77	3	1	1	1
44	S840044	44	PCT-4\PHB\1\1>277-M-2-M	5	3	2	82	1	1	1	1
45	S840045	45	PCT-4\PHB\1\1>277-M-3-M	5	3	3	82	1	1	1	1
46	S840046	46	PCT-4\PHB\1\1>277-M-4-M	5	1	1	71	3	1	1	1
47	S840047	47	PCT-4\PHB\1\1>277-M-5-M	5	1	1	78	3	1	1	1
48	S840048	48	PCT-4\PHB\1\1>277-M-6-M	5	2	1	68	1	1	1	1
49	S840049	49	PCT-4\PHB\1\1>368-M-1-M	5	3	2	66	1	1	1	1
50	S840050	50	PCT-4\PHB\1\1>368-M-2-M	5	2	1	75	1	1	1	1
51	S840051	51	PCT-4\PHB\1\1>368-M-3-M	5	2	2	71	3	1	1	1
52	S840052	52	PCT-4\PHB\1\1>368-M-4-M	5	2	2	74	1	3	1	3

53	S840053	53	PCT-4\PHB\1\1>368-M-5-M	5	3	2	71	1	1	3	3
54	S840054	54	PCT-4\PHB\1\1>368-M-6-M	5	3	2	71	3	1	1	1
55	S840055	55	PCT-4\PHB\1\1>453-M-1-M	7	2	1	74	1	1	3	1
56	S840056	56	PCT-4\PHB\1\1>453-M-2-M	7	1	1	71	1	1	1	1
57	S840057	57	PCT-4\PHB\1\1>453-M-3-M	7	2	4	78	1	3	1	3
58	S840058	58	PCT-4\PHB\1\1>453-M-4-M	7	2	3	71	1	1	1	5
59	S840059	59	PCT-4\PHB\1\1>453-M-5-M	7	2	2	84	1	1	1	1
60	S840060	60	PCT-4\PHB\1\1>453-M-6-M	7	4	4	79	1	1	1	3
61	S840061	61	PCT-4\PHB\1\1>485-M-1-M	7	3	2	77	3	1	1	1
62	S840062	62	PCT-4\PHB\1\1>485-M-2-M	7	2	2	80	1	3	1	1
63	S840063	63	PCT-4\PHB\1\1>485-M-3-M	5	4	4	82	1	1	1	1
64	S840064	64	PCT-4\PHB\1\1>485-M-4-M	5	4	4	77	1	3	5	3
65	S840065	65	PCT-4\PHB\1\1>485-M-5-M	5	4	3	77	1	3	3	1
66	S840066	66	PCT-4\PHB\1\1>485-M-6-M	5	3	3	79	1	1	1	1
67	S840067	67	PCT-4\PHB\1\1>538-M-1-M	5	3	3	80	1	1	1	1
68	S840068	68	PCT-4\PHB\1\1>538-M-2-M	7	2	2	71	1	1	1	1
69	S840069	69	PCT-4\PHB\1\1>538-M-3-M	7	5	5	77	3	1	1	3
70	S840070	70	PCT-4\PHB\1\1>538-M-4-M	5	2	3	75	3	1	1	1
71	S840071	71	PCT-4\PHB\1\1>538-M-5-M	3	4	3	75	3	1	1	1
72	S840072	72	PCT-4\PHB\1\1>538-M-6-M	3	3	4	75	3	1	1	1
73	S840073	73	PCT-4\PHB\1\1>582-M-1-M	5	4	3	80	3	1	1	1
74	S840074	74	PCT-4\PHB\1\1>582-M-2-M	5	2	1	75	1	1	1	1
75	S840075	75	PCT-4\PHB\1\1>582-M-3-M	5	3	3	74	3	1	1	1
76	S840076	76	PCT-4\PHB\1\1>582-M-4-M	5	2	2	81	3	1	1	1
77	S840077	77	PCT-4\PHB\1\1>582-M-5-M	7	2	1	76	3	1	1	3
78	S840078	78	PCT-4\PHB\1\1>582-M-6-M	5	4	4	82	3	1	5	1
79	S840079	79	PCT-4\PHB\1\1>603-M-1-M	5	2	2	74	1	1	1	1
80	S840080	80	PCT-4\PHB\1\1>603-M-2-M	7	2	1	77	1	1	1	1
81	S840081	81	PCT-4\PHB\1\1>603-M-3-M	7	3	3	74	3	1	1	1
82	S840082	82	PCT-4\PHB\1\1>603-M-4-M	5	2	1	84	1	1	1	1
83	S840083	83	PCT-4\PHB\1\1>603-M-5-M	7	2	1	74	3	1	3	1
84	S840084	84	PCT-4\PHB\1\1>603-M-6-M	5	3	3	76	3	3	1	1
85	S840085	85	PCT-4\PHB\1\1>749-M-1-M	5	2	2	77	3	1	1	3
86	S840086	86	PCT-4\PHB\1\1>749-M-2-M	7	2	2	73	1	1	1	1
87	S840087	87	PCT-4\PHB\1\1>749-M-3-M	5	2	2	75	1	3	1	3
88	S840088	88	PCT-4\PHB\1\1>749-M-4-M	5	3	2	71	3	3	1	3
89	S840089	89	PCT-4\PHB\1\1>749-M-5-M	7	3	3	83	3	1	3	1
90	S840090	90	PCT-4\PHB\1\1>749-M-6-M	5	3	3	70	3	1	1	1
91	S840091	91	PCT-4\PHB\1\1>751-M-1-M	5	3	2	85	3	3	1	1
92	S840092	92	PCT-4\PHB\1\1>751-M-2-M	5	2	2	75	1	1	1	1
93	S840093	93	PCT-4\PHB\1\1>751-M-3-M	3	1	1	67	1	1	1	1
94	S840094	94	PCT-4\PHB\1\1>751-M-4-M	5	2	1	79	3	1	1	1
95	S840095	95	PCT-4\PHB\1\1>751-M-5-M	3	2	1	79	1	1	1	3
96	S840096	96	PCT-4\PHB\1\1>751-M-6-M	5	2	2	75	1	1	1	1
97	S840097	97	PCT-4\PHB\1\1>752-M-1-M	5	2	1	68	1	1	1	1
98	S840098	98	PCT-4\PHB\1\1>752-M-2-M	5	2	1	67	1	1	1	1
99	S840099	99	PCT-4\PHB\1\1>752-M-3-M	5	2	1	65	1	1	1	1
100	S840100	100	PCT-4\PHB\1\1>752-M-4-M	3	1	2	76	1	1	1	1
101	S840101	101	PCT-4\PHB\1\1>752-M-5-M	5	1	1	78	1	1	1	1
102	S840102	102	PCT-4\PHB\1\1>752-M-6-M	5	2	1	77	1	1	1	3
103	S840103	103	PCT-4\PHB\1\1>783-M-1-M	5	4	3	77	1	1	1	1
104	S840104	104	PCT-4\PHB\1\1>783-M-2-M	7	2	1	74	1	1	1	1
105	S840105	105	PCT-4\PHB\1\1>783-M-3-M	5	3	2	85	1	3	1	3
106	S840106	106	PCT-4\PHB\1\1>783-M-4-M	5	2	1	77	1	1	3	3
107	S840107	107	PCT-4\PHB\1\1>783-M-5-M	7	2	1	68	1	1	1	1
108	S840108	108	PCT-4\PHB\1\1>783-M-6-M	7	2	1	70	1	1	1	1
109	S840109	109	PCT-4\PHB\1\1>822-M-1-M	7	2	1	70	1	1	1	1
110	S840110	110	PCT-4\PHB\1\1>822-M-2-M	7	2	1	75	1	3	1	1

111	S840111	111	PCT-4\PHB\1\1>822-M-3-M	5	1	1	72	1	1	1	1
112	S840112	112	PCT-4\PHB\1\1>822-M-4-M	5	3	3	71	1	1	1	1
113	S840113	113	PCT-4\PHB\1\1>822-M-5-M	5	2	2	84	1	1	1	1
114	S840114	114	PCT-4\PHB\1\1>822-M-6-M	5	1	1	74	1	1	1	1
115	S840115	115	PCT-4\PHB\1\1>846-M-1-M	5	4	4	74	3	1	1	1
116	S840116	116	PCT-4\PHB\1\1>846-M-2-M	5	3	2	82	3	3	3	1
117	S840117	117	PCT-4\PHB\1\1>846-M-3-M	5	3	1	79	3	1	1	1
118	S840118	118	PCT-4\PHB\1\1>846-M-4-M	5	2	2	70	3	1	1	1
119	S840119	119	PCT-4\PHB\1\1>846-M-5-M	5	2	2	72	3	1	1	1
120	S840120	120	PCT-4\PHB\1\1>846-M-6-M	5	2	3	74	3	1	1	1
121	S840121	121	PCT-4\PHB\1\1>856-M-1-M	5	3	2	76	3	1	1	1
122	S840122	122	PCT-4\PHB\1\1>856-M-2-M	7	2	2	70	3	1	1	1
123	S840123	123	PCT-4\PHB\1\1>856-M-3-M	5	2	2	81	3	3	1	1
124	S840124	124	PCT-4\PHB\1\1>856-M-4-M	5	3	2	74	1	1	1	3
125	S840125	125	PCT-4\PHB\1\1>856-M-5-M	7	2	2	82	1	1	1	1
126	S840126	126	PCT-4\PHB\1\1>856-M-6-M	5	3	2	77	3	1	1	1
127	S840127	127	PCT-4\PHB\1\1>994-M-1-M	5	2	2	85	1	1	1	1
128	S840128	128	PCT-4\PHB\1\1>994-M-2-M	7	1	1	81	1	1	1	3
129	S840129	129	PCT-4\PHB\1\1>994-M-3-M	7	1	1	84	1	1	1	1
130	S840130	130	PCT-4\PHB\1\1>994-M-4-M	5	2	2	80	1	3	1	1
131	S840131	131	PCT-4\PHB\1\1>994-M-5-M	5	2	1	79	1	3	1	1
132	S840132	132	PCT-4\PHB\1\1>994-M-6-M	7	3	2	70	1	1	1	1
133	S840133	133	PCT-4\PHB\1\1>1332-M-1-M	5	3	2	71	1	1	1	1
134	S840134	134	PCT-4\PHB\1\1>1332-M-2-M	7	4	3	71	1	1	1	1
135	S840135	135	PCT-4\PHB\1\1>1332-M-3-M	5	3	2	74	3	1	1	1
136	S840136	136	PCT-4\PHB\1\1>1332-M-4-M	5	2	1	67	3	1	3	1
137	S840137	137	PCT-4\PHB\1\1>1332-M-5-M	7	2	2	71	1	1	1	1
138	S840138	138	PCT-4\PHB\1\1>1332-M-6-M	5	2	1	74	1	1	1	1
139	S840139	139	PCT-4\PHB\1\1>1678-M-1-M	5	4	4	84	1	1	1	1
140	S840140	140	PCT-4\PHB\1\1>1678-M-2-M	7	3	2	82	1	1	1	1
141	S840141	141	PCT-4\PHB\1\1>1678-M-3-M	5	3	3	89	3	1	1	1
142	S840142	142	PCT-4\PHB\1\1>1678-M-4-M	5	3	2	66	3	1	1	1
143	S840143	143	PCT-4\PHB\1\1>1678-M-5-M	5	4	3	82	3	1	1	1
144	S840144	144	PCT-4\PHB\1\1>1678-M-6-M	5	4	4	83	3	3	1	1
145	S840145	145	PCT-4\PHB\1\1>1723-M-1-M	5	4	4	82	3	1	1	1
146	S840146	146	PCT-4\PHB\1\1>1723-M-2-M	5	3	2	81	3	1	1	1
147	S840147	147	PCT-4\PHB\1\1>1723-M-3-M	5	3	2	75	3	1	1	1
148	S840148	148	PCT-4\PHB\1\1>1723-M-4-M	5	2	2	77	3	1	1	1
149	S840149	149	PCT-4\PHB\1\1>1723-M-5-M	5	2	3	75	3	1	1	1
150	S840150	150	PCT-4\PHB\1\1>1723-M-6-M	5	3	3	78	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 8. S4 lines selected in the population PCT-4\PHB\1\1.
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S840021	21	PCT-4\PHB\1\1>145-M-3-M	5	5	5	70	3	3	1	1
2	S840023	23	PCT-4\PHB\1\1>145-M-5-M	7	3	3	70	1	1	1	1
3	S840028	28	PCT-4\PHB\1\1>196-M-4-M	5	4	4	71	3	1	1	1
4	S840036	36	PCT-4\PHB\1\1>209-M-6-M	7	2	1	75	3	1	1	1
5	S840037	37	PCT-4\PHB\1\1>231-M-1-M	5	2	2	77	3	1	1	1
6	S840042	42	PCT-4\PHB\1\1>231-M-6-M	3	3	2	71	3	1	1	1
7	S840045	45	PCT-4\PHB\1\1>277-M-3-M	5	3	3	82	1	1	1	1
8	S840046	46	PCT-4\PHB\1\1>277-M-4-M	5	1	1	71	3	1	1	1
9	S840047	47	PCT-4\PHB\1\1>277-M-5-M	5	1	1	78	3	1	1	1
10	S840048	48	PCT-4\PHB\1\1>277-M-6-M	5	2	1	68	1	1	1	1
11	S840049	49	PCT-4\PHB\1\1>368-M-1-M	5	3	2	66	1	1	1	1
12	S840050	50	PCT-4\PHB\1\1>368-M-2-M	5	2	1	75	1	1	1	1
13	S840054	54	PCT-4\PHB\1\1>368-M-6-M	5	3	2	71	3	1	1	1
14	S840055	55	PCT-4\PHB\1\1>453-M-1-M	7	2	1	74	1	1	3	1
15	S840056	56	PCT-4\PHB\1\1>453-M-2-M	7	1	1	71	1	1	1	1
16	S840062	62	PCT-4\PHB\1\1>485-M-2-M	7	2	2	80	1	3	1	1
17	S840068	68	PCT-4\PHB\1\1>538-M-2-M	7	2	2	71	1	1	1	1
18	S840079	79	PCT-4\PHB\1\1>603-M-1-M	5	2	2	74	1	1	1	1
19	S840083	83	PCT-4\PHB\1\1>603-M-5-M	7	2	1	74	3	1	3	1
20	S840086	86	PCT-4\PHB\1\1>749-M-2-M	7	2	2	73	1	1	1	1
21	S840093	93	PCT-4\PHB\1\1>751-M-3-M	3	1	1	67	1	1	1	1
22	S840095	95	PCT-4\PHB\1\1>751-M-5-M	3	2	1	79	1	1	1	3
23	S840097	97	PCT-4\PHB\1\1>752-M-1-M	5	2	1	68	1	1	1	1
24	S840099	99	PCT-4\PHB\1\1>752-M-3-M	5	2	1	65	1	1	1	1
25	S840100	100	PCT-4\PHB\1\1>752-M-4-M	3	1	2	76	1	1	1	1
26	S840103	103	PCT-4\PHB\1\1>783-M-1-M	5	4	3	77	1	1	1	1
27	S840106	106	PCT-4\PHB\1\1>783-M-4-M	5	2	1	77	1	1	3	3
28	S840107	107	PCT-4\PHB\1\1>783-M-5-M	7	2	1	68	1	1	1	1
29	S840109	109	PCT-4\PHB\1\1>822-M-1-M	7	2	1	70	1	1	1	1
30	S840114	114	PCT-4\PHB\1\1>822-M-6-M	5	1	1	74	1	1	1	1
31	S840118	118	PCT-4\PHB\1\1>846-M-4-M	5	2	2	70	3	1	1	1
32	S840142	142	PCT-4\PHB\1\1>1678-M-4-M	5	3	2	66	3	1	1	1
33	S840145	145	PCT-4\PHB\1\1>1723-M-1-M	5	4	4	82	3	1	1	1
34	S840146	146	PCT-4\PHB\1\1>1723-M-2-M	5	3	2	81	3	1	1	1
35	S840147	147	PCT-4\PHB\1\1>1723-M-3-M	5	3	2	75	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 9. S6 line evaluation from the populations PCT-5\0\0\0; PCT-A\0\0\0; and PCT-4\0\0\1
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl	Sel.
1	S860001	1	PCT-5\0\0\0>1496-M-1-M-1-M	3	3	3	84	3	3	1	1	
2	S860002	2	PCT-5\0\0\0>1496-M-1-M-2-M	5	2	2	78	3	1	1	1	
3	S860003	3	PCT-5\0\0\0>1496-M-1-M-3-M	5	2	2	77	3	1	1	1	6
4	S860004	4	PCT-5\0\0\0>1496-M-1-M-4-M	5	1	1	77	3	1	1	1	
5	S860005	5	PCT-5\0\0\0>1496-M-1-M-5-M	7	2	2	77	3	1	1	1	
6	S860006	6	PCT-5\0\0\0>1496-M-1-M-6-M	7	2	2	76	3	1	1	1	
7	S860007	7	PCT-5\0\0\0>2130-M-2-M-1-M	7	2	2	78	3	1	1	1	
8	S860008	8	PCT-5\0\0\0>2130-M-2-M-2-M	7	2	2	82	3	1	1	1	
9	S860009	9	PCT-5\0\0\0>2130-M-2-M-3-M	7	3	3	81	3	1	5	3	
10	S860010	10	PCT-5\0\0\0>2130-M-2-M-4-M	9	5	5	70	1	1	1	5	
11	S860011	11	PCT-5\0\0\0>2130-M-2-M-5-M	7	5	5	71	3	1	1	1	
12	S860012	12	PCT-5\0\0\0>2130-M-2-M-6-M	5	4	5	85	3	1	1	1	
13	S860013	13	PCT-5\0\0\0>2314-M-1-M-1-M	5	4	5	78	3	1	1	3	
14	S860014	14	PCT-5\0\0\0>2314-M-1-M-2-M	7	3	3	82	3	1	1	1	
15	S860015	15	PCT-5\0\0\0>2314-M-1-M-3-M	5	2	1	76	3	1	1	1	
16	S860016	16	PCT-5\0\0\0>2314-M-1-M-4-M	5	2	1	68	3	1	1	1	
17	S860017	17	PCT-5\0\0\0>2314-M-1-M-5-M	7	2	1	71	3	1	1	1	
18	S860018	18	PCT-5\0\0\0>2314-M-1-M-6-M	5	2	1	66	3	1	1	1	
19	S860019	19	PCT-A\0\0\0>175-M-1-M-1-M	5	2	2	67	1	1	1	1	
20	S860020	20	PCT-A\0\0\0>175-M-1-M-2-M	5	1	2	67	1	1	1	1	
21	S860021	21	PCT-A\0\0\0>175-M-1-M-3-M	7	3	3	68	1	1	1	1	
22	S860022	22	PCT-A\0\0\0>175-M-1-M-4-M	7	3	2	66	1	1	1	1	6
23	S860023	23	PCT-A\0\0\0>175-M-1-M-5-M	7	3	2	68	1	1	1	1	6
24	S860024	24	PCT-A\0\0\0>175-M-1-M-6-M	7	4	3	71	1	1	1	1	
25	S860025	25	PCT-A\0\0\0>175-M-3-M-1-M	7	3	2	66	1	1	1	1	6
26	S860026	26	PCT-A\0\0\0>175-M-3-M-2-M	7	3	4	83	1	1	1	1	
27	S860027	27	PCT-A\0\0\0>175-M-3-M-3-M	5	3	2	70	3	1	1	1	6
28	S860028	28	PCT-A\0\0\0>175-M-3-M-4-M	5	2	1	70	3	1	1	1	6
29	S860029	29	PCT-A\0\0\0>175-M-3-M-5-M	7	2	1	77	3	1	1	1	
30	S860030	30	PCT-A\0\0\0>175-M-3-M-6-M	5	2	1	74	5	1	3	1	
31	S860031	31	PCT-A\0\0\0>175-M-4-M-1-M	7	3	2	79	5	1	1	1	
32	S860032	32	PCT-A\0\0\0>175-M-4-M-2-M	7	2	2	78	3	1	1	1	
33	S860033	33	PCT-A\0\0\0>175-M-4-M-3-M	7	2	1	77	3	1	1	1	
			Oryzica Sabana 6	3	3	4	87	3	1	1	1	
			Linea 30	5	1	1	76	3	1	1	1	
			Oryzica Sabana 10	7	2	3	95	1	1	1	1	
			Oryzica Sabana 6	3	3	3	86	3	1	1	1	
			Linea 30	5	1	1	74	3	1	1	1	
			Oryzica Sabana 10	3	2	2	91	5	1	1	1	
34	S860034	34	PCT-A\0\0\0>175-M-4-M-4-M	7	2	1	71	1	1	1	1	6
35	S860035	35	PCT-A\0\0\0>175-M-4-M-5-M	7	1	1	75	1	1	1	1	6
36	S860036	36	PCT-A\0\0\0>175-M-4-M-6-M	7	1	1	75	1	1	1	1	
37	S860037	37	PCT-A\0\0\0>175-M-6-M-1-M	5	1	1	72	1	1	1	1	6
38	S860038	38	PCT-A\0\0\0>175-M-6-M-2-M	5	1	1	76	1	1	1	1	
39	S860039	39	PCT-A\0\0\0>175-M-6-M-3-M	5	3	4	88	3	3	1	1	
40	S860040	40	PCT-A\0\0\0>175-M-6-M-4-M	3	2	2	84	5	1	1	1	

41	S860041	41	PCT-A\0\0\0>175-M-6-M-5-M	3	2	2	83	5	3	1	1	
42	S860042	42	PCT-A\0\0\0>175-M-6-M-6-M	3	3	3	84	3	3	1	1	
43	S860043	43	PCT-A\0\0\0>189-M-1-M-1-M	5	2	2	84	3	1	1	1	
44	S860044	44	PCT-A\0\0\0>189-M-1-M-2-M	5	3	3	83	3	3	1	1	
45	S860045	45	PCT-A\0\0\0>189-M-1-M-3-M	5	3	2	87	3	1	1	1	
46	S860046	46	PCT-A\0\0\0>189-M-1-M-4-M	5	2	1	78	3	1	1	1	
47	S860047	47	PCT-A\0\0\0>189-M-1-M-5-M	7	2	1	76	1	1	1	1	
48	S860048	48	PCT-A\0\0\0>189-M-1-M-6-M	7	3	2	71	3	1	1	1	
49	S860049	49	PCT-A\0\0\0>189-M-2-M-1-M	7	2	1	78	3	1	1	1	
50	S860050	50	PCT-A\0\0\0>189-M-2-M-2-M	7	2	1	85	3	1	1	1	6
51	S860051	51	PCT-A\0\0\0>189-M-2-M-3-M	7	3	2	63	1	1	1	1	
52	S860052	52	PCT-A\0\0\0>189-M-2-M-4-M	7	3	2	56	1	1	1	1	
53	S860053	53	PCT-A\0\0\0>189-M-2-M-5-M	7	3	2	65	1	1	1	1	
54	S860054	54	PCT-A\0\0\0>189-M-2-M-6-M	3	4	4	70	1	1	1	1	
55	S860055	55	PCT-A\0\0\0>189-M-3-M-1-M	5	3	2	64	1	1	1	1	
56	S860056	56	PCT-A\0\0\0>189-M-3-M-2-M	5	3	2	85	3	1	1	1	
57	S860057	57	PCT-A\0\0\0>189-M-3-M-3-M	5	2	2	79	3	1	1	1	
58	S860058	58	PCT-A\0\0\0>189-M-3-M-4-M	5	3	2	65	3	1	1	1	
59	S860059	59	PCT-A\0\0\0>189-M-3-M-5-M	5	3	2	65	3	1	1	1	
60	S860060	60	PCT-A\0\0\0>189-M-3-M-6-M	5	3	2	82	3	1	1	1	
61	S860061	61	PCT-A\0\0\0>189-M-4-M-1-M	5	2	2	81	3	1	1	1	
62	S860062	62	PCT-A\0\0\0>189-M-4-M-2-M	5	2	2	82	3	1	1	1	
63	S860063	63	PCT-A\0\0\0>189-M-4-M-3-M	3	3	2	79	5	1	1	1	6
			Oryzica Sabana 6	3	3	3	85	5	1	1	1	
			Linea 30	3	1	1	70	3	1	1	1	
			Oryzica Sabana 10	3	3	3	90	5	1	1	1	
64	S860064	64	PCT-A\0\0\0>189-M-4-M-4-M	3	4	3	79	5	1	1	1	6
65	S860065	65	PCT-A\0\0\0>189-M-4-M-5-M	3	4	4	79	5	3	1	1	6
66	S860066	66	PCT-A\0\0\0>189-M-4-M-6-M	3	4	4	79	5	3	1	1	6
67	S860067	67	PCT-A\0\0\0>278-M-1-M-1-M	3	3	3	79	5	1	1	1	6
68	S860068	68	PCT-A\0\0\0>278-M-1-M-2-M	3	3	3	79	5	1	1	1	6
69	S860069	69	PCT-A\0\0\0>278-M-1-M-3-M	5	2	3	84	1	1	1	1	
70	S860070	70	PCT-A\0\0\0>278-M-1-M-4-M	5	2	3	84	3	1	1	1	
71	S860071	71	PCT-A\0\0\0>278-M-1-M-5-M	5	3	3	84	1	1	1	1	
72	S860072	72	PCT-A\0\0\0>278-M-1-M-6-M	5	3	3	81	3	1	1	1	
73	S860073	73	PCT-A\0\0\0>394-M-1-M-1-M	5	3	3	82	3	1	1	1	6
74	S860074	74	PCT-A\0\0\0>394-M-1-M-2-M	5	2	2	87	3	1	1	1	
75	S860075	75	PCT-A\0\0\0>394-M-1-M-3-M	5	2	3	82	3	1	1	1	
76	S860076	76	PCT-A\0\0\0>394-M-1-M-4-M	5	2	2	75	3	1	1	1	6
77	S860077	77	PCT-A\0\0\0>394-M-1-M-5-M	5	2	3	82	3	1	1	1	6
78	S860078	78	PCT-A\0\0\0>394-M-1-M-6-M	3	2	3	84	3	1	1	1	
79	S860079	79	PCT-A\0\0\0>394-M-2-M-1-M	5	2	3	79	3	1	1	1	6
80	S860080	80	PCT-A\0\0\0>394-M-2-M-2-M	5	2	2	84	3	1	1	1	6
81	S860081	81	PCT-A\0\0\0>394-M-2-M-3-M	5	3	2	79	3	1	1	1	6
82	S860082	82	PCT-A\0\0\0>394-M-2-M-4-M	5	2	2	82	3	1	1	1	
83	S860083	83	PCT-A\0\0\0>394-M-2-M-5-M	5	3	2	81	1	1	1	1	
84	S860084	84	PCT-A\0\0\0>394-M-2-M-6-M	5	3	2	79	1	1	1	1	
85	S860085	85	PCT-A\0\0\0>503-M-1-M-1-M	5	2	2	81	1	1	1	1	6
86	S860086	86	PCT-A\0\0\0>503-M-1-M-2-M	5	2	1	82	1	1	1	1	
87	S860087	87	PCT-A\0\0\0>503-M-1-M-3-M	5	2	1	86	1	1	1	1	
88	S860088	88	PCT-A\0\0\0>503-M-1-M-4-M	5	3	2	83	1	1	1	1	
89	S860089	89	PCT-A\0\0\0>503-M-1-M-5-M	5	3	2	90	1	1	1	1	

90	S860090	90	PCT-A\0\0\0>503-M-1-M-6-M	5	3	2	79	1	1	1	1	
			Oryzica Sabana 6	3	4	3	86	3	1	1	1	
			Linea 30	5	1	1	71	3	1	1	1	
			Oryzica Sabana 10	3	2	2	90	3	1	1	1	
91	S860091	91	PCT-A\0\0\0>1169-M-1-M-1-M	5	2	1	88	3	1	1	3	
92	S860092	92	PCT-A\0\0\0>1169-M-1-M-2-M	5	2	1	87	3	1	1	1	
93	S860093	93	PCT-A\0\0\0>1169-M-1-M-3-M	3	2	1	71	3	1	1	1	
94	S860094	94	PCT-A\0\0\0>1169-M-1-M-4-M	3	2	1	71	3	1	1	1	6
95	S860095	95	PCT-A\0\0\0>1169-M-1-M-5-M	5	1	1	77	3	1	1	1	
96	S860096	96	PCT-A\0\0\0>1169-M-1-M-6-M	5	1	1	65	3	1	1	1	
97	S860097	97	PCT-A\0\0\0>1169-M-2-M-1-M	5	1	2	66	3	1	1	1	
98	S860098	98	PCT-A\0\0\0>1169-M-2-M-2-M	5	2	1	70	1	1	1	1	6
99	S860099	99	PCT-A\0\0\0>1169-M-2-M-3-M	5	3	3	82	3	1	1	1	
100	S860100	100	PCT-A\0\0\0>1169-M-2-M-4-M	5	3	2	83	3	1	1	1	
101	S860101	101	PCT-A\0\0\0>1169-M-2-M-5-M	3	2	1	79	3	1	1	1	
102	S860102	102	PCT-A\0\0\0>1169-M-2-M-6-M	5	2	3	83	3	1	1	1	
103	S860103	103	PCT-A\0\0\0>1321-M-2-M-1-M	5	2	2	79	3	1	1	1	
104	S860104	104	PCT-A\0\0\0>1321-M-2-M-2-M	5	1	1	84	3	3	3	1	
105	S860105	105	PCT-A\0\0\0>1321-M-2-M-3-M	5	1	1	70	3	1	1	1	
106	S860106	106	PCT-A\0\0\0>1321-M-2-M-4-M	5	1	1	69	3	1	1	1	6
107	S860107	107	PCT-A\0\0\0>1321-M-2-M-5-M	5	1	1	71	3	1	1	1	
108	S860108	108	PCT-A\0\0\0>1321-M-2-M-6-M	5	2	1	68	3	1	1	1	
109	S860109	109	PCT-A\0\0\0>1452-M-1-M-1-M	5	2	1	68	3	1	1	1	
110	S860110	110	PCT-A\0\0\0>1452-M-1-M-2-M	5	1	1	68	1	1	1	1	6
111	S860111	111	PCT-A\0\0\0>1452-M-1-M-3-M	5	1	1	70	1	1	1	1	
112	S860112	112	PCT-A\0\0\0>1452-M-1-M-4-M	5	2	2	70	1	1	1	1	
113	S860113	113	PCT-A\0\0\0>1452-M-1-M-5-M	5	1	1	75	1	1	1	1	
114	S860114	114	PCT-A\0\0\0>1452-M-1-M-6-M	5	1	1	70	3	1	1	1	
115	S860115	115	PCT-A\0\0\0>1485-M-1-M-1-M	5	1	1	70	3	1	1	1	
116	S860116	116	PCT-A\0\0\0>1485-M-1-M-2-M	5	1	1	77	3	1	1	1	
117	S860117	117	PCT-A\0\0\0>1485-M-1-M-3-M	7	3	2	66	3	1	1	1	
			Oryzica Sabana 6	3	3	3	85	3	1	1	1	
			Linea 30	7	1	1	71	3	1	1	1	
			Oryzica Sabana 10	7	2	2	93	1	1	1	1	
			Oryzica Sabana 6	3	3	3	88	3	1	3	1	
			Linea 30	5	1	1	74	3	1	1	1	
			Oryzica Sabana 10	5	2	2	91	3	1	3	1	
118	S860118	118	PCT-A\0\0\0>1485-M-1-M-4-M	3	1	1	70	1	1	3	1	6
119	S860119	119	PCT-A\0\0\0>1485-M-1-M-5-M	5	1	1	78	1	1	1	1	6
120	S860120	120	PCT-A\0\0\0>1485-M-1-M-6-M	5	1	1	75	1	1	1	1	
121	S860121	121	PCT-A\0\0\0>1488-M-4-M-1-M	5	2	1	75	1	1	1	1	6
122	S860122	122	PCT-A\0\0\0>1488-M-4-M-2-M	5	1	1	75	1	1	1	1	
123	S860123	123	PCT-A\0\0\0>1488-M-4-M-3-M	3	2	2	83	1	1	3	1	
124	S860124	124	PCT-A\0\0\0>1488-M-4-M-4-M	3	3	3	84	3	1	1	1	6
125	S860125	125	PCT-A\0\0\0>1488-M-4-M-5-M	7	2	1	87	3	1	1	1	6
126	S860126	126	PCT-A\0\0\0>1488-M-4-M-6-M	5	1	1	86	3	1	1	1	
127	S860127	127	PCT-A\0\0\0>1488-M-5-M-1-M	5	2	2	84	3	1	1	1	6
128	S860128	128	PCT-A\0\0\0>1488-M-5-M-2-M	5	2	2	91	3	1	1	1	
129	S860129	129	PCT-A\0\0\0>1488-M-5-M-3-M	7	1	1	74	1	1	1	1	
130	S860130	130	PCT-A\0\0\0>1488-M-5-M-4-M	5	1	1	70	1	1	1	1	6
131	S860131	131	PCT-A\0\0\0>1488-M-5-M-5-M	7	1	1	75	1	1	1	1	
132	S860132	132	PCT-A\0\0\0>1488-M-5-M-6-M	7	1	1	70	1	1	1	1	

133	S860133	133	PCT-A\0\0\0>1674-M-1-M-1-M	7	1	1	67	1	1	1	1	
134	S860134	134	PCT-A\0\0\0>1674-M-1-M-2-M	7	1	1	76	1	1	1	1	
135	S860135	135	PCT-A\0\0\0>1674-M-1-M-3-M	5	2	3	83	3	1	1	1	
136	S860136	136	PCT-A\0\0\0>1674-M-1-M-4-M	5	3	4	86	3	1	1	1	
137	S860137	137	PCT-A\0\0\0>1674-M-1-M-5-M	5	3	4	84	3	3	1	1	
138	S860138	138	PCT-A\0\0\0>1674-M-1-M-6-M	5	3	3	82	3	1	1	1	
139	S860139	139	PCT-A\0\0\0>1674-M-2-M-1-M	5	3	3	82	3	1	1	1	
140	S860140	140	PCT-A\0\0\0>1674-M-2-M-2-M	7	4	4	88	1	1	1	1	
141	S860141	141	PCT-A\0\0\0>1674-M-2-M-3-M	3	3	3	78	3	1	1	1	
142	S860142	142	PCT-A\0\0\0>1674-M-2-M-4-M	5	2	1	71	3	1	1	1	6
143	S860143	143	PCT-A\0\0\0>1674-M-2-M-5-M	5	2	2	82	1	1	1	1	
144	S860144	144	PCT-A\0\0\0>1674-M-2-M-6-M	3	2	2	75	1	1	1	3	
			Oryzica Sabana 6	3	4	4	86	3	3	1	1	
			Linea 30	5	2	2	75	3	1	1	1	
			Oryzica Sabana 10	5	3	3	93	3	1	1	1	
145	S860145	145	PCT-A\0\0\0>1674-M-6-M-1-M	3	2	3	84	3	1	1	1	
146	S860146	146	PCT-A\0\0\0>1674-M-6-M-2-M	5	2	1	88	3	1	1	1	
147	S860147	147	PCT-A\0\0\0>1674-M-6-M-3-M	5	3	3	70	3	1	1	1	6
148	S860148	148	PCT-A\0\0\0>1674-M-6-M-4-M	5	5	5	70	3	1	1	1	
149	S860149	149	PCT-A\0\0\0>1674-M-6-M-5-M	7	5	5	79	1	1	1	1	
150	S860150	150	PCT-A\0\0\0>1674-M-6-M-6-M	5	3	2	71	3	1	1	1	6
151	S860151	151	PCT-A\0\0\0>1788-M-2-M-1-M	5	3	4	73	1	1	1	1	
152	S860152	152	PCT-A\0\0\0>1788-M-2-M-2-M	9	4	4	83	1	1	1	1	6
153	S860153	153	PCT-A\0\0\0>1788-M-2-M-3-M	7	3	2	68	3	1	1	1	
154	S860154	154	PCT-A\0\0\0>1788-M-2-M-4-M	5	2	1	65	3	1	1	1	
155	S860155	155	PCT-A\0\0\0>1788-M-2-M-5-M	7	2	1	78	3	1	1	1	
156	S860156	156	PCT-A\0\0\0>1788-M-2-M-6-M	7	2	1	70	3	1	1	1	
157	S860157	157	PCT-A\0\0\0>1788-M-3-M-1-M	5	2	1	65	3	1	1	1	
158	S860158	158	PCT-A\0\0\0>1788-M-3-M-2-M	7	2	1	74	3	1	1	1	
159	S860159	159	PCT-A\0\0\0>1788-M-3-M-3-M	7	2	1	71	1	1	1	1	
160	S860160	160	PCT-A\0\0\0>1788-M-3-M-4-M	5	3	2	70	1	1	1	1	
161	S860161	161	PCT-A\0\0\0>1788-M-3-M-5-M	5	2	1	70	1	1	1	1	
162	S860162	162	PCT-A\0\0\0>1788-M-3-M-6-M	5	3	1	71	1	1	1	1	
163	S860163	163	PCT-A\0\0\0>1788-M-5-M-1-M	5	2	1	70	1	1	1	1	
164	S860164	164	PCT-A\0\0\0>1788-M-5-M-2-M	5	2	1	71	1	1	1	1	
165	S860165	165	PCT-A\0\0\0>1788-M-5-M-3-M	5	4	4	79	3	1	1	1	
166	S860166	166	PCT-A\0\0\0>1788-M-5-M-4-M	3	4	4	79	3	1	1	1	
167	S860167	167	PCT-A\0\0\0>1788-M-5-M-5-M	5	4	4	80	3	1	1	1	
168	S860168	168	PCT-A\0\0\0>1788-M-5-M-6-M	3	4	4	80	3	3	1	1	
169	S860169	169	PCT-A\0\0\0>1832-M-1-M-1-M	3	5	5	80	3	1	1	1	
170	S860170	170	PCT-A\0\0\0>1832-M-1-M-2-M	5	4	4	81	3	1	1	1	
171	S860171	171	PCT-A\0\0\0>1832-M-1-M-3-M	5	3	3	84	3	1	1	1	
			Oryzica Sabana 6	3	4	3	86	3	1	1	1	
			Linea 30	3	1	1	70	3	1	1	1	
			Oryzica Sabana 10	5	3	3	90	3	1	1	1	
172	S860172	172	PCT-A\0\0\0>1832-M-1-M-4-M	5	3	2	85	3	1	1	1	
173	S860173	173	PCT-A\0\0\0>1832-M-1-M-5-M	5	2	2	85	3	1	1	1	
174	S860174	174	PCT-A\0\0\0>1832-M-1-M-6-M	5	2	1	85	3	1	1	1	
175	S860175	175	PCT-A\0\0\0>1955-M-2-M-1-M	5	2	2	85	3	1	1	1	
176	S860176	176	PCT-A\0\0\0>1955-M-2-M-2-M	3	1	1	86	3	1	1	1	
177	S860177	177	PCT-A\0\0\0>1955-M-2-M-3-M	3	1	2	81	5	1	1	1	
178	S860178	178	PCT-A\0\0\0>1955-M-2-M-4-M	3	3	2	81	5	1	1	1	

179	S860179	179	PCT-A\0\0\0>1955-M-2-M-5-M	3	3	2	82	5	1	1	1	
180	S860180	180	PCT-A\0\0\0>1955-M-2-M-6-M	3	3	2	83	5	3	1	1	
181	S860181	181	PCT-A\0\0\0>1955-M-3-M-1-M	3	2	2	82	5	3	1	1	
182	S860182	182	PCT-A\0\0\0>1955-M-3-M-2-M	3	2	2	83	5	1	1	1	
183	S860183	183	PCT-A\0\0\0>1955-M-3-M-3-M	3	2	2	83	3	1	1	1	
184	S860184	184	PCT-A\0\0\0>1955-M-3-M-4-M	3	2	1	78	5	1	1	1	6
185	S860185	185	PCT-A\0\0\0>1955-M-3-M-5-M	5	2	1	80	3	1	1	1	
186	S860186	186	PCT-A\0\0\0>1955-M-3-M-6-M	5	2	1	83	3	1	1	1	
187	S860187	187	PCT-A\0\0\0>1955-M-4-M-1-M	5	2	1	80	3	1	1	1	
188	S860188	188	PCT-A\0\0\0>1955-M-4-M-2-M	5	2	1	82	3	1	1	1	
189	S860189	189	PCT-A\0\0\0>1955-M-4-M-3-M	3	2	1	81	3	1	1	1	
190	S860190	190	PCT-A\0\0\0>1955-M-4-M-4-M	3	2	1	74	5	1	1	1	
191	S860191	191	PCT-A\0\0\0>1955-M-4-M-5-M	5	2	1	80	5	1	1	1	
192	S860192	192	PCT-A\0\0\0>1955-M-4-M-6-M	5	2	1	75	5	1	1	1	
193	S860193	193	PCT-A\0\0\0>1955-M-5-M-1-M	3	2	1	82	5	1	1	1	
194	S860194	194	PCT-A\0\0\0>1955-M-5-M-2-M	3	2	1	82	5	1	1	1	
195	S860195	195	PCT-A\0\0\0>1955-M-5-M-3-M	5	1	1	76	3	1	1	1	
196	S860196	196	PCT-A\0\0\0>1955-M-5-M-4-M	3	1	1	72	3	1	1	1	
197	S860197	197	PCT-A\0\0\0>1955-M-5-M-5-M	5	1	1	68	3	1	1	1	
198	S860198	198	PCT-A\0\0\0>1955-M-5-M-6-M	5	1	1	68	3	1	1	1	
199	S860199	199	PCT-A\0\0\0>2083-M-1-M-1-M	5	1	1	67	3	1	1	1	
200	S860200	200	PCT-A\0\0\0>2083-M-1-M-2-M	7	1	1	68	3	1	1	1	
201	S860201	201	PCT-A\0\0\0>2083-M-1-M-3-M	7	1	1	65	3	1	1	1	
			Oryzica Sabana 6	3	3	3	86	3	1	3	1	
			Linea 30	5	1	1	71	3	1	1	1	
			Oryzica Sabana 10	5	3	3	90	3	1	3	1	
			Oryzica Sabana 6	3	3	3	84	3	1	3	3	
			Linea 30	5	1	1	73	3	1	1	1	
			Oryzica Sabana 10	5	2	3	89	3	1	1	1	
202	S860202	202	PCT-A\0\0\0>2083-M-1-M-4-M	5	1	1	66	3	1	1	1	6
203	S860203	203	PCT-A\0\0\0>2083-M-1-M-5-M	7	1	1	68	3	1	1	1	6
204	S860204	204	PCT-A\0\0\0>2083-M-1-M-6-M	5	1	1	67	3	1	1	1	6
205	S860205	205	PCT-A\0\0\0>2083-M-2-M-1-M	5	1	1	64	3	1	1	1	6
206	S860206	206	PCT-A\0\0\0>2083-M-2-M-2-M	5	1	1	63	3	1	1	1	
207	S860207	207	PCT-A\0\0\0>2083-M-2-M-3-M	3	1	1	63	3	1	1	1	6
208	S860208	208	PCT-A\0\0\0>2083-M-2-M-4-M	5	1	1	67	3	1	1	1	6
209	S860209	209	PCT-A\0\0\0>2083-M-2-M-5-M	5	1	1	67	3	1	1	1	
210	S860210	210	PCT-A\0\0\0>2083-M-2-M-6-M	5	1	1	73	3	1	1	1	
211	S860211	211	PCT-A\0\0\0>2137-M-2-M-1-M	5	2	1	64	3	1	1	1	
212	S860212	212	PCT-A\0\0\0>2137-M-2-M-2-M	5	1	1	73	3	1	1	1	
213	S860213	213	PCT-A\0\0\0>2137-M-2-M-3-M	5	1	1	75	3	1	1	1	
214	S860214	214	PCT-A\0\0\0>2137-M-2-M-4-M	5	1	1	68	3	1	1	1	
215	S860215	215	PCT-A\0\0\0>2137-M-2-M-5-M	5	1	1	70	3	1	1	1	
216	S860216	216	PCT-A\0\0\0>2137-M-2-M-6-M	5	2	1	66	33	1	1	1	
217	S860217	217	PCT-A\0\0\0>2149-M-1-M-1-M	5	1	1	71	3	1	1	1	
218	S860218	218	PCT-A\0\0\0>2149-M-1-M-2-M	5	1	1	74	3	1	1	1	
219	S860219	219	PCT-A\0\0\0>2149-M-1-M-3-M	3	2	2	71	5	1	1	1	
220	S860220	220	PCT-A\0\0\0>2149-M-1-M-4-M	3	2	1	71	5	1	1	1	
221	S860221	221	PCT-A\0\0\0>2149-M-1-M-5-M	3	1	1	74	5	1	1	1	
222	S860222	222	PCT-A\0\0\0>2149-M-1-M-6-M	3	1	1	71	5	1	1	1	
223	S860223	223	PCT-A\0\0\0>2149-M-3-M-1-M	3	2	1	74	5	1	1	1	
224	S860224	224	PCT-A\0\0\0>2149-M-3-M-2-M	5	2	2	81	5	1	1	1	

225	S860225	225	PCT-A\0\0\0>2149-M-3-M-3-M	5	1	1	81	5	1	1	1	
226	S860226	226	PCT-A\0\0\0>2149-M-3-M-4-M	5	1	1	79	5	1	1	1	
227	S860227	227	PCT-A\0\0\0>2149-M-3-M-5-M	5	1	1	83	5	1	1	1	
228	S860228	228	PCT-A\0\0\0>2149-M-3-M-6-M	5	1	1	81	5	1	1	1	
229	S860229	229	PCT-4\0\0\1>1311-M-1-M-1-M	5	1	1	81	5	1	1	1	
230	S860230	230	PCT-4\0\0\1>1311-M-1-M-2-M	5	1	1	80	5	1	1	1	
231	S860231	231	PCT-4\0\0\1>1311-M-1-M-3-M	5	1	1	81	5	1	1	1	
			Oryzica Sabana 6	3	3	3	85	5	1	1	1	
			Linea 30	5	1	1	71	3	1	1	1	
			Oryzica Sabana 10	5	2	2	90	3	1	1	1	
232	S860232	232	PCT-4\0\0\1>1311-M-1-M-4-M	5	2	1	82	3	3	1	1	
233	S860233	233	PCT-4\0\0\0>1311-M-1-M-5-M	5	2	1	83	5	1	1	1	
234	S860234	234	PCT-4\0\01>1311-M-1-M-6-M	5	1	1	79	5	1	1	1	
235	S860235	235	PCT-4\0\0\1>1311-M-2-M-1-M	5	1	1	81	3	1	1	1	6
236	S860236	236	PCT-4\0\0\1>1311-M-2-M-2-M	5	1	1	84	3	1	1	1	
237	S860237	237	PCT-4\0\0\1>1311-M-2-M-3-M	3	2	1	70	3	1	1	1	
238	S860238	238	PCT-4\0\0\1>1311-M-2-M-4-M	3	2	1	71	3	1	1	1	
239	S860239	239	PCT-4\0\0\1>1311-M-2-M-5-M	7	2	1	78	3	1	1	1	
240	S860240	240	PCT-4\0\0\1>1311-M-2-M-6-M	5	2	1	71	3	1	1	1	
241	S860241	241	PCT-4\0\0\1>90-M-2-M-1-M	5	2	1	73	3	1	1	1	
242	S860242	242	PCT-4\0\0\1>90-M-2-M-2-M	5	2	1	75	3	1	1	1	
243	S860243	243	PCT-4\0\0\1>90-M-2-M-3-M	5	2	1	69	3	1	1	1	6
244	S860244	244	PCT-4\0\0\1>90-M-2-M-4-M	5	2	1	70	3	1	1	1	6
245	S860245	245	PCT-4\0\0\1>90-M-2-M-5-M	7	2	1	75	3	1	1	1	6
246	S860246	246	PCT-4\0\0\1>90-M-2-M-6-M	5	2	1	70	3	1	1	1	6
247	S860247	247	PCT-4\0\0\1>106-M-3-M-1-M	5	2	1	69	3	1	1	1	6
248	S860248	248	PCT-4\0\0\1>106-M-3-M-2-M	7	2	1	70	3	1	1	1	
249	S860249	249	PCT-4\0\0\1>106-M-3-M-3-M	5	2	1	71	3	1	1	1	6
250	S860250	250	PCT-4\0\0\1>106-M-3-M-4-M	5	1	1	78	3	3	1	1	
251	S860251	251	PCT-4\0\0\1>106-M-3-M-5-M	5	2	2	79	3	3	1	1	
252	S860252	252	PCT-4\0\0\\1>106-M-3-M-6-M	5	1	2	82	3	3	1	1	
253	S860253	253	PCT-4\0\0\0\1>2435-M-2-M-1-M	5	1	1	71	5	3	1	1	
254	S860254	254	PCT-4\0\0\0\1>2435-M-2-M-2-M	5	1	1	79	3	3	1	1	
255	S860255	255	PCT-4\0\0\0\1>2435-M-2-M-3-M	7	1	1	70	3	1	1	1	6
256	S860256	256	PCT-4\0\0\0\1>2435-M-2-M-4-M	7	1	1	70	3	1	1	1	
257	S860257	257	PCT-4\0\0\0\1>2435-M-2-M-5-M	7	1	2	70	3	3	1	1	
258	S860258	258	PCT-4\0\0\0\1>2435-M-2-M-6-M	7	1	1	71	3	3	3	1	6
			Oryzica Sabana 6	3	3	4	88	3	3	3	1	
			Linea 30	5	1	1	72	3	1	1	1	
			Oryzica Sabana 10	5	3	3	91	3	3	1	1	
259	S860259	259	PCT-4\0\0\0\1>2485-M-1-M-1-M	5	1	1	70	3	3	1	1	6
260	S860260	260	PCT-4\0\0\0\1>2485-M-1-M-2-M	7	1	1	71	3	3	1	1	
261	S860261	261	PCT-4\0\0\0\1>2485-M-1-M-3-M	3	3	4	84	5	1	1	1	
262	S860262	262	PCT-4\0\0\0\1>2485-M-1-M-4-M	3	3	4	84	5	1	1	1	
263	S860263	263	PCT-4\0\0\0\1>2485-M-1-M-5-M	5	3	4	86	5	1	1	1	
264	S860264	264	PCT-4\0\0\0\1>2485-M-1-M-6-M	3	3	4	82	5	1	1	1	6
265	S860265	265	PCT-4\0\0\0\1>2485-M-2-M-1-M	5	3	3	83	5	1	1	1	
266	S860266	266	PCT-4\0\0\0\1>2485-M-2-M-2-M	5	3	3	83	5	1	1	1	6
267	S860267	267	PCT-4\0\0\0\1>2485-M-2-M-3-M	5	4	4	75	3	3	1	1	6
268	S860268	268	PCT-4\0\0\0\1>2485-M-2-M-4-M	5	5	5	76	3	3	1	1	6
269	S860269	269	PCT-4\0\0\0\1>2485-M-2-M-5-M	5	3	3	79	3	3	1	1	
270	S860270	270	PCT-4\0\0\0\1>2485-M-2-M-6-M	5	3	3	77	3	1	1	3	

271	S860271	271	PCT-4\0\0\0\1>2485-M-3-M-1-M	5	2	3	77	3	1	1	1	6
272	S860272	272	PCT-4\0\0\0\1>2485-M-3-M-2-M	7	2	2	79	3	1	1	1	
273	S860273	273	PCT-4\0\0\0\1>2485-M-3-M-3-M	5	2	2	74	3	1	1	1	6
274	S860274	274	PCT-4\0\0\0\1>2485-M-3-M-4-M	5	1	2	75	3	1	1	1	6
275	S860275	275	PCT-4\0\0\0\1>2485-M-3-M-5-M	7	1	1	80	1	1	1	1	
276	S860276	276	PCT-4\0\0\0\1>2485-M-3-M-6-M	5	1	1	75	1	1	1	1	
277	S860277	277	PCT-4\0\0\0\1>2486-M-1-M-1-M	5	1	1	75	1	1	1	1	6
278	S860278	278	PCT-4\0\0\0\1>2486-M-1-M-2-M	7	1	1	75	1	1	1	1	
279	S860279	279	PCT-4\0\0\0\1>2486-M-1-M-3-M	5	1	1	81	1	1	1	1	
280	S860280	280	PCT-4\0\0\0\1>2486-M-1-M-4-M	5	1	1	79	3	1	1	1	
281	S860281	281	PCT-4\0\0\0\1>2486-M-1-M-5-M	7	1	1	83	3	1	1	1	
282	S860282	282	PCT-4\0\0\0\1>2486-M-1-M-6-M	7	1	1	85	3	1	1	1	

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration; Sel = plant selection.

Table 10. S6 lines selected from the populations PCT-5\0\0\0;; PCT-A\0\0\0; and PCT-4\0\0\1
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBI
1	S860003	3	PCT-5\0\0\0>1496-M-1-M-3-M	5	2	2	77%	3	1	1	1
2	S860022	22	PCT-A\0\0\0>175-M-1-M-4-M	7	3	2	66	1	1	1	1
3	S860023	23	PCT-A\0\0\0>175-M-1-M-5-M	7	3	2	68	1	1	1	1
4	S860025	25	PCT-A\0\0\0>175-M-3-M-1-M	7	3	2	66	1	1	1	1
5	S860027	27	PCT-A\0\0\0>175-M-3-M-3-M	5	3	2	70	3	1	1	1
6	S860028	28	PCT-A\0\0\0>175-M-3-M-4-M	5	2	1	70	3	1	1	1
7	S860034	34	PCT-A\0\0\0>175-M-4-M-4-M	7	2	1	71	1	1	1	1
8	S860035	35	PCT-A\0\0\0>175-M-4-M-5-M	7	1	1	75	1	1	1	1
9	S860037	37	PCT-A\0\0\0>175-M-6-M-1-M	5	1	1	72	1	1	1	1
10	S860050	50	PCT-A\0\0\0>189-M-2-M-2-M	7	2	1	85	3	1	1	1
11	S860063	63	PCT-A\0\0\0>189-M-4-M-3-M	3	3	2	79	5	1	1	1
12	S860064	64	PCT-A\0\0\0>189-M-4-M-4-M	3	4	3	79	5	1	1	1
13	S860065	65	PCT-A\0\0\0>189-M-4-M-5-M	3	4	4	79	5	3	1	1
14	S860066	66	PCT-A\0\0\0>189-M-4-M-6-M	3	4	4	79	5	3	1	1
15	S860067	67	PCT-A\0\0\0>278-M-1-M-1-M	3	3	3	79	5	1	1	1
16	S860068	68	PCT-A\0\0\0>278-M-1-M-2-M	3	3	3	79	5	1	1	1
17	S860073	73	PCT-A\0\0\0>394-M-1-M-1-M	5	3	3	82	3	1	1	1
18	S860076	76	PCT-A\0\0\0>394-M-1-M-4-M	5	2	2	75	3	1	1	1
19	S860077	77	PCT-A\0\0\0>394-M-1-M-5-M	5	2	3	82	3	1	1	1
20	S860079	79	PCT-A\0\0\0>394-M-2-M-1-M	5	2	3	79	3	1	1	1
21	S860080	80	PCT-A\0\0\0>394-M-2-M-2-M	5	2	2	84	3	1	1	1
22	S860081	81	PCT-A\0\0\0>394-M-2-M-3-M	5	3	2	79	3	1	1	1
23	S860085	85	PCT-A\0\0\0>503-M-1-M-1-M	5	2	2	81	1	1	1	1
24	S860094	94	PCT-A\0\0\0>1169-M-1-M-4-M	3	2	1	71	3	1	1	1
25	S860098	98	PCT-A\0\0\0>1169-M-2-M-2-M	5	2	1	70	1	1	1	1
26	S860106	106	PCT-A\0\0\0>1321-M-2-M-4-M	5	1	1	69	3	1	1	1
27	S860110	110	PCT-A\0\0\0>1452-M-1-M-2-M	5	1	1	68	1	1	1	1
28	S860118	118	PCT-A\0\0\0>1485-M-1-M-4-M	3	1	1	70	1	1	3	1
29	S860119	119	PCT-A\0\0\0>1485-M-1-M-5-M	5	1	1	78	1	1	1	1
30	S860121	121	PCT-A\0\0\0>1488-M-4-M-1-M	5	2	1	75	1	1	1	1
31	S860124	124	PCT-A\0\0\0>1488-M-4-M-4-M	3	3	3	84	3	1	1	1
32	S860125	125	PCT-A\0\0\0>1488-M-4-M-5-M	7	2	1	87	3	1	1	1
33	S860127	127	PCT-A\0\0\0>1488-M-5-M-1-M	5	2	2	84	3	1	1	1
34	S860130	130	PCT-A\0\0\0>1488-M-5-M-4-M	5	1	1	70	1	1	1	1
35	S860142	142	PCT-A\0\0\0>1674-M-2-M-4-M	5	2	1	71	3	1	1	1
36	S860147	147	PCT-A\0\0\0>1674-M-6-M-3-M	5	3	3	70	3	1	1	1
37	S860150	150	PCT-A\0\0\0>1674-M-6-M-6-M	5	3	2	71	3	1	1	1
38	S860152	152	PCT-A\0\0\0>1788-M-2-M-2-M	9	4	4	83	1	1	1	1
39	S860184	184	PCT-A\0\0\0>1955-M-3-M-4-M	3	2	1	78	5	1	1	1
40	S860202	202	PCT-A\0\0\0>2083-M-1-M-4-M	5	1	1	66	3	1	1	1
41	S860203	203	PCT-A\0\0\0>2083-M-1-M-5-M	7	1	1	68	3	1	1	1
42	S860204	204	PCT-A\0\0\0>2083-M-1-M-6-M	5	1	1	67	3	1	1	1
43	S860205	205	PCT-A\0\0\0>2083-M-2-M-1-M	5	1	1	64	3	1	1	1
44	S860207	207	PCT-A\0\0\0>2083-M-2-M-3-M	3	1	1	63	3	1	1	1
45	S860208	208	PCT-A\0\0\0>2083-M-2-M-4-M	5	1	1	67	3	1	1	1
46	S860235	235	PCT-4\0\0\0>1311-M-2-M-1-M	5	1	1	81	3	1	1	1
47	S860243	243	PCT-4\0\0\0>90-M-2-M-3-M	5	2	1	69	3	1	1	1
48	S860244	244	PCT-4\0\0\0>90-M-2-M-4-M	5	2	1	70	3	1	1	1
49	S860245	245	PCT-4\0\0\0>90-M-2-M-5-M	7	2	1	75	3	1	1	1
50	S860246	246	PCT-4\0\0\0>90-M-2-M-6-M	5	2	1	70	3	1	1	1

51	S860247	247	PCT-4\0\0\0>106-M-3-M-1-M	5	2	1	69	3	1	1	1
52	S860249	249	PCT-4\0\0\0>106-M-3-M-3-M	5	2	1	71	3	1	1	1
53	S860255	255	PCT-4\0\0\0\1>2435-M-2-M-3-M	7	1	1	70	3	1	1	1
54	S860258	258	PCT-4\0\0\0\1>2435-M-2-M-6-M	7	1	1	71	3	3	3	1
55	S860259	259	PCT-4\0\0\0\1>2485-M-1-M-1-M	5	1	1	70	3	3	1	1
56	S860264	264	PCT-4\0\0\0\1>2485-M-1-M-6-M	3	3	4	82	5	1	1	1
57	S860266	266	PCT-4\0\0\0\1>2485-M-2-M-2-M	5	3	3	83	5	1	1	1
58	S860267	267	PCT-4\0\0\0\1>2485-M-2-M-3-M	5	4	4	75	3	3	1	1
59	S860268	268	PCT-4\0\0\0\1>2485-M-2-M-4-M	5	5	5	76	3	3	1	1
60	S860271	271	PCT-4\0\0\0\1>2485-M-3-M-1-M	5	2	3	77	3	1	1	1
61	S860273	273	PCT-4\0\0\0\1>2485-M-3-M-3-M	5	2	2	74	3	1	1	1
62	S860274	274	PCT-4\0\0\0\1>2485-M-3-M-4-M	5	1	2	75	3	1	1	1
63	S860277	277	PCT-4\0\0\0\1>2486-M-1-M-1-M	5	1	1	75	1	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot; NBl = neck blast; Gd = grain discoloration.

Table 11. S6 line evaluation from the population PCT-4\0\0\1>S2
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S860283	283	PCT-4\0\0\1>S2-41-1-M-1-M	5	1	1	85	3	1	1	1
2	S860284	284	PCT-4\0\0\1>S2-41-1-M-2-M	5	1	1	85	3	1	1	1
3	S860285	285	PCT-4\0\0\1>S2-41-1-M-3-M	5	2	1	76	5	1	1	1
4	S860286	286	PCT-4\0\0\1>S2-41-1-M-4-M	5	2	1	76	3	1	1	1
5	S860287	287	PCT-4\0\0\1>S2-41-1-M-5-M	5	1	1	81	3	1	1	1
6	S860288	288	PCT-4\0\0\1>S2-41-1-M-6-M	5	1	1	76	3	1	1	1
7	S860289	289	PCT-4\0\0\1>S2-41-2-M-1-M	5	2	2	75	3	1	1	1
8	S860290	290	PCT-4\0\0\1>S2-41-2-M-2-M	5	1	1	83	3	1	1	1
9	S860291	291	PCT-4\0\0\1>S2-41-2-M-3-M	5	1	1	81	3	1	1	1
10	S860292	292	PCT-4\0\0\1>S2-41-2-M-4-M	5	1	1	74	3	1	1	1
11	S860293	293	PCT-4\0\0\1>S2-41-2-M-5-M	5	1	1	79	3	1	1	1
12	S860294	294	PCT-4\0\0\1>S2-41-2-M-6-M	5	1	1	78	3	1	1	1
13	S860295	295	PCT-4\0\0\1>S2-1532-1-M-1-M	5	1	1	76	3	1	1	1
14	S860296	296	PCT-4\0\0\1>S2-1532-1-M-2-M	5	2	1	79	3	1	1	1
15	S860297	297	PCT-4\0\0\1>S2-1532-1-M-3-M	5	2	1	77	3	1	1	1
16	S860298	298	PCT-4\0\0\1>S2-1532-1-M-4-M	5	2	1	80	3	1	1	1
17	S860299	299	PCT-4\0\0\1>S2-1532-1-M-5-M	5	1	1	82	3	3	1	1
18	S860300	300	PCT-4\0\0\1>S2-1532-1-M-6-M	5	1	1	78	5	1	1	1
19	S860301	301	PCT-4\0\0\1>S2-1803-3-M-1-M	5	1	1	78	5	1	1	1
20	S860302	302	PCT-4\0\0\1>S2-1803-3-M-2-M	5	2	1	82	5	3	1	1
21	S860303	303	PCT-4\0\0\1>S2-1803-3-M-3-M	5	1	1	78	5	3	1	1
22	S860304	304	PCT-4\0\0\1>S2-1803-3-M-4-M	5	1	1	77	3	1	1	1
23	S860305	305	PCT-4\0\0\1>S2-1803-3-M-5-M	5	1	1	78	3	1	1	1
24	S860306	306	PCT-4\0\0\1>S2-1803-3-M-6-M	5	1	1	76	3	1	1	1
25	S860307	307	PCT-4\0\0\1>S2-2324-2-M-1-M	5	1	1	77	3	1	1	1
26	S860308	308	PCT-4\0\0\1>S2-2324-2-M-2-M	5	1	1	80	3	1	1	1
27	S860309	309	PCT-4\0\0\1>S2-2324-2-M-3-M	5	1	1	77	3	1	1	1
28	S860310	310	PCT-4\0\0\1>S2-2324-2-M-4-M	3	1	1	74	3	1	1	1
29	S860311	311	PCT-4\0\0\1>S2-2324-2-M-5-M	7	1	1	80	3	3	1	1
30	S860312	312	PCT-4\0\0\1>S2-2324-2-M-6-M	5	2	1	75	3	3	1	1
			Oryzica Sabana 6	5	4	4	87	5	3	1	1
			Linea 30	5	1	1	74	3	1	1	1
			Oryzica Sabana 10	5	3	3	93	5	3	1	1
31	S860313	313	PCT-4\0\0\1>S2-2324-3-M-1-M	3	1	1	70	3	1	1	1
32	S860314	314	PCT-4\0\0\1>S2-2324-3-M-2-M	5	1	1	79	3	1	1	1
33	S860315	315	PCT-4\0\0\1>S2-2324-3-M-3-M	3	3	2	71	3	1	1	1
34	S860316	316	PCT-4\0\0\1>S2-2324-3-M-4-M	5	2	1	70	3	1	1	1
35	S860317	317	PCT-4\0\0\1>S2-2324-3-M-5-M	5	2	1	79	3	1	1	1
36	S860318	318	PCT-4\0\0\1>S2-2324-3-M-6-M	3	2	1	73	3	1	1	1
37	S860319	319	PCT-4\0\0\1>S2-2324-4-M-1-M	3	1	1	71	3	1	1	1
38	S860320	320	PCT-4\0\0\1>S2-2324-4-M-2-M	3	1	1	75	3	1	1	1
39	S860321	321	PCT-4\0\0\1>S2-2324-4-M-3-M	5	2	1	71	3	1	1	1
40	S860322	322	PCT-4\0\0\1>S2-2324-4-M-4-M	5	2	1	71	3	1	1	1
41	S860323	323	PCT-4\0\0\1>S2-2324-4-M-5-M	5	1	1	78	1	1	1	1
42	S860324	324	PCT-4\0\0\1>S2-2324-4-M-6-M	5	1	1	75	1	1	1	1

43	S860325	325	PCT-4\0\0\1>S2-2324-5-M-1-M	5	1	1	78	1	1	1	1
44	S860326	326	PCT-4\0\0\1>S2-2324-5-M-2-M	5	1	1	79	1	3	1	1
45	S860327	327	PCT-4\0\0\1>S2-2324-5-M-3-M	5	1	1	78	3	1	1	1
46	S860328	328	PCT-4\0\0\1>S2-2324-5-M-4-M	5	1	1	79	3	1	1	1
47	S860329	329	PCT-4\0\0\1>S2-2324-5-M-5-M	7	1	1	85	1	3	1	1
48	S860330	330	PCT-4\0\0\1>S2-2324-5-M-6-M	5	1	1	71	3	1	1	1
49	S860331	331	PCT-4\0\0\1>S2-2358-2-M-1-M	5	1	1	71	3	1	1	1
50	S860332	332	PCT-4\0\0\1>S2-2358-2-M-2-M	7	1	1	79	3	3	1	1
51	S860333	333	PCT-4\0\0\1>S2-2358-2-M-3-M	5	1	1	75	3	3	1	1
52	S860334	334	PCT-4\0\0\1>S2-2358-2-M-4-M	5	1	1	74	3	1	1	1
53	S860335	335	PCT-4\0\0\1>S2-2358-2-M-5-M	7	1	1	77	3	3	1	1
54	S860336	336	PCT-4\0\0\1>S2-2358-2-M-6-M	5	1	1	79	3	1	1	1
55	S860337	337	PCT-4\0\0\1>S2-227-3-M-1-M	5	1	1	80	3	3	1	1
56	S860338	338	PCT-4\0\0\1>S2-227-3-M-2-M	7	2	1	82	3	3	1	1
57	S860339	339	PCT-4\0\0\1>S2-227-3-M-3-M	5	1	1	71	3	3	1	1
			Oryzica Sabana 6	3	3	4	85	3	1	1	1
			Linea 30	3	1	1	70	3	1	1	1
			Oryzica Sabana 10	5	2	3	91	3	1	1	1
58	S860340	340	PCT-4\0\0\1>S2-227-3-M-4-M	5	1	1	71	3	3	1	1
59	S860341	341	PCT-4\0\0\1>S2-227-3-M-5-M	5	1	1	76	3	1	1	1
60	S860342	342	PCT-4\0\0\1>S2-227-3-M-6-M	3	1	1	71	3	3	1	1
61	S860343	343	PCT-4\0\0\1>S2-227-4-M-1-M	3	1	1	71	3	3	1	1
62	S860344	344	PCT-4\0\0\1>S2-227-4-M-2-M	5	2	1	75	3	1	1	1
63	S860345	345	PCT-4\0\0\1>S2-227-4-M-3-M	5	1	1	75	3	1	1	1
64	S860346	346	PCT-4\0\0\1>S2-227-4-M-4-M	5	1	1	70	3	1	1	1
65	S860347	347	PCT-4\0\0\1>S2-227-4-M-5-M	5	1	1	89	3	1	1	1
66	S860348	348	PCT-4\0\0\1>S2-227-4-M-6-M	5	2	1	75	3	1	1	1
67	S860349	349	PCT-4\0\0\1>S2-1584-1-M-1-M	5	1	1	78	3	1	1	1
68	S860350	350	PCT-4\0\0\1>S2-1584-1-M-2-M	5	1	2	79	3	1	1	1
69	S860351	351	PCT-4\0\0\1>S2-1584-1-M-3-M	5	1	2	88	3	1	1	1
70	S860352	352	PCT-4\0\0\1>S2-1584-1-M-4-M	5	2	3	89	3	1	1	1
71	S860353	353	PCT-4\0\0\1>S2-1584-1-M-5-M	5	2	3	88	3	1	1	1
72	S860354	354	PCT-4\0\0\1>S2-1584-1-M-6-M	5	2	4	89	3	1	1	1
73	S860355	355	PCT-4\0\0\1>S2-1584-4-M-1-M	5	3	4	88	3	1	1	1
74	S860356	356	PCT-4\0\0\1>S2-1584-4-M-2-M	5	2	3	88	3	1	1	1
75	S860357	357	PCT-4\0\0\1>S2-1584-4-M-3-M	5	2	2	85	3	1	1	1
76	S860358	358	PCT-4\0\0\1>S2-1584-4-M-4-M	3	4	4	83	3	1	1	1
77	S860359	359	PCT-4\0\0\1>S2-1584-4-M-5-M	5	2	3	84	3	1	1	1
78	S860360	360	PCT-4\0\0\1>S2-1584-4-M-6-M	3	3	4	81	3	1	1	1
79	S860361	361	PCT-4\0\0\1>S2-2197-3-M-1-M	5	2	3	80	3	3	1	1
80	S860362	362	PCT-4\0\0\1>S2-2197-3-M-2-M	5	2	4	83	3	3	1	1
81	S860363	363	PCT-4\0\0\1>S2-2197-3-M-3-M	5	1	2	76	3	1	1	1
82	S860364	364	PCT-4\0\0\1>S2-2197-3-M-4-M	5	1	2	83	3	1	1	1
83	S860365	365	PCT-4\0\0\1>S2-2197-3-M-5-M	5	1	1	83	3	1	1	1
84	S860366	366	PCT-4\0\0\1>S2-2197-3-M-6-M	5	1	1	77	3	1	1	1
85	S860367	367	PCT-4\0\0\1>S2-2145-5-M-1-M	5	1	2	79	3	1	1	1
86	S860368	368	PCT-4\0\0\1>S2-2145-5-M-2-M	5	1	2	82	5	1	1	1
87	S860369	369	PCT-4\0\0\1>S2-2145-5-M-3-M	5	1	2	85	3	3	1	1
			Oryzica Sabana 6	3	3	3	85	5	1	1	1
			Linea 30	7	1	1	75	3	1	1	1
			Oryzica Sabana 10	5	2	3	90	3	1	1	1
			Oryzica Sabana 6	3	3	3	86	5	1	3	1

			Linea 30	5	1	1	75	5	1	3	1
			Oryzica Sabana 10	5	3	3	91	5	1	1	1
88	S860370	370	PCT-4\0\0\1>S2-2145-5-M-4-M	3	1	2	85	3	1	1	1
89	S860371	371	PCT-4\0\0\1>S2-2145-5-M-5-M	5	1	2	85	3	1	1	1
90	S860372	372	PCT-4\0\0\1>S2-2145-5-M-6-M	3	1	2	86	3	1	1	1
91	S860373	373	PCT-4\0\0\1>S2-1038-1-M-1-M	5	1	2	86	3	1	1	1
92	S860374	374	PCT-4\0\0\1>S2-1038-1-M-2-M	5	1	2	86	3	1	1	1
93	S860375	375	PCT-4\0\0\1>S2-1038-1-M-3-M	5	1	2	86	3	1	1	1
94	S860376	376	PCT-4\0\0\1>S2-1038-1-M-4-M	5	1	2	86	3	1	1	1
95	S860377	377	PCT-4\0\0\1>S2-1038-1-M-5-M	5	1	1	87	3	1	1	1
96	S860378	378	PCT-4\0\0\1>S2-1038-1-M-6-M	5	2	2	84	3	1	1	1
97	S860379	379	PCT-4\0\0\1>S2-41-1-1-1-M	5	1	1	85	3	1	1	1
98	S860380	380	PCT-4\0\0\1>S2-41-1-1-2-M	5	1	2	85	3	1	1	1
99	S860381	381	PCT-4\0\0\1>S2-41-1-1-3-M	5	3	3	86	3	1	3	1
100	S860382	382	PCT-4\0\0\1>S2-41-1-1-4-M	5	1	1	89	3	1	1	1
101	S860383	383	PCT-4\0\0\1>S2-41-1-1-5-M	5	2	2	88	3	1	1	1
102	S860384	384	PCT-4\0\0\1>S2-41-1-1-6-M	5	2	2	86	3	1	1	1
103	S860385	385	PCT-4\0\0\1>S2-41-2-1-1-M	5	1	2	88	3	1	1	1
104	S860386	386	PCT-4\0\0\1>S2-41-2-1-2-M	5	1	2	88	3	1	1	1
105	S860387	387	PCT-4\0\0\1>S2-41-2-1-3-M	5	1	2	89	3	1	1	1
106	S860388	388	PCT-4\0\0\1>S2-41-2-1-4-M	5	1	2	89	3	1	1	1
107	S860389	389	PCT-4\0\0\1>S2-41-2-1-5-M	5	1	2	89	3	1	1	1
108	S860390	390	PCT-4\0\0\1>S2-41-2-1-6-M	5	1	2	89	3	1	1	1
109	S860391	391	PCT-4\0\0\1>S2-41-2-2-1-M	5	1	2	89	3	1	3	1
110	S860392	392	PCT-4\0\0\1>S2-41-2-2-2-M	7	1	1	90	3	1	1	1
111	S860393	393	PCT-4\0\0\1>S2-41-2-2-3-M	7	1	1	77	3	1	1	1
112	S860394	394	PCT-4\0\0\1>S2-41-2-2-4-M	7	2	1	71	3	1	1	1
113	S860395	395	PCT-4\0\0\1>S2-41-2-2-5-M	7	1	1	79	3	1	1	1
114	S860396	396	PCT-4\0\0\1>S2-41-2-2-6-M	5	2	1	76	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 12. Selected lines in the population PCT-4\0\0\1>S2
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S860286	286	PCT-4\0\0\1>S2-41-1-M-4-M	5	2	1	76	3	1	1	1
2	S860288	288	PCT-4\0\0\1>S2-41-1-M-6-M	5	1	1	76	3	1	1	1
3	S860303	303	PCT-4\0\0\1>S2-1803-3-M-3-M	5	1	1	78	5	3	1	1
4	S860304	304	PCT-4\0\0\1>S2-1803-3-M-4-M	5	1	1	77	3	1	1	1
5	S860319	319	PCT-4\0\0\1>S2-2324-4-M-1-M	3	1	1	71	3	1	1	1
6	S860358	358	PCT-4\0\0\1>S2-1584-4-M-4-M	3	4	4	83	3	1	1	1
7	S860359	359	PCT-4\0\0\1>S2-1584-4-M-5-M	5	2	3	84	3	1	1	1
8	S860360	360	PCT-4\0\0\1>S2-1584-4-M-6-M	3	3	4	81	3	1	1	1
9	S860363	363	PCT-4\0\0\1>S2-2197-3-M-3-M	5	1	2	76	3	1	1	1
10	S860366	366	PCT-4\0\0\1>S2-2197-3-M-6-M	5	1	1	77	3	1	1	1
11	S860376	376	PCT-4\0\0\1>S2-1038-1-M-4-M	5	1	2	86	3	1	1	1
12	S860378	378	PCT-4\0\0\1>S2-1038-1-M-6-M	5	2	2	84	3	1	1	1
13	S860393	393	PCT-4\0\0\1>S2-41-2-2-3-M	7	1	1	77	3	1	1	1
14	S860394	394	PCT-4\0\0\1>S2-41-2-2-4-M	7	2	1	71	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 13. S6 line evaluation of the population PCT-4\0\0\1
(selection of S3 plants at PES, 1996B)
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S860379	379	PCT-4\0\0\1>S2-41-1-1-1-M	5	1	1	85	3	1	1	1
2	S860380	380	PCT-4\0\0\1>S2-41-1-1-2-M	5	1	2	85	3	1	1	1
3	S860381	381	PCT-4\0\0\1>S2-41-1-1-3-M	5	3	3	86	3	1	3	1
4	S860382	382	PCT-4\0\0\1>S2-41-1-1-4-M	5	1	1	89	3	1	1	1
5	S860383	383	PCT-4\0\0\1>S2-41-1-1-5-M	5	2	2	88	3	1	1	1
6	S860384	384	PCT-4\0\0\1>S2-41-1-1-6-M	5	2	2	86	3	1	1	1
7	S860385	385	PCT-4\0\0\1>S2-41-2-1-1-M	5	1	2	88	3	1	1	1
8	S860386	386	PCT-4\0\0\1>S2-41-2-1-2-M	5	1	2	88	3	1	1	1
9	S860387	387	PCT-4\0\0\1>S2-41-2-1-3-M	5	1	2	89	3	1	1	1
10	S860388	388	PCT-4\0\0\1>S2-41-2-1-4-M	5	1	2	89	3	1	1	1
11	S860389	389	PCT-4\0\0\1>S2-41-2-1-5-M	5	1	2	89	3	1	1	1
12	S860390	390	PCT-4\0\0\1>S2-41-2-1-6-M	5	1	2	89	3	1	1	1
13	S860391	391	PCT-4\0\0\1>S2-41-2-2-1-M	5	1	2	89	3	1	3	1
14	S860392	392	PCT-4\0\0\1>S2-41-2-2-2-M	7	1	1	90	3	1	1	1
15	S860393	393	PCT-4\0\0\1>S2-41-2-2-3-M	7	1	1	77	3	1	1	1
16	S860394	394	PCT-4\0\0\1>S2-41-2-2-4-M	7	2	1	71	3	1	1	1
17	S860395	395	PCT-4\0\0\1>S2-41-2-2-5-M	7	1	1	79	3	1	1	1
18	S860396	396	PCT-4\0\0\1>S2-41-2-2-6-M	5	2	1	76	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 14. S6 lines selected from the population PCT-4\0\0\1
(selection of S3 plants at PES, 1996B)
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S860393	393	PCT-4\0\0\1>S2-41-2-2-3-M	7	1	1	77	3	1	1	1
2	S860394	394	PCT-4\0\0\1>S2-41-2-2-4-M	7	2	1	71	3	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration.

Table 15. INGER – LAC: VIOAL Nursery for Acid Soils, 1998

Cons.	Pedigree	Vg.	Bl 1	Bl 2	AC	NBl	Fl (50%)	LSc	BS	VHB	Gd	Ht	G.T	W.B.	S.T	Amyl. (%)	White rice (%)	Head rice (%)
1	CNA-IRAT-5\SA\0\3>127-2-M-1-M-2	3	1	2	1	1	63	1	1	1	1	104	I	0.6	L	29	80.14	65.76
2	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-1	5	1	1	1	1	66	1	1	9	1	102	H	0.8	L	22	69.40	62.95
3	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-2	3	1	1	1	1	66	1	1	9	1	99	H	1.2	L	22	73.88	67.10
4	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-5	3	1	1	1	1	65	1	1	9	1	108	H	2.2	L	20	66.72	59.61
5	CNA-IRAT-A\SA\0\3>1-M-2-M-2-M-1	3	1	1	1	1	63	1	1	9	1	112	H	2.0	L	22	71.29	63.15
6	CNA-IRAT-A\SA\0\3>1-M-2-M-2-M-4	3	1	1	1	1	65	1	1	9	1	105	H	1.2	L	24	65.67	58.30
7	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-2	3	1	1	1	1	65	1	1	9	1	112	H	1.6	L	20	67.58	58.56
8	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-4	5	1	1	1	1	65	1	1	9	1	113	H	1.0	L	23	70.20	63.50
9	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-5	5	1	1	1	1	65	1	1	9	1	112	H	1.8	L	22	71.64	65.38
10	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-2	3	1	1	1	1	66	3	1	9	1	97	H	1.6	L	23	72.99	65.89
11	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-3	1	1	1	1	1	68	3	1	9	1	95	H	1.2	L	21	72.15	67.10
12	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-4	3	1	1	1	1	69	1	1	9	1	95	H	1.2	L	22	74.24	67.95
13	CNAx3608-6-1-2-2-1-M-M	3	1	2	1	1	68	1	1	9	1	112	-	0.1	EL			
14	CANx3619-3-1-B-2-M-M	3	3	4	1	1	86	3	1	9	1	102	I	1.2	L			
15	CNAx4754-80-B-M-7-M-M	3	1	2	1	1	66	1	1	9	1	97	-	0.6	EL			
16	CNAx4754-128-B-M-4-M	3	1	1	1	1	74	1	1	9	1	95	H	1.0	L			
17	CNAx4754-61-B-M-20-M	3	1	1	1	1	91	3	1	9	1	104	H	0.4	L			
18	CT13480-M-16-1-M-M	3	1	1	1	1	86	3	1		3	63	-	-	-			
19	CT13480-M-10-1-M-M	1	1	2	1	1	94	5	1		3	68	B	0.6	L			
20	CT13488-M-9-2-M-M	1	1	1	1	1	85	3	1		3	69	I	1.2	L			
21	CT13503-M-3-1-M-M	1	1	3	1	1	85	3	3		3	88	BI	0.8	L			
22	CT13503-M-13-1-M-M	3	2	2	1	3	86	5	3		5	76	B	0.2	L			
23	CT13503-M-18-1-M-M	3	1	1	1	1	85	5	1		5	78	I	0.6	L			
24	CT13503-M-18-2-M-M	1	1	1	1	1	86	5	3		5	76	-	1.0	L			
25	CT13503-M-18-3-M-M	1	1	1	1	1	86	5	3		5	74	-	2.0	EL			
26	CIRAD 409	1	1	1	1	1	62	3	1		1	91	I	1.2	L	24	71.06	66.60
27	CIRAD 410	3	3	3	1	1	67	3	5		1	87	I	3.8	M	24	85.20	65.86
28	CIRAD 411	5	3	3	1	1	70	3	3		1	102	HI	2.8	L	17	87.25	55.32
29	ORYZICA SABANA 6	3	3	4	1	1	82	5	1		1	106	I	2.2	L	26	73.04	55.67
30	ORYZICA SABANA 10	3	2	1	1	1	86	3	1		1	106	H	1.2	L	23	71.53	61.73
31	IRAT 216	4	7	2	1	1	87	3	3			85						

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; AC = acid soil reaction; FI = flowering; LSc = leaf scald; BS = brown spot; NBl = neck blast; Gd = grain discoloration; Sel. = number selected; Ht = height (cm). G.T. = Gelatinization temperature; W.B. = white belly; Amyl. = amylose content.

Table 16. INGER LAC, VIOAL Nursery for SUELOS ACIDOS- Evaluation in Colombia
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Ht	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl	Hum %	Rto. Kg/ha
1	S870001	1	CNA-IRAT-5\SA\0\3>127-2-M-1-M-2	5		1	3	66	1	1	1	1	16.3	1433.68
2	S870002	2	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-1	7		1	2	71	1	1	1	1	15.9	1015.52
3	S870003	3	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-2	7	97	1	2	75	1	1	1	1	16.3	1127.85
4	S870004	4	CNA-IRAT-A\SA\0\3>1-M-2-M-1-M-5	7	97	2	2	74	1	1	1	1	15	1054.52
5	S870005	5	CNA-IRAT-A\SA\0\3>1-M-2-M-2-M-1	7	95	2	1	71	1	1	1	1	15.4	1410.50
6	S870006	6	CNA-IRAT-A\SA\0\3>1-M-2-M-2-M-4	7	98	1	1	74	1	1	1	1	15	1189.85
7	S870007	7	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-2	7	100	1	1	74	1	1	1	1	14.3	973.52
8	S870008	8	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-4	7	97	1	1	73	1	1	1	1	14.3	1033.69
9	S870009	9	CNA-IRAT-A\SA\0\3>1-M-2-M-3-M-5	7	113	1	1	77	1	1	1	1	15	1033.99
10	S870010	10	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-2	7	100	1	1	81	1	3	1	1	15	980.01
11	S870011	11	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-3	7	112	2	1	80	1	3	1	1	14.3	854.70
12	S870012	12	CNA-IRAT-A\SA\0\3>1-M-2-M-4-M-4	7	96	2	1	81	1	3	1	1	15.4	1145.66
13	S870013	13	CNAx3608-6-1-2-2-1-M-M	7	88	2	1	74	1	1	1	1	15.4	1582.28
14	S870014	14	CANx3619-3-1-B-2-M-M	7	92	3	3	94	3	3	1	1	16.3	877.80
15	S870015	15	CNAx4754-80-B-M-7-M-M	7	108	2	1	75	3	1	1	1	15.4	1614.06
16	S870016	16	CNAx4754-128-B-M-4-M	7	99	2	1	81	3	1	1	1	15	1975.60
17	S870017	17	CNAx4754-61-B-M-20-M	7	110	1	1	94	3	1	1	1	17.3	1811.93
18	S870018	18	CT13480-M-16-1-M-M	5	104	1	1	89	5	3	1	1	16.3	1965.60
19	S870019	19	CT13480-M-10-1-M-M	7	112	1	3	92	5	1	1	1	14.3	1245.64
20			Oryzica Sabana 6	7	85	3	3	86	5	3	1	1	17.3	2190.66
21			Linea 30	5	74	1	1	73	3	1	1	1	16.9	2202.74
22			Oryzica Sabana 10	5	112	2	2	87	3	3	1	1	16.9	1426.38
23	S870020	20	CT13488-M-9-2-M-M	5	96	1	1	86	3	3	3	1	15.9	1820.04
24	S870021	21	CT13503-M-3-1-M-M	5	97	1	1	88	3	3	3	3	16.9	2047.77
25	S870022	22	CT13503-M-13-1-M-M	5	80	1	1	90	3	3	1	3	14.3	2275.11
26	S870023	23	CT13503-M-18-1-M-M	7	81	1	1	90	3	1	5	3	16.3	1918.06
27	S870024	24	CT13503-M-18-2-M-M	7	82	1	1	88	3	1	3	1	15.4	1600.44
28	S870025	25	CT13503-M-18-3-M-M	7	81	1	1	90	3	1	1	1	14.3	2200.37
29	S870026	26	CIRAD 409	5	90	1	1	71	3	1	1	1	16.3	1706.19
30	S870027	27	CIRAD 410	5	85	1	1	71	3	1	1	1	15.9	1148.66
31	S870028	28	CIRAD 411	5	87	2	1	75	3	3	3	1	15.9	999.35
32	S870029	29	ORYZICA SABANA 6	5	103	3	3	89	3	3	2	1	17.7	1799.48
33	S870030	30	ORYZICA SABANA 10	5	85	2	2	89	5	1	1	1	20.1	1032.70

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration, Ht = plant height; Hum = grain humidity; Rdo = grain yield.

Table 17. Evaluationof Advanced lines from the population PCT-3
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl	Sel.
1	S880001	1	CT13480-M-10-1-M-M-1	5	2	2	91	3	1	1	1	M
2	S880002	2	CT13480-M-10-1-M-M-2	5	3	4	93	5	1	1	3	M
3	S880003	3	CT13503-M-18-1-M-M-1	5	1	1	86	3	3	1	1	M
4	S880004	4	CT13503-M-18-2-M-M-1	5	1	2	85	3	5	3	5	M

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration; Sel = mass selection.

Tabl 18. S2 lines selected for recombination from the population PCT-4\SA\1\1
after statistical analysis of the Augmented Designs trial
LA Libertad experimental station, 1998A

Nbr.	Origin 1998A	Origin 1997B	Pedigree	Nbr.	Origin 1998A	Origin 1997B	Pedigree
1	890011	11	PCT-4\SA\1\1>162	31	890098	98	PCT-4\SA\1\1>1145
2	890015	15	PCT-4\SA\1\1>193	32	890099	99	PCT-4\SA\1\1>1155
3	890017	17	PCT-4\SA\1\1>195	33	890101	101	PCT-4\SA\1\1>1156
4	890019	19	PCT-4\SA\1\1>223	34	890103	103	PCT-4\SA\1\1>1199
5	890020	20	PCT-4\SA\1\1>230	35	890105	105	PCT-4\SA\1\1>1206
6	890021	21	PCT-4\SA\1\1>236	36	890109	109	PCT-4\SA\1\1>1259
7	890022	22	PCT-4\SA\1\1>241	37	890110	110	PCT-4\SA\1\1>1260
8	890029	29	PCT-4\SA\1\1>305	38	890119	119	PCT-4\SA\1\1>1358
9	890038	38	PCT-4\SA\1\1>428	39	890121	121	PCT-4\SA\1\1>1377
10	890047	47	PCT-4\SA\1\1>503	40	890122	122	PCT-4\SA\1\1>1389
11	890050	50	PCT-4\SA\1\1>542	41	890123	123	PCT-4\SA\1\1>1392
12	890058	58	PCT-4\SA\1\1>631	42	890124	124	PCT-4\SA\1\1>1414
13	890073	73	PCT-4\SA\1\1>881	43	890125	125	PCT-4\SA\1\1>1443
14	890075	75	PCT-4\SA\1\1>895	44	890126	126	PCT-4\SA\1\1>1472
15	890076	76	PCT-4\SA\1\1>910	45	890128	128	PCT-4\SA\1\1>1475
16	890080	80	PCT-4\SA\1\1>954	46	890129	129	PCT-4\SA\1\1>1479
17	890082	82	PCT-4\SA\1\1>975	47	890131	131	PCT-4\SA\1\1>1486
18	890083	83	PCT-4\SA\1\1>982	48	890132	132	PCT-4\SA\1\1>1512
19	890084	84	PCT-4\SA\1\1>1013	49	890133	133	PCT-4\SA\1\1>1538
20	890086	86	PCT-4\SA\1\1>1034	50	890134	134	PCT-4\SA\1\1>1549
21	890087	87	PCT-4\SA\1\1>1036	51	890135	135	PCT-4\SA\1\1>1559
22	890088	88	PCT-4\SA\1\1>1044	52	890136	136	PCT-4\SA\1\1>1566
23	890089	89	PCT-4\SA\1\1>1047	53	890140	140	PCT-4\SA\1\1>1632
24	890090	90	PCT-4\SA\1\1>1048	54	890143	143	PCT-4\SA\1\1>1666
25	890091	91	PCT-4\SA\1\1>1108	55	890144	144	PCT-4\SA\1\1>1667
26	890092	92	PCT-4\SA\1\1>1116	56	890145	145	PCT-4\SA\1\1>1689
27	890093	93	PCT-4\SA\1\1>1127	57	890147	147	PCT-4\SA\1\1>1701
28	890094	94	PCT-4\SA\1\1>1128	58	890148	148	PCT-4\SA\1\1>1702
29	890095	95	PCT-4\SA\1\1>1135	59	890168	168	PCT-4\SA\1\1>1915
30	890097	97	PCT-4\SA\1\1>1138	60	890170	170	PCT-4\SA\1\1>1919

Tabl 19. S0 fertile plants selected in the population PCT-4\SA\2\1

La Libertad experimental stationEstación Experimental La Libertad 1998A

Nbr.	Pedigree
1	PCT-4\SA\2\1>38
2	PCT-4\SA\2\1>43
3	PCT-4\SA\2\1>44
4	PCT-4\SA\2\1>69
5	PCT-4\SA\2\1>113
6	PCT-4\SA\2\1>128
7	PCT-4\SA\2\1>172
8	PCT-4\SA\2\1>190
9	PCT-4\SA\2\1>192
10	PCT-4\SA\2\1>275
11	PCT-4\SA\2\1>282
12	PCT-4\SA\2\1>287
13	PCT-4\SA\2\1>290
14	PCT-4\SA\2\1>310
15	PCT-4\SA\2\1>317
16	PCT-4\SA\2\1>331
17	PCT-4\SA\2\1>333
18	PCT-4\SA\2\1>335
19	PCT-4\SA\2\1>375
20	PCT-4\SA\2\1>438
21	PCT-4\SA\2\1>473
22	PCT-4\SA\2\1>477
23	PCT-4\SA\2\1>482
24	PCT-4\SA\2\1>521
25	PCT-4\SA\2\1>529
26	PCT-4\SA\2\1>589
27	PCT-4\SA\2\1>617
28	PCT-4\SA\2\1>626
29	PCT-4\SA\2\1>657
30	PCT-4\SA\2\1>664
31	PCT-4\SA\2\1>676
32	PCT-4\SA\2\1>677
33	PCT-4\SA\2\1>697
34	PCT-4\SA\2\1>731
35	PCT-4\SA\2\1>734
36	PCT-4\SA\2\1>764
37	PCT-4\SA\2\1>768
38	PCT-4\SA\2\1>779
39	PCT-4\SA\2\1>786
40	PCT-4\SA\2\1>792
41	PCT-4\SA\2\1>805
42	PCT-4\SA\2\1>831
43	PCT-4\SA\2\1>855
44	PCT-4\SA\2\1>979
45	PCT-4\SA\2\1>1020
46	PCT-4\SA\2\1>1158
47	PCT-4\SA\2\1>1181
48	PCT-4\SA\2\1>1190
49	PCT-4\SA\2\1>1196
50	PCT-4\SA\2\1>1198
51	PCT-4\SA\2\1>1225
52	PCT-4\SA\2\1>1234
53	PCT-4\SA\2\1>1235
54	PCT-4\SA\2\1>1238
55	PCT-4\SA\2\1>1270
56	PCT-4\SA\2\1>1300
57	PCT-4\SA\2\1>1306
58	PCT-4\SA\2\1>1326
59	PCT-4\SA\2\1>1343
60	PCT-4\SA\2\1>1416
61	PCT-4\SA\2\1>1417
62	PCT-4\SA\2\1>1492
63	PCT-4\SA\2\1>1513
64	PCT-4\SA\2\1>1559
65	PCT-4\SA\2\1>1564
66	PCT-4\SA\2\1>1605
67	PCT-4\SA\2\1>1615
68	PCT-4\SA\2\1>1669
69	PCT-4\SA\2\1>1699
70	PCT-4\SA\2\1>1728
71	PCT-4\SA\2\1>1794
72	PCT-4\SA\2\1>1807
73	PCT-4\SA\2\1>1836
74	PCT-4\SA\2\1>1923
75	PCT-4\SA\2\1>1985

Table 20. S0 fertile plants selected in the population PCT-5\PHB\1\0,PHB\1,PHB\1
La Libertad experimental station, 1998A

Nbr.	Pedigree
1	PCT-\PHB\1\0,PHB\1,PHB\1>126
2	PCT-\PHB\1\0,PHB\1,PHB\1>163
3	PCT-\PHB\1\0,PHB\1,PHB\1>192
4	PCT-\PHB\1\0,PHB\1,PHB\1>226
5	PCT-\PHB\1\0,PHB\1,PHB\1>230
6	PCT-\PHB\1\0,PHB\1,PHB\1>242
7	PCT-\PHB\1\0,PHB\1,PHB\1>258
8	PCT-\PHB\1\0,PHB\1,PHB\1>331
9	PCT-\PHB\1\0,PHB\1,PHB\1>338
10	PCT-\PHB\1\0,PHB\1,PHB\1>384
11	PCT-\PHB\1\0,PHB\1,PHB\1>385
12	PCT-\PHB\1\0,PHB\1,PHB\1>439
13	PCT-\PHB\1\0,PHB\1,PHB\1>444
14	PCT-\PHB\1\0,PHB\1,PHB\1>515
15	PCT-\PHB\1\0,PHB\1,PHB\1>579

Nbr.	Pedigree
16	PCT-\PHB\1\0,PHB\1,PHB\1>590
17	PCT-\PHB\1\0,PHB\1,PHB\1>618
18	PCT-\PHB\1\0,PHB\1,PHB\1>619
19	PCT-\PHB\1\0,PHB\1,PHB\1>652
20	PCT-\PHB\1\0,PHB\1,PHB\1>730
21	PCT-\PHB\1\0,PHB\1,PHB\1>842
22	PCT-\PHB\1\0,PHB\1,PHB\1>1037
23	PCT-\PHB\1\0,PHB\1,PHB\1>1129
24	PCT-\PHB\1\0,PHB\1,PHB\1>1341
25	PCT-\PHB\1\0,PHB\1,PHB\1>1591
26	PCT-\PHB\1\0,PHB\1,PHB\1>1651
27	PCT-\PHB\1\0,PHB\1,PHB\1>1661
28	PCT-\PHB\1\0,PHB\1,PHB\1>1670
29	PCT-\PHB\1\0,PHB\1,PHB\1>1853
30	PCT-\PHB\1\0,PHB\1,PHB\1>1917

Table 21. S0 fertile plants selected in the population PCT-A\PHB\1\0,PHB\1,PHB\1
La Libertad experimental station 1998A

Nbr.	Pedigree
1	PCT-A\1\0,PHB\1,PHB\1>253
2	PCT-A\1\0,PHB\1,PHB\1>397
3	PCT-A\1\0,PHB\1,PHB\1>421
4	PCT-A\1\0,PHB\1,PHB\1>642
5	PCT-A\1\0,PHB\1,PHB\1>721
6	PCT-A\1\0,PHB\1,PHB\1>866
7	PCT-A\1\0,PHB\1,PHB\1>946
8	PCT-A\1\0,PHB\1,PHB\1>1058
9	PCT-A\1\0,PHB\1,PHB\1>1194
10	PCT-A\1\0,PHB\1,PHB\1>1302
11	PCT-A\1\0,PHB\1,PHB\1>1326
12	PCT-A\1\0,PHB\1,PHB\1>1347
13	PCT-A\1\0,PHB\1,PHB\1>1361
14	PCT-A\1\0,PHB\1,PHB\1>1447
15	PCT-A\1\0,PHB\1,PHB\1>1631
16	PCT-A\1\0,PHB\1,PHB\1>1744
17	PCT-A\1\0,PHB\1,PHB\1>1802
18	PCT-A\1\0,PHB\1,PHB\1>1827
19	PCT-A\1\0,PHB\1,PHB\1>1834
20	PCT-A\1\0,PHB\1,PHB\1>1850
21	PCT-A\1\0,PHB\1,PHB\1>1889
22	PCT-A\1\0,PHB\1,PHB\1>1933
23	PCT-A\1\0,PHB\1,PHB\1>1990
24	PCT-A\1\0,PHB\1,PHB\1>2007

Table 22. S0 fertile plants selected in the population PCT-4\PHB\1\1,PHB\1,PHB\1
La Libertad experimental station, 1998A

Nbr.	Pedigree
1	PCT-4\PHB\1\1,PHB\1,PHB\1>135
2	PCT-4\PHB\1\1,PHB\1,PHB\1>191
3	PCT-4\PHB\1\1,PHB\1,PHB\1>227
4	PCT-4\PHB\1\1,PHB\1,PHB\1>228
5	PCT-4\PHB\1\1,PHB\1,PHB\1>262
6	PCT-4\PHB\1\1,PHB\1,PHB\1>300
7	PCT-4\PHB\1\1,PHB\1,PHB\1>329
8	PCT-4\PHB\1\1,PHB\1,PHB\1>336
9	PCT-4\PHB\1\1,PHB\1,PHB\1>359
10	PCT-4\PHB\1\1,PHB\1,PHB\1>443
11	PCT-4\PHB\1\1,PHB\1,PHB\1>455
12	PCT-4\PHB\1\1,PHB\1,PHB\1>472
13	PCT-4\PHB\1\1,PHB\1,PHB\1>479
14	PCT-4\PHB\1\1,PHB\1,PHB\1>507
15	PCT-4\PHB\1\1,PHB\1,PHB\1>509
16	PCT-4\PHB\1\1,PHB\1,PHB\1>541
17	PCT-4\PHB\1\1,PHB\1,PHB\1>572
18	PCT-4\PHB\1\1,PHB\1,PHB\1>583
19	PCT-4\PHB\1\1,PHB\1,PHB\1>584
20	PCT-4\PHB\1\1,PHB\1,PHB\1>585
21	PCT-4\PHB\1\1,PHB\1,PHB\1>587
22	PCT-4\PHB\1\1,PHB\1,PHB\1>603
23	PCT-4\PHB\1\1,PHB\1,PHB\1>614
24	PCT-4\PHB\1\1,PHB\1,PHB\1>650
25	PCT-4\PHB\1\1,PHB\1,PHB\1>692
26	PCT-4\PHB\1\1,PHB\1,PHB\1>816
27	PCT-4\PHB\1\1,PHB\1,PHB\1>869
28	PCT-4\PHB\1\1,PHB\1,PHB\1>894
29	PCT-4\PHB\1\1,PHB\1,PHB\1>1047
30	PCT-4\PHB\1\1,PHB\1,PHB\1>1062
31	PCT-4\PHB\1\1,PHB\1,PHB\1>1093
32	PCT-4\PHB\1\1,PHB\1,PHB\1>1112
33	PCT-4\PHB\1\1,PHB\1,PHB\1>1155
34	PCT-4\PHB\1\1,PHB\1,PHB\1>1234
35	PCT-4\PHB\1\1,PHB\1,PHB\1>1255
36	PCT-4\PHB\1\1,PHB\1,PHB\1>1264
37	PCT-4\PHB\1\1,PHB\1,PHB\1>1298
38	PCT-4\PHB\1\1,PHB\1,PHB\1>1308
39	PCT-4\PHB\1\1,PHB\1,PHB\1>1335
40	PCT-4\PHB\1\1,PHB\1,PHB\1>1373
41	PCT-4\PHB\1\1,PHB\1,PHB\1>1376
42	PCT-4\PHB\1\1,PHB\1,PHB\1>1377
43	PCT-4\PHB\1\1,PHB\1,PHB\1>1382
44	PCT-4\PHB\1\1,PHB\1,PHB\1>1398
46	PCT-4\PHB\1\1,PHB\1,PHB\1>1515
47	PCT-4\PHB\1\1,PHB\1,PHB\1>1545
48	PCT-4\PHB\1\1,PHB\1,PHB\1>1652
49	PCT-4\PHB\1\1,PHB\1,PHB\1>1697
50	PCT-4\PHB\1\1,PHB\1,PHB\1>1734
51	PCT-4\PHB\1\1,PHB\1,PHB\1>1735
52	PCT-4\PHB\1\1,PHB\1,PHB\1>1864
53	PCT-4\PHB\1\1,PHB\1,PHB\1>1895
54	PCT-4\PHB\1\1,PHB\1,PHB\1>1912
55	PCT-4\PHB\1\1,PHB\1,PHB\1>1945

Table 23. S0 fertile plants selected in the population PCT-11\0\0\1
La Libertad experimental station, 1998A

Nbr.	Pedigree
1	PCT-11\0\0\1>42
2	PCT-11\0\0\1>51
3	PCT-11\0\0\1>52
4	PCT-11\0\0\1>73
5	PCT-11\0\0\1>84
6	PCT-11\0\0\1>87
7	PCT-11\0\0\1>110
8	PCT-11\0\0\1>112
9	PCT-11\0\0\1>134
10	PCT-11\0\0\1>137
11	PCT-11\0\0\1>150
12	PCT-11\0\0\1>155
13	PCT-11\0\0\1>166
14	PCT-11\0\0\1>224
15	PCT-11\0\0\1>225
16	PCT-11\0\0\1>228
17	PCT-11\0\0\1>242
18	PCT-11\0\0\1>244
19	PCT-11\0\0\1>256
20	PCT-11\0\0\1>261
21	PCT-11\0\0\1>269
22	PCT-11\0\0\1>309
23	PCT-11\0\0\1>314
24	PCT-11\0\0\1>317
25	PCT-11\0\0\1>375
26	PCT-11\0\0\1>376
27	PCT-11\0\0\1>386
28	PCT-11\0\0\1>405
29	PCT-11\0\0\1>438
30	PCT-11\0\0\1>493
31	PCT-11\0\0\1>509
32	PCT-11\0\0\1>513
33	PCT-11\0\0\1>516
34	PCT-11\0\0\1>522
35	PCT-11\0\0\1>549
36	PCT-11\0\0\1>566
37	PCT-11\0\0\1>576
38	PCT-11\0\0\1>621
39	PCT-11\0\0\1>657
40	PCT-11\0\0\1>660
41	PCT-11\0\0\1>727
42	PCT-11\0\0\1>733
43	PCT-11\0\0\1>734
44	PCT-11\0\0\1>781
45	PCT-11\0\0\1>782
46	PCT-11\0\0\1>801
47	PCT-11\0\0\1>810
48	PCT-11\0\0\1>816
49	PCT-11\0\0\1>831
50	PCT-11\0\0\1>841
51	PCT-11\0\0\1>866
52	PCT-11\0\0\1>877
53	PCT-11\0\0\1>903
54	PCT-11\0\0\1>905
55	PCT-11\0\0\1>908
56	PCT-11\0\0\1>924
57	PCT-11\0\0\1>943
58	PCT-11\0\0\1>953
59	PCT-11\0\0\1>1013
60	PCT-11\0\0\1>1050
61	PCT-11\0\0\1>1083
62	PCT-11\0\0\1>1092
63	PCT-11\0\0\1>1138
64	PCT-11\0\0\1>1184
65	PCT-11\0\0\1>1196
66	PCT-11\0\0\1>1199
67	PCT-11\0\0\1>1308
68	PCT-11\0\0\1>1310
69	PCT-11\0\0\1>1337
70	PCT-11\0\0\1>1372
71	PCT-11\0\0\1>1384
72	PCT-11\0\0\1>1397
73	PCT-11\0\0\1>1461
74	PCT-11\0\0\1>1486
75	PCT-11\0\0\1>1520
76	PCT-11\0\0\1>1526
77	PCT-11\0\0\1>1537
78	PCT-11\0\0\1>1600
79	PCT-11\0\0\1>1606
80	PCT-11\0\0\1>1627
81	PCT-11\0\0\1>1628
82	PCT-11\0\0\1>1629
83	PCT-11\0\0\1>1636
84	PCT-11\0\0\1>1660
85	PCT-11\0\0\1>1670
86	PCT-11\0\0\1>1681
87	PCT-11\0\0\1>1694
88	PCT-11\0\0\1>1709
89	PCT-11\0\0\1>1777
90	PCT-11\0\0\1>1780
91	PCT-11\0\0\1>1781
92	PCT-11\0\0\1>1790
93	PCT-11\0\0\1>1814
94	PCT-11\0\0\1>1959
95	PCT-11\0\0\1>1961

Table 24. Yield trial of 8 advanced lines
La Libertad experimental station, 1998A

Nbr.	Pedigree	Fl 50%	Ht Cm	Hum %	Rto Kg/ha
1	Oryzica Sabana 6	85	99	17.7	2404.4
2	CIRAD 409	66	88	20.1	2891.26
3	CIRAD 410	67	81	18.6	2228.4
4	CIRAD 411	72	85	21	1779.18
5	Oryzica Sabana 10	89	102	20.1	1791.55
6	CNA IRAT-A\SA\0\3>1-M-2-M-1-M-1	64	102	16.9	1675.04
7	CNA IRAT-A\SA\0\3>1-M-2-M-1-M-1	69	95	18.2	1591.77
8	CNA IRAT-A\SA\0\3>1-M-2-M-3-M-4	68	100	18.2	1637.58

Fl = flowering; Hum = grain humidity; Rdo = grain yield

Table 25. Selected lines from the conventional breeding project
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl
1	S800017	17	CT9899-12-6-3P-1-4-M	5	3	4	82	3	1	1	1
2	S800019	19	CT9907-5-3-1P-3-1-M	5	3	4	79	3	3	1	1
3	S800022	22	CT11632-3-3-M	5	2	3	93	3	1	1	1
4	S800026	26	CT11231-2-2-1-3-M	5	3	4	79	3	1	1	1
5	S800031	31	CT11891-3-3-3-M	5	3	3	70	3	1	1	1
6	S800040	40	CT13366-8-2-M	5	2	1	70	5	1	1	1
7	S800043	43	CT13366-9-3-M	5	3	3	77	5	1	1	1
8	S800044	44	CT13366-9-5-M	5	2	3	80	5	1	1	1
9	S800059	59	CT13370-2-1-M	5	1	2	81	3	1	1	1
10	S800064	64	CT13370-3-4-M	5	2	3	84	3	1	1	1
11	S800098	98	CT13371-5-1-M	5	1	2	79	3	1	1	1
12	S800120	120	CT13382-8-3-M	3	2	2	82	3	1	1	1
13	S800125	125	CT13382-9-M	5	2	2	83	3	1	1	1
14	S800127	127	CT13569-5-1-M	5	2	4	86	3	1	1	1
15	S800129	129	CT13569-5-5-M	5	2	2	84	3	1	1	1
16	S800130	130	CT13569-5-6-M	5	2	2	83	3	1	1	1
17	S800132	132	CT13569-8-1-M	5	2	3	81	3	1	1	3
18	S800133	133	CT13569-8-2-M	5	2	3	80	3	1	1	1
19	S800134	134	CT13570-1-3-M	5	1	3	81	3	1	1	1
20	S800135	135	CT13570-3-2-M	5	1	3	83	3	1	1	1
21	S800136	136	CT13570-3-3-M	5	2	3	83	3	1	1	1
22	S800137	137	CT13570-13-4-M	5	2	2	80	3	1	1	1
23	S800142	142	CT13571-12-3-M	5	3	3	85	1	1	1	1
24	S800146	146	CT13572-3-3-M	7	3	4	71	1	1	1	1

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot
NBl = neck blast; Gd = grain discoloration

Table 26. Selected lines in the introduction trial from WARDA (O.sativa x O. glaberrima)
La Libertad experimental station, 1998A

Nbr.	Field Nbr. 1998A	Origin 1997B	Pedigree	Vg	Ht	Bl 1	Bl 2	Fl 50%	LSc	BS	GD	NBl	Hum %	Rto. grs
1	S810004	4	WAB450-I-B-P-82-2-1	7	98	1	1	77	1	1	1	1	18.2	510.3
2	S810006	6	WAB450-II-1-2-P50-HB	5	85	2	2	74	3	1	1	1	15.0	233.2
3	S810011	11	WAB450-I-B-P-78-HB	7	94	2	1	70	1	1	1	1	15.4	363.6
4	S810017	17	WAB450-I-B-P-57-3-1	7	104	2	1	79	1	1	1	1	15.9	322.4
5	S810021	21	WAB450-I-B-P-133-HB	5	92	2	2	75	1	1	1	1	14.3	408.7
6	S810022	22	WAB450-I-B-P-6-2-1	5	89	2	2	78	1	1	1	1	15.4	417.2
7	S810079	79	WAB450-16-2-BL1-DR2	7	71	3	2	71	1	1	1	1	15.9	325.6
8	S810082	82	WAB450-16-2-BL1-DV1	7	70	2	1	70	1	1	1	1	15.0	389.9

Vg = vigor; Bl 1 = leaf blast ; Bl 2 = leaf blast ; Fl = flowering; LSc = leaf scald; BS = brown spot;
NBl = neck blast; Gd = grain discoloration, Ht = plant height; Hum = grain humidity; Rdo = grain yield.

APPENDIX 1. RICE PROJECT IP-4.

Breakdown Structure and Logical Framework

Project IP-4. Improved Rice Germplasm for Latin America and the Caribbean

Project Goal

To improve the nutritional and economic well-being of rice growers and low income consumers in Latin America and the Caribbean through sustainable increases in rice production and productivity

Project Purpose

To increase genetic diversity and enhance gene pools for higher, more stable yields with lower unit production costs and reduce environmental hazards

Enhanced Gene Pools

- Rice improvement for upland and lowland using recurrent selection and conventional breeding
- Evaluation of savannas upland rice lines in Latin American countries
- Population maintenance through recombination
- Registration of new populations
- Distribution of breeding populations to LAC countries
- Conventional and recurrent selection breeding for hillsides upland rice
- Identification and selection for useful traits in wild rices with the aid of molecular markers. Improvement of yield potential in interspecific crosses
- Evaluation of interspecific populations. Introgression of new plant type into LAC's gene pols
- Use of anther and in vitro culture and somaclonal variation for enhancement of gene pools

Physiological basis for rice traits understood

- Weed control enhanced by the use of new genotypes and practices
- Identification of rice cultivars with tolerance to submergence
- Identification of rice cultivars exhibiting high weed competition
- Characterization of useful traits in new plant type derived populations

Rice pests and genetics of resistance characterized

- Monitoring changes in genetic structure and virulence diversity of the rice blast pathogen
- Characterization of rice germplasm for blast resistance
- Genetics and dissection of blast resistance genes using molecular markers
- Improving methods for developin durable blast resistance
- Characterization of partial resistance to blast in existing germplasm
- Characterization of resistance to RHBV and *Tagosodes oryzicolus*
- Maintaining and establishing colonies of *T. oryzicolus*
- Epidemiology for RHBV
- Control of RHBV through nucleoprotein mediated cross protection in transgenic rice
- Physical, chemical and moleculars characterization of the rice stripe necrosis virus

Project priorities and research capacities enhanced

- Analysis of national rice samples in Colombia
- Creation of a network of rice economics in Latin America (RECAL)
- Collaboration with IFPRI in varietal adoption studies in Latin America and the Caribbean
- FLAR breeding and crop management activities in Latin America and the Caribbean (training)
- Germplasm characterization for yield, milling quality, blast resistance, iron toxicity tolerance, RHBV resistance, cold tolerance by FLAR
- Crosses and evaluation of segregating populations by FLAR and country members
- FLAR Interactions with CIRAD/CIAT/IRRI
- Collaboration with Forest Margins project for the development of improved upland rice cultivars for the Peruvian selva

LOGICAL FRAMEWORK - PROJECT IP-4

Project Title: Improved Rice Germplasm for Latin America and the Caribbean   Project Manager: Fernando Correa

Narrative Summary	Measurable Indicators	Means of Verification	Important Assumptions
Goal To improve the nutritional and economic well-being of rice growers and low income consumers in Latin America and the Caribbean through sustainable increases in rice production and productivity	Improved access of rice growers and consumers to standard goods and services. Reduction in pesticide use and increase yield average/ha. Increase in the number of ha planted with new cultivars.	National statistics on agriculture and development of LAC. Rice production statistics.	Donors, governments and NARS continued interest in sustainable increase in rice production.
Purpose To increase genetic diversity and enhance gene pools for higher, more stable yields with lower unit production costs and reduce environmental hazards	Evaluations of yield potential of F2BC2, end 1998. Increased use of improved populations from recurrent selection by NARS at the end of 1997. Rice lines selected with desired gene traits. Potential donors high levels of blast resistance.	Database on seed exchange. Project, CIAT and NARS annual reports.	Improved/diversed populations are adopted/used by NARS; policies favor adoption. Farmers are willing to reduce pesticide use.
Output 1 Enhanced Gene Pools.	Seed of best gene pools distributed to FLAR and 50% of other partners by the end of 1998.	Project progress report for 1998.	Continued demand for these populations. NARS willing to try out/use improved lines.
Activities - Introduce, identify, generate and evaluate germplasm from different sources. Multiply seed to FLAR/ other partners. Use AC/ embryo rescue (CM, MCh, ZL, CB). - Identify and select for useful traits with the aid of molecular markers (linked to Project SB-2) (JT, FC, CM).	First evaluation of the yield potential of 3 F2BC2 populations conducted by 1998 in 3 sites. Number of field trials planted. Number of crosses made, DH obtained, hybrid plants recovered by embryo rescue and traits identified. QTLs identified.	Project progress report for 1998. Field visits to testing sites. Budget.	Adequate funding and timely release of budget. Continued support from CIRAD-CA. Useful traits in wild germplasm can be incorporated in improved populations. NARS willing and capable to try out/use new improved populations.
Output 2 Physiological basis for rice traits understood	Main 5 agronomic/physiological traits measured beginning 1997.	Project progress report for 1998. Two publications.	Continued demand by NARS for these populations and knowledge.
Activities - Characterize new plant. Introgress new plant type into LAC's gene pools (CB, CM) - Understand the physiological mechanisms for tolerance to low P and acid soils (CB) - Weed control enhanced by the use of new genotypes and practices - Identification of rice cultivars with tolerance to submergence	N-management for new plant type worked out by the end of 1998. First BC to new plant type made by end 1998. Mechanism for tolerance to low P/acid soils proposed. Weed competitive varieties developes.	Project progress report for 1998.	Continued JIRCAS interest and support. Adequate funding and timely released of budget. Rice support staff in plant physiology in place. Post-Doc in place. Germplasm adoption is higher and more consistent than of agronomic changes

Output 3 Rice pest and genetics of resistance characterized.	Isolates characterized for their virulence and genetic structure.	Project progress reports.	Collection of blast infected samples gives viable isolates. Molecular markers available from BRU.
Activities - Monitoring genetic and virulence diversity of pathogen. Testing breeding methods for durable blast resistance (CM, FC) - Dissecting blast resistance genes in highly resistant cultivars and make new crosses (CM, FC, linked to project SB-2)	Isolates.	Assigned budget.	Rice crosses and populations developed by rice breeders. Biotechnology unit continues identifying molecular markers associated with resistance.
Activities - Evaluation of rice germplasm including transgenic plants for resistance to *T. orizicolus* and to RHBV (CM, FC, ZL) - Studies of RHBV colony vs date vs variety (LC, CM) - RHBV surveys in rice fields and epidemiological studies. Biocontrol of *T. orizicolus* (LC, CM, FC) - Collaboration with NARS to transfer evaluation technics (LC, CM, FC)	Rice lines with diversified resistance to *Tagosodes orizicolus* and to RHBV. More effective colony management. Baseline information for understanding and prediction RHBV epidemics, crop management. Increased capacity of NARS to screen germplasm. Effective entomopathogens for insect control. Transgenic lines with RHBV-viral genes w/reduced disease symptoms.	Workplan. Budget plan.	Collaboration with FEDEARROZ, FLAR. Depends partially on special project funding.
Output 3C The causal agent of the "entorchamiento" problem characterized.	Identification and characterization of causal agent.	Project reports.	Recommendations issued and adopted by farmers.
Activities - Isolation and characterization of the causal agent and vector of "entorchamiento" (FC, FM). - Development of diagnostic methods and germplasm screening technique to implement control measures (FC, FM).	The causal agent of the "entorchamiento" disease of rice and its vector are characterized, managed. Different control strategies are implemented.	Publications and diagnostic kits available. Resistant germplasm selected under artificial conditions. Workplan, budget.	Available infected material can be maintained and propagated by artificial measures. Recommendations issued and adopted by farmers. Special funding: COLCIENCIAS and ODA
Output 4 Priorities and research capacity enhanced	One workshop conducted by 1997 for NARS. 15-20 trained people from NARS. Farmers' surveys in LAC.	Project progress and workshop report for 1997.	NARS continued interest in specialized training and information exchange. Linkages with NARS.
Activities - Coordinate research, training activities with NARS. Establish priorities (LS, MCh, FC, ZL) - Apply questionnaires to rice farmers (LS).	Research plans written. Number of scientists trained. Costs of production, production coefficients Budget.	Progress report for 1997.	Adequate funding and timely released of budget.

APPENDIX 2. 1998 INDIVIDUAL WORKPLAN

Individual Work Plan

Project Number: IP-4 **Project Title: Improved Rice Germplasm for Latin America and the Caribbean**

Subproject: Collaborative Rice Project between CIAT and CIRAD

Starts: January 1998 **Ends:** December 1998 **Your Name:** Marc CHATEL **Project Manager:** Fernando Correa

Project of Subproject Outputs and Indicators	Specific Indicators for the outputs
Output 1.	Population development and improvement.
	Line development and use by NARS.
Enhanced Gene Pools: Savannas Upland Rice Conventional and Recurrent Selection Breeding.	**Important Assumptions of the Activity Level**
	Continued support from CIAT and CIRAD. Adequate funding and timely release of budget. NARS willing and capable to try out/use new improved populations.

Activities	Semester 1						Semester 2					
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1.1. Recurrent Selection: Population Enhancement.												
1.1.1. Use of Recurrent Selection for acid soils. S2 progenies evaluation under acid soil				*****	*****	*****	*****	*****				
1.1.2. Recombination of the best S2 progenies (Palmira)	***** 1999	***** 1999	***** 1999							*****	*****	*****
1.1.3 Evaluation and recombination of 3 populations enhanced by 3 cycles of Recurrent Selection for total resistance to Blast.				*****	*****	*****	*****	*****				
1.2. Recurrent Selection: New Upland Savanna Population.												
1.2.1. Behavior of a new developed population PCT-11				*****	*****	*****	*****	*****				
1.2.2. Population Enhancement for global characteristics	***** 1999	***** 1999	***** 1999	******	*****	*****	*****	*****		*****	*****	*****
1.3. Recurrent Selection: Line development from different populations.												
1.3.1. Selection and evaluation of segregating lines. 1.3.2. Off season multiplication (Palmira)	***** 1999	***** 1999	***** 1999	******	*****	*****	*****	*****		*****	*****	*****
1.4. Conventional Breeding.												
1.4.1. Evaluation and selection of breeding lines.				*****	*****	*****	*****	*****				
1.4.2. Off season multiplication (Palmira)	***** 1999	***** 1999	***** 1999							*****	*****	*****
1.5. Strengthening NARS and training.												
1.5.1. International Rice Breeding Course (Brazil).			*****									

1.5.2.	National Rice Selection Breeding Course (Venezuela)									*****			
1.5.3.	Preparation of the 2d International Rice Recurrent Selection Workshop (to be held in September 1999 in Venezuela or Brazil)		*****	*****						*****	*****	*****	
1.5.4.	Visits and field work with NARS			*****					*****	*****			
1.5.5.	Germplasm distribution and evaluation with Partners (Latin America, CIRAD, Africa, and Asia)		*****								*****		
1.6. Annual Report and Publications.													

Individual Work Plan

Project Number: IP-4 **Project Title: Improved Rice Germplasm for Latin America and the Caribbean**

Subproject: Collaborative Rice Project between CIAT and CIRAD

Starts: January 1998 **Ends:** December 1998 **Your Name(s)**: Michel VALES and Marc CHATEL **Project Manager:** Fernando Correa

Project of Subproject Outputs and Indicators	**Specific Indicators for the outputs**
Output 2. **Enhanced Gene Pools: Hillsides Upland Rice Conventional and Recurrent Selection Breeding.**	Rice lines selected with desired traits. Line development and use by NARS. **Important Assumptions of the Activity Level** Continued support from CIAT and CIRAD. Adequate funding and timely release of budget. NARS willing and capable to try out/use new improved populations.

Activities	**Semester 1**						**Semester 2**					
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
1.1. Recurrent Selection: Population Development.												
1.1.1. Development and recombination of a specific population for the Hillsides. (PCT-13)	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1.2. Conventional Breeding.												
1.2.1. Introductions from Madagascar (CIRAD-FOFIFA Project). Fixed and segregating material.	*****	*****						*****	*****			
1.2.2. Seed increase (Palmira)		*****	*****	*****	*****				*****	*****	*****	*****
1.2.3. Evaluation and selection of segregating lines, and 5 F2 populations.	***** 1999	***** 1999		*****	*****	*****	*****	*****		*****	*****	*****
1.2.4. Field trials with partners: CIAO, CIAT, and CENICAFE (?)												
1.3. Transfer and Adaptation of results.												
1.3.1. Identification of Partners in Central America and the Andean region	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1.3.2. Germplasm release to identified partners (depends on 1.2.1.)												
1.4. Annual Report and Publications.												

Individual Work Plan

Project Number: IP-4 **Project Title: Improved Rice Germplasm for Latin America and the Caribbean**

Subproject: Collaborative Rice Project between CIAT, CIRAD, and FLAR

Starts: January 1998 **Ends:** December 1998 **Your Name:** Marc CHATEL **Project Manager:** Fernando Correa and Luis Sanint

Project of Subproject Outputs and Indicators	**Specific Indicators for the outputs**
Output 3. **Enhanced Gene Pools: Tropical and Temperate Lowland Rice: Recurrent Selection Breeding.**	Population development and improvement. Line development and use by NARS. **Important Assumptions of the Activity Level** Continued support from CIAT, CIRAD, and FLAR. Adequate funding and timely release of budget. NARS willing and capable to try out/use new improved populations.

Activities	**Semester 1**						**Semester 2**					
	Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
1.1. Recurrent Selection: Population Enhancement.												
1.1.1. Purification of 4 Populations and 1 Gene Pool for Hoja Blanca.	*****	*****										
1.1.2. Recombination of the purified germplasm			*****	*****	*****	*****	*****					
1.2. Recurrent Selection: New Tropical lowland Population.												
1.2.1. Build-up and recombination of the population PCT-12	*****	*****	*****	*****	*****							
1.2.2. PCT-12 Enhancement for global characteristics									*****	*****	*****	*****
1.3. Recurrent Selection: Line development from different populations.												
1.3.1. Selection and evaluation of segregating lines with FLAR.	***** 1999	***** 1999		*****	*****	*****	*****	*****		*****	*****	*****
1.3.2. Off season multiplication (Palmira)	*****	*****	*****	*****					*****	*****	*****	*****
1.5. Strengthening NARS.												
1.5.1. Assessment of Recurrent Selection progress for LAC Temperate and Subtropical Lowlands: Argentina, Chile, Uruguay and Southern Brazil	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1.5.2. Assessment of Recurrent Selection Progress for Tropical Lowlands: Colombia, Venezuela, Costa Rica, El Salvador, Panama, and Cuba.	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1.5.3. Recurrent Selection in Venezuela (DANAC): .New population PFD-1 build-up at CIAT .Definition of recurrent selection activities in Venezuela	*****	*****	*****	*****								

1.5.4. Recurrent Selection Germplasm for Europe .Use of the Chilean population PQUI-1	*****	*****							*****			
1.5. 5. Visits and field work with NARS			*****					*****	*****			
1.5.6. Germplasm distribution and evaluation with Partners: .Latin America and the Caribbean .CIRAD .Europe		*****								*****		
1.6. Training												
1.6.1. International Rice Breeding Course (Brazil).			*****									
1.6.2. National Rice Selection Breeding Course (Venezuela)									*****			
1.6.3. Preparation of the 2d International Rice Recurrent Selection Workshop (to be held in September 1999 in Venezuela or Brazil)		*****	*****						*****	*****	*****	
1.7. Annual Report and Publications												

APPENDIX 3. GERMPLASM REGISTRATION: PCIRAD-23 and 24

PCIRAD-23

Synonyms:	CIRAD -H1P\0\0\4
Institution:	CIRAD-CA
Year of registration:	1998
Scientists:	James Taillebois
Ecosystem:	Tropical Lowlands
Objectives:	Yield potential Grain quality
Germplasm type:	*Indica* Population
Population development:	Synthesis of a new population. Male-sterility source: Plants of GPCNA-18 Cytoplasm source: Polycytoplasm GPCNA-18 New variability: 31 lines (Physical seed mixture with GPCNA-18) Recurrent Selection: 4cycles of recombination where all seeds of male sterile plants are mixed. Selection pressure for allogamy.
Genetic constitution:	See table
Germplasm identification:	PCIRAD-23\0\0\4
Actual users:	CIRAD (Brazil- South)
Request for seed to:	Dr. James Taillebois CIRAD/G4I Caixa Postal 69 96020-360 Pelotas, RS - Brazil Phone: (55-532) 25 21 22 ; Fax: (55-532) 22 53 74

Parent	Origin/Cross	Frequency (%)
1C.13.1.1.1	Zhen Shan 97A/METICA 1	?
1C.5.3.2.1	ZHEN SHAN 97A/METICA 1	?
BR.IRGA 408		?
C 1321.90R		?
C74		?
CNA 3450		?
CNA 5682		?
CNA 5787		?
CNA 6816		?
CT 6163.8.9.1.2A		?
CT 6516.23.8.1		?
DIWONI	Surinam Line	?
ELONI	Surinam Line	?
IR 28228.12.3.1		?
IR 36		?
IRAT 216	CIRAD Upland Line	?
IRAT 348	RUSTIC	?
IRI 378R		?
ITA 212		?
L306.11	ELONI mutant	?
LA 110		?
METICA 1		?
P 4134.F3.22.1.B		?
SQ.B.5.3	ZHEN SHAN 97A/METICA 1//CNA 4120	?
SR.B.1.6	ZHEN SHAN 97A/METICA 1//CNA92.BM11.BM19p18	?
ST.B.14.2	ZHEN SHAN 97A/METICA 1//CNA 4110	?
SZ.B.9.1	ZHEN SHAN 97A/METICA 1//CNA 4114	?
TOLIMA	CT 5747.12.9.3.7	?
GPCNA-18	Indica gene pool	About 50%

PCIRAD-24

Synonims:	CIRAD -H2P\0\0\4
Institution:	CIRAD-CA
Year of registration:	1998
Scientists:	James Taillebois
Ecosystem:	Tropical Lowlands
Objectives:	Yield potential Grain quality
Germplasm type:	*Indica* Population
Population development:	Synthesis of a new population. Male-sterility source : Plants of GPCNA-18 Cytoplasm source : Polycytoplasm GPCNA-18 Mew variability : 51 lines (Physical seed mixture with GPCNA-18) Recurrent Selection : 4cycles of recombination where all seeds of male steriles plants are mixed. Selection pressure for allogamy.
Genetic constitution:	See table
Germplasm identification:	PCIRAD-24\0\0\4
Actual users:	CIRAD (Brazil – South)
Request for seed to:	Dr. James Taillebois CIRAD/G4I Caixa Postal 69 96020-360 Pelotas, RS - Brazil Phone: (55-532) 25 21 22 ; Fax: (55-532) 22 53 74

Parent	Origin/Cross	Frequency (%)
19/2	French Guyana Line	?
5167R		?
ANAYANSI		?
BR IRGA 408	Brazilian Line	?
BR IRGA 410	Brazilian Line	?
BR.IRGA 412	Brazilian Line	?
CAMPONI	Surinam Line	?
CEYSVONI	Surinam Line	?
CICA 9	Colombian Line	?
CNA 1051	Brazilian Line	?
CNA 3450	Brazilian Line	?
CNA 3451	Brazilian Line	?
CNA 3454	Brazilian Line	?
CNA 3461	Brazilian Line	?
CNA 3472	Brazilian Line	?
CNA 3814	Brazilian Line	?
CNA 3870	Brazilian Line	?
CNA 4279	Brazilian Line	?
CNA 4898	Brazilian Line	?
CNA 4900	Brazilian Line	?
CNA 4922	Brazilian Line	?
CNA 4978	Brazilian Line	?
CNA 5041	Brazilian Line	?
CNA 5156	Brazilian Line	?
CNA 5193	Brazilian Line	?
CNA 5394	Brazilian Line	?
CNA 5505	Brazilian Line	?
CNA 5510	Brazilian Line	?
CNA 5538	Brazilian Line	?
CNA 5557	Brazilian Line	?
CNA 5696	Brazilian Line	?
CNA 5709	Brazilian Line	?
CNA 5730	Brazilian Line	?
CNA 5741	Brazilian Line	?
CNA 5787	Brazilian Line	?
CNA 6159	Brazilian Line	?
CNA 6204	Brazilian Line	?
CT 6279.4.6.6.1	Colombian Line	?
CT 6516.23.8.1.1	Colombian Line	?
CT 6540.6.6.7	Colombian Line	?
ECIA 89.S10.1.1		?
ELONI	Surinam line	?
FERRINI	Surinam line	?

METICA 1	Colombian Line	?
P4150.F3.2.5.3.M.1P	Colombian Line	?
P 4718.F2.35.5	Colombian Line	?
P 3634F4.5.6.M.1P	Colombian Line	?
P 5746.55.13.4.1	Colombian Line	?
SR.B.1.6	ZHEN SHAN 97A/METICA	?
SU.B.5.2	ZHEN SHAN 97A/METICA 1//CNA 4110	?
SZ.B.9.1	ZHEN SHAN 97A/METICA 1//CNA 4114	?
GPCNA-18	Indica population	About 50%

APPENDIX 4. PUBLICATIONS, CONFERENCES, AND POSTERS

Borrero, J, 1997. COLLABORATIVE PROJECT BETWEEN CIRAD-CA, CIAT AND FLAR: 1997 Annual report presentation.Seminar presented to the CIAT Rice project IP-4. CIAT Palmira – Colombia. December 10.

Borrero, J, 1998. SELECCION RECURRENTE EN ARROZ. Teoría y practica.
Seminar presented to the Rice Program of CIAT-Bolivia. Santa Cruz de la Sierra-Bolivia. January 12-16.

Borrero, J; M. Chatel and M. Triana Espinel, 1998. MEJORAMIENTO POBLACIONAL DE ARROZ IRRIGADO PARA HOJA BLANCA. (1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Conference: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Chatel, M; E.P. Guimarães; Y. Ospina and J. Borrero. IMPROVEMENT OF UPLAND RICE USING GENE POOLS AND POPULATIONS WITH RECESSIVE MALE-STERILE GENE. Proceedings of the Upland Rice Consortium Workshop: "Upland Rice Research in Partnership" 4-13 January 1996; Padang, Indonesia.

Chatel, M; E.P Guimarães; J.Borrero; A.Moreno Berracol; L.C. Villega and C.A Quirós, 1998. EL ARROZ DE SECANO: UNA NUEVA OPCION DE CULTIVO PARA LA REGION ANDINA DE COLOMBIA. (1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Seminar presented at CIAT – Palmira. May 6. (3) Conference: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-1. (4) Seminar presented at the Food Crops Research Institute, Yunnan Academy of Agricultural Sciences. Kunming, China. September 9-15.

Chatel, M; E. P. Guimarães; Y. Ospina and J. Borrero, 1998. NUEVAS POBLACIONES DE ARROZ DE SAVANAS PARA SELECCION RECURRENTE
(1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Poster: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Chatel, Y; J. Borrero; Y. Ospina (CIRAD/CIAT); S. Hernaiz; R. Alvarado (INIA-Chile), and E. Graterol (DANAC-Venezuela), 1998. GERMPLASM WITH GENETIC MALE-STERILITY FOR RICE RECURRENT SELECCION BREEDING. Poster: International Symposium on Rice Germplasm Evaluation and Enhancement. Stuttgart, Arkansas.August 30-September 2.

Chatel, M; Y. Ospina; and J. Borrero, 1998. RECURRENT SELECTION BREEDING: USING GENE POOLS AND POPULATIONS WITH RECESSIVE MALE-STERILE GENE AND CONVENTIONAL BREEDING. Conference: Third International Upland Rice Breeders Workshop (IURBW) Goiania-Goias. March 10-12.

Chatel,M; Y. Ospina; and J. Borrero, 1998. COLLABORATIVE PROJECT BETWEEN CIRAD-CA, CIAT, AND FLAR.Rice Improvement: Recurrent Selection Breeding using Gene Pools and Populations with Recessive Male-Sterile Gene, and Conventional Breeding. Upland Savanna, Hillsides, and Lowland Rice.Annual Report, 1997. CIRAD/CIAT/FLAR publication .

Chatel, M; Y. Ospina; and J. Borrero, 1998. MEJORAMIENTO GENETICO DEL ARROZ: UTILIZACION DEL METODO DE SELECCION RECURRENTE
Conference: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Chatel, M; Y. Ospina; and J. Borrero, 1998. RICE BREEDING USING RECURRENT SELECTION AND POPULATIONS WITH RECESSIVE MALE-STERILE GENE
Seminar presented at the Food Crops Research Institute, Yunnan Academy of Agricultural Sciences. Kunming, China. September 9-15, 1998.

Ospina, Y; M. Chatel and J. Borrero, 1998. MEJORAMIENTO POBLACIONAL DE ARROZ DE SABANAS PARA SUELOS ACIDOS. (1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Poster: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Ospina, Y; M. Chatel; E. P. Guimarães and J. Borrero, 1998. MEJORAMIENTO POBLACIONAL DE ARROZ DE SABANAS PARA PRECOCIDAD. (1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Conference: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Ospina,Y ; M. Chatel; E. P. Guimarães and J. Borrero, 1998. MEJORAMIENTO POBLACIONAL DE ARROZ DE SABANAS PARA *Pyricularia grisea Sacc.*
(1) Poster: RENAPA.Goiania-Goias.March 9-13. (2) Poster: I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11.

Taillebois, J (presentation made by M. Chatel), 1998. INVESTIGACION EN ARROZ EN AMERICA LATINA: PROYECTO ARROZ HIBRIDO. Conference: Taller Internacional: Semilla, Insumo Esencial en la Agricultura Moderna. Chiclayo-Peru. May 11-13.

APPENDIX 5. TRAINING

Direction of Thesis

PROGRESO GENETICO MEDIANTE SELECCION RECURRENTE
EN LA POBLACION PCT-4 DE ARROZ DE SECANO (Oriza Sativa L.)
PARA EL ECOSISTEMA DE SABANAS
Yolima Ospina Rey

Posgrado Ciencias Agrarias
Enfasis: Genética y Fitomejoramiento
Universidad Nacional de Colombia, sede Palmira, Vicerectoria de Ciencias Agrarias.

International Courses

BRAZIL
International Course on Rice Breeding.
"CURSO INTERNACIONAL SOBRE MELHORAMENTO GENÉTICO DE ARROZ"
Organized by EMBRAPA Arroz e Feijão. Goiania-Goias, Brazil. March 16-28, 1998.

BELIZE (CRID Net)
INTERNATIONAL TRAINING COURSE IN GERMPLASM MANAGEMENT
Organized by CRID Net, in collaboration with CRA, CARDI, CTA and CIRAD/CIAT
Belize, October 26-30, 1998.

National course

VENEZUELA
National Course on Rice Recurrent Selection Breeding.
"CURSO NACIONAL DE SELECCION RECURRENTE EN ARROZ"
Organized by DANAC, CIRAD, CIAT and EMBRAPA Arroz e Feijao.
San Felipe, Yaracuy, Venezuela. September 21-26, 1998

PARAGUAY

First Course on Lowland Rice.

"PRIMER CURSO AVANZADO SOBRE EL CULTIVO DEL ARROZ DE RIEGO"

Organizede by the "Asociacion de Productores de Arroz de Itapúa" (APAI), the "Ministerio de Agricultura y Ganadería (MAG), and FLAR.

Itapúa, Paraguay, March 24-26, 1998.

APPENDIX 6. REFERENCES

1. Cuevas-Pérez, F.; E.P. Guimarães; L.E. Berrio; D.I. González. 1992. Genetic base of rice in Latin America and the Caribbean, 1971 to 1989. Crop Sci. 32(4):1054-1059.

2. Châtel, M.; E.P. Guimarães. 1995. Recurrent selection in rice gene pools and populations: review of present status and progress. CIRAD/CIAT, Cali, Colombia. 30 p.

4. Châtel, M.; E.P. Guimarães. 1995. Upland rice improvement: using gene pools and populations with recessive male-sterile gene. CIRAD/CIAT, Cali, Colombia. 29 p.

5. Châtel, M.; E.P. Guimarães. 1996. Upland rice improvement: using gene pools and populations with recessive male-sterile gene. CIRAD/CIAT, Cali, Colombia. 31 p.

6. Châtel, M.; E.P. Guimarães. 1995. Nomenclature system for rice gene pools, populations and recurrent selection breeding: General use and catalogue registration. CIRAD/CIAT, Cali, Colombia. 10 p.

7. Châtel, M.; E.P. Guimarães. 1998. Catalogue registration to manage rice gene pools and populations improvement. CIRAD/CIAT, Cali, Colombia.

8. Federer, W.T. 1956. Augmented (or hoonuiaku) designs. Hawaiian Planter's Record 55:191-208.

9. Châtel et al. CIRAD/CIAT/FLAR annual reports, 1996, 1997

APPENDIX 7. RECIPROCAL VISITS FROM SCIENTISTS

1. From CIRAD-CA to Latin America

Marcel de RAISSAC, Deputy Program Leader "Cultures Alimentaires".
Visit to CIAT and FLAR Headquarters. Palmira-Colombia.

Christian POISSON, Rice Project Leader, and **Brigitte COURTOIS**, Rice Breeder. CIRAD/IRRI Collaborative Project.
They attended the RENAPA and Third International Upland Rice Breeders Workshop, held in Goiania-Goias, Brazil.

Thomas LE BOURGEOIS, weed scientist. Participation to the I Seminario Latinoamericano sobre Arroz Vermelho. Porto Alegre, Brazil- September 23-25, 1998.

Patricio MENDEZ del VILLAR, Economist. Participation to the I Taller Latinoamericano de Economia del Arroz. Quito, Ecuador- July 14-15,1998.
Contacts with EMBRAPA Arroz e Feijão, July 16-17, 1998.

Didier THARREAU, Rice Pathologist. Visit to CIAT rice Project, Palmira September 26 – October 3, 1998.

2. From CIAT to CIRAD-CA

Fernando CORREA, Rice Project Leader and Pathologist.
Luis SANINT, Director of FLAR
James GIBBONS, Breeder of FLAR.
Yolima OSPINA, Research Assistant of the CIRAD/CIAT Collaborative project.

Contacts with CIRAD scientists, and participation to the 2 nd International Rice Blast Conference. Montpellier-France. August 4-8, 1998.

APPENDIX 8. VISITS FROM LAC SCIENTISTS

From BRAZIL to CIAT-Colombia, and CIRAD-France

Dr. Elcio.P.Guimarães, EMBRAPA, Arroz e Feijão, Goiania-Goias.
(1) Planing of the Second International Workshop on Rice Recurrent Selection Breeding, to be held in September 1999. February 3-6, 1998.

(2) Planing of the Venezuelan Course on Rice Recurrent Selection Breeding to be held in Venezuela, September 21-26, 1998. February 3-6, 1998.

(3) International Rice Blast Conference, and contacts with CIRAD scientists at Montpellier Headquarters. August 3-10, 1998.

From COLOMBIA to CIRAD-France

Yolima Ospina, Research Assistant of the CIRAD/CIAT Collaborative Rice Project.
International Rice Blast Conference, and contacts with CIRAD scientists at Montpellier Headquarters. August 3-10, 1998.

Hernando Ramirez, Student of the Universidad Nacional de Palmira and working at CIAT.
Contacts with Dr. Roger Frutos, Biotechnology Laboratory of CIRAD. Montpellier Headquarters. November 2-6, 1998

From VENEZUELA to CIAT Colombia

Dr. Eduardo Graterol, DANAC, Venezuela. February 2 –6, 1998.
(1) Planing of the Venezuelan Course on Rice Recurrent Selection Breeding.
To be held in Venezuela, September21-26, 1998.
(2) Field work: Build-up at CIAT-Palmira of the Venezuelan Population PFD-1.
(3) Research activity planing for recurrent selection in Venezuela.

APPENDIX 9. TRIPS

National Trips (Field work)

Marc Chatel, Yolima Ospina, Jaime Borrero
Villavicencio, Coffee Region, Cauca Region.

International Trips

Jaime Borrero

BOLIVIA
Visit and field work with CIAT/ Bolivia, Santa Cruz de la Sierra. January 12-16,1998

BRAZIL
RENAPA.Goiania-Goias.March 9-13, 1998
Third IURBW Goiania-Goias. March 10-12, 1998.
International Rice Course. Goiania-Goias. March 16-18

Yolima Ospina

BRAZIL
RENAPA.Goiania-Goias.March 9-13, 1998
Third IURBW Goiania-Goias. March 10-12, 1998.

FRANCE
2nd International Rice Blast Conference. Montpellier-France. August 4-8, 1998.

Marc Chatel

USA
Rice workshop. Reno-Nevada. February 28-March 5, 1998.

BRAZIL
RENAPA.Goiania-Goias.March 9-13, 1998
Third IURBW Goiania-Goias. March 10-12, 1998.
International Rice Course. Goiania-Goias. March 16-18
FLAR:Monitoring Tour, States of Rio Grande do Sul and Santa Catarina.
March 19-22.

PARAGUAY

First Course on Lowland Rice. Itapúa, Paraguay, March 24-26, 1998

BOLIVIA

Presentation of FLAR to the Producers Associations and the Centro de Investigacion Agricola Tropical (CIAT-Bolivia). Santa Cruz de la Sierra, Bolivia, March 25-26, 1998

FRANCE

(1) 2nd International Rice Blast Conference. Montpellier-France. August 4-8, 1998.
(2) CIRAD's September days. Montpellier-France. August 31-September 4, 1998

CUBA

I Congreso Nacional de Arroz and I Encuentro Internacional de Arroz. La Habana-Cuba. June 9-11, 1998.

VENEZUELA

National Course on Rice Recurrent Selection Breeding.
San Felipe, Yaracuy, Venezuela. 21-26 September, 1998.

PERU

I Seminario –Taller Internacional: Semilla, Insumo Esencial en la Agriculture Moderna
Chiclayo, Peru. 11-13 May, 1998.

CHILE

Visit to INIA-Quilamapu. Meeting with seed producers and millers, Chillan-Chile, and INIA Headquarters, Santiago, Chile. 14-16 May, 1998

ARGENTINA

Visit to Partners: Universidades de Corrientes y de Tucuman.
Corrientes and Tucuman, Argentina. 17-22 May, 1998.

CHINA

Visit to the Food Crops Research Institute, Yunnan Academy of Agricultural Sciences. Kunming-China. September 9-17, 1998.
Field visit to Upland Hillside breeding sites: Simao, Menglian, Menghai, and Jinghong.

BELIZE

Field visit and International Course on Germplasm Management. Belize, October 26 31.

COSTA RICA

FLAR Steering Comity meeting, San José-Costa Rica, November, 3-5.

APPENDIX 10. SPECIAL SERVICES FOR NARDS

- Anther culture of two crosses from Romania

- Seed increase of lines from Romania for temperate climate ecosystems (Cold tolerance)

- Second recombination of the Chilean populations PQUI-1\0\0\1 and PQUI-1\Co\1\0

Sinthetization of the population PFD-2 for Venezuela
Sinthetization of populations for Uruguay
Sinthetization of the population PARG-3 for Argentina

APPENDIX 11. COUNTRIES MAPS

COLOMBIA

VENEZUELA

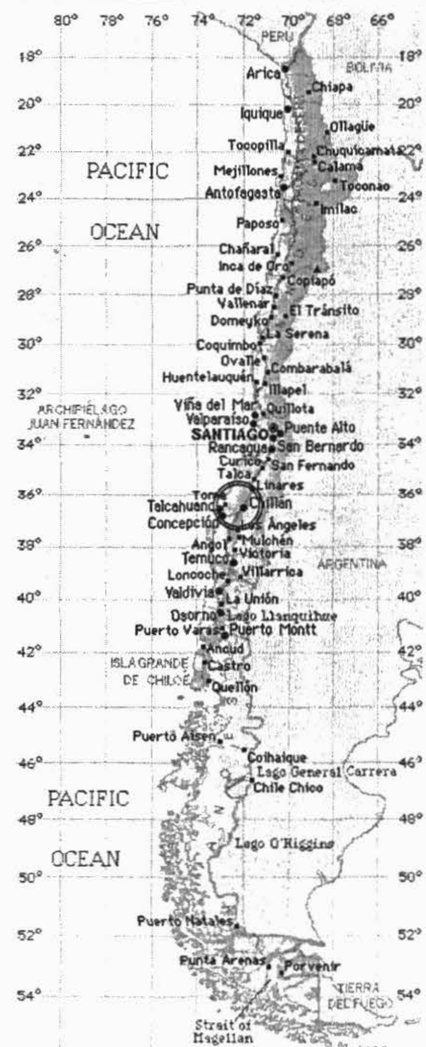
BOLIVIA

BRAZIL

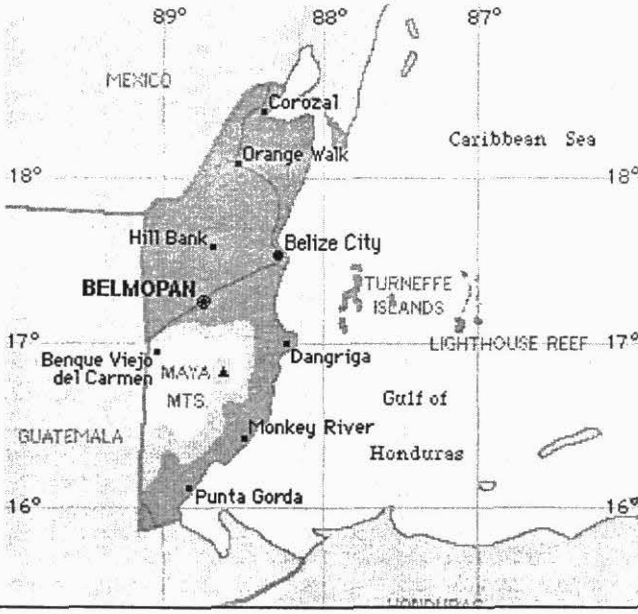
PARAGUAY

URUGUAY

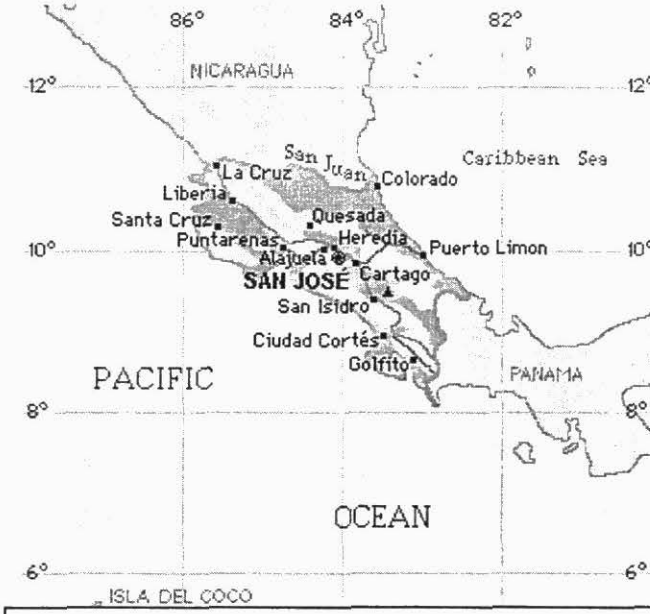
ARGENTINA



CHILE

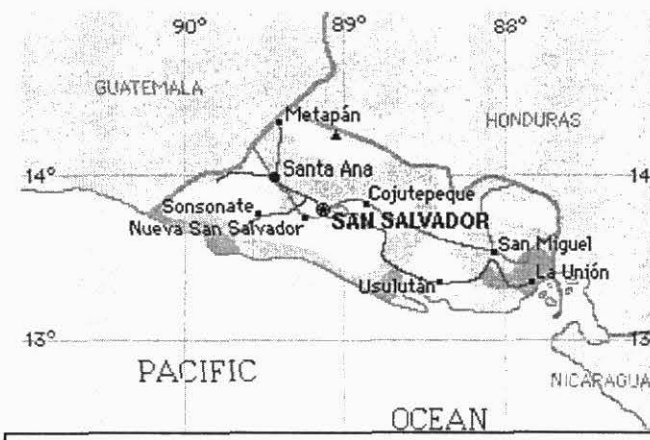


BELIZE

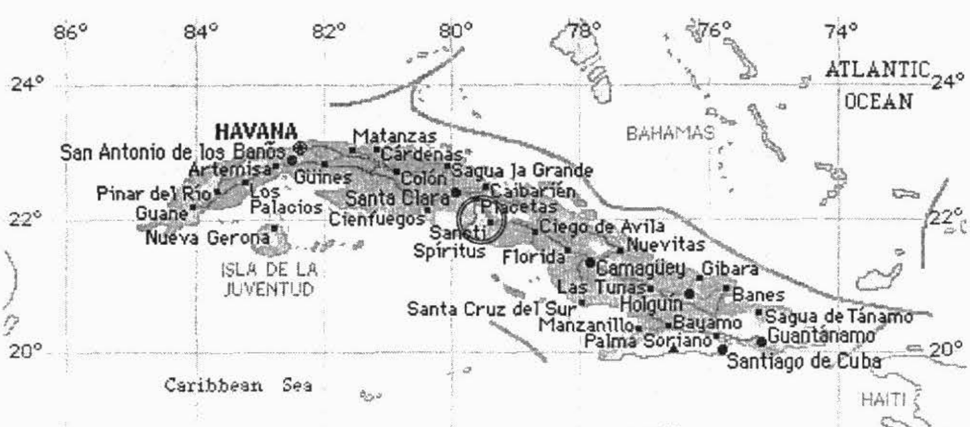


COSTA RICA

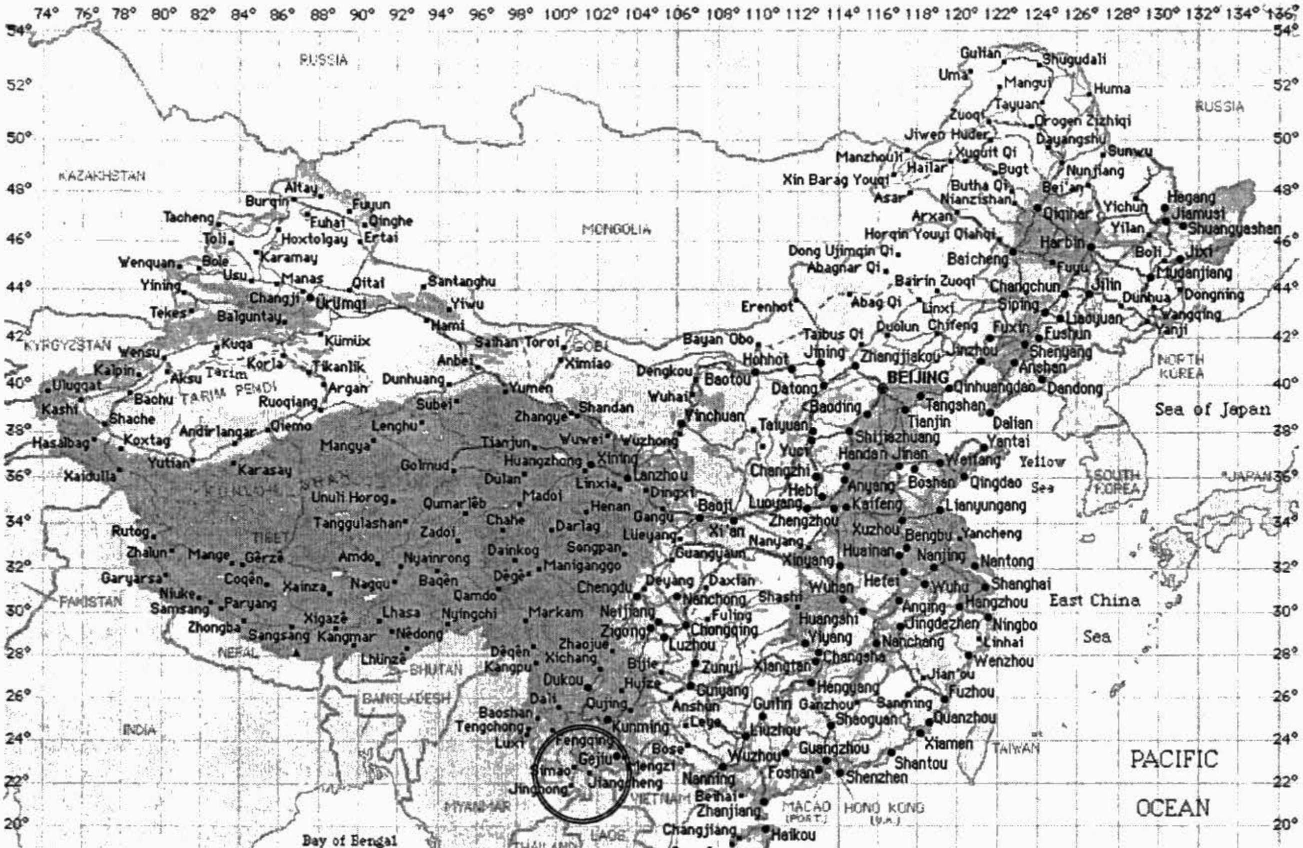
PANAMA



EL SALVADOR



CUBA



CHINA

ROMANIA