IRTP NETWORK IN LATIN AMERICA AND THF CARIBBEAN [a/]

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1. INTRODUCTION

In Latin America and the Caribbean, rice is an important crop and it represents a staple food in most countries of the region, especially for low income families in the lowland tropics.

In the harvest season 1981/1982, 8.8 million hectares were planted in five ecosystems of Latin America and the Caribbean (Table 1). The total production was 16.1 million tons of paddy, 53% from the irrigated area and 47% from the other culture types.

The increase and stability of rice production and productivity in the region depend mainly on the availability of high yielding varieties with resistance to major constraints present in the different ecosystems, and good crop management, especially on weed control.

In the temperate region (Southern Cone) irrigated rice yields are restricted mainly by blast, low temperature, iron toxicity, straighthead and weeds.

In the tropics, the major constraints of the irrigated and upland ecosystems are blast, leaf scald, brown spot, grain spotting, sheath rot and the hoja blanca virus and its vector. Among soil problems, iron and

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aluminium toxicities are the most important in acid soils of irrigated and upland ecosystems, respectively. Salinity is a constraint of irrigated rice of the Caribbean, Coastal Peru, Ecuador and Mexico. Weeds are a serious problem, especially in the upland ecosystems.

The IRTP network for Latin America as an integrated part of the CIAT Rice Program is presently cooperating with National Programs of 24 countries of the region (Figure 1). This cooperation is focused to provide National Programs with improved germplasm to overcome their major constraints.

This paper discusses the performance of germplasm distributed in the 1983-1984 IRTP nurseries, and activities related with breeders workshops and monitoring tours.

2. GERMPLASM DISTRIBUTED IN 1983 AND 1984

In 1983, 525 entries were selected and included in seven nurseries distributed as 179 sets to 24 countries (Table 2). The yield and observational nurseries were planted under irrigated, and favored and unfavored upland ecosystems.

The yield nursery VIRAL-T was planted in 32 locations of which 17 were irrigated, 13 favored upland and 2 unfavored upland. The entries that showed high yield potential in the irrigated and favored upland ecosystems are indicated in Table 3. The promising entries in the favored upland sites were also tolerant to neck blast, leaf scald and brown spot in several locations of Central America under heavy pressure of these diseases.

The observational nursery (VIOAL), constituting 184 entries, was planted in 25 locations of which 10 were irrigated, 13 favored upland and 2 unfavored upland. Cooperators evaluated the reaction of this germplasm to major diseases present in their ecosystems. There were several favored upland locations in Central America with heavy disease

pressure. 8 for blast, 6 for leaf scald, 2 for sheath blight and 2 for brown spot. The reaction of the germplasm to each of these diseases varied within and among locations. Most lines resistant to blast in all locations were susceptible to leaf scald. Some lines, however, combined blast, brown spot and sheath blight resistance (Table 4).

In 10 favored upland locations of Central America and Mexico (Yucatan), 16 lines combined high yield with resistance to brown spot and sheath blight (Table 5).

In Corrientes, Argentina, the VIOAL was evaluated for the straight-head disease, a major constraint in that area. Sixty three lines were resistant and selected. Among these lines, 12 yielded more than 7.0 t/ha (Table 6).

The observational nursery for unfavored upland (VIOAL-SNF), was planted in seven unfavored locations, as well as in five favored upland sites. Cooperators evaluated resistance to blast, leaf scald and brown spot. Reactions to each disease varied among locations. Most lines resistant to blast in one location were susceptible in other locations. The lines resistant to blast in all locations were susceptible to leaf scald or brown spot in the majority of the locations. A few entries resistant to blast were resistant to leaf scald in a few sites (Table 7).

The observational nursery for low temperature (VITBAL), constituting 52 entries, was planted and evaluated in Brazil, Chile and Uruguay. In Brazil, the nursery had several lines that performed better than the local check. In the Experimental Station at Treinta y Tres, Uruguay, 9 lines tolerated low temperatures and yielded 1 or 2 t/ha more than the local check, Bluebelle (Table 8). In Chile, however, only 2 lines (IR 9202-5-2-2-2 and K 31-163-3) tolerated the low temperatures of that area with a minimum and maximum temperatures of 9-22°C and a mean of 17°C.

In 1984, 466 entries were selected and included in 7 nurseries distributed to National Programs of 24 countries of the region. (Table 9).

The germplasm was distributed according to the main planting dates of cooperators: in March-April to cooperators that plant in May-June, including Ecuador and the countries of the Northern Hemisphere. In August-September to programs of the Southern Hemisphere that plant in October-December.

Data of VIRAL-T and VIOAL nurseries, received (until May 15) from cooperators of Northern Hemisphere is discussed here. Data from Southern Hemisphere of various nurseries is not presented because cooperators are still harvesting the materials.

The yield nursery VIRAL-T was planted in 17 locations of which 7 were irrigated and 10 favored upland. Lines that showed a high yield potential in the favored upland ecosystem of Central America are indicated in Table 10. These lines were tolerant to blast, leaf scald, brown spot and sheath blight in various locations of this region with high pressure of these diseases. Same lines showed a good yield performance in irrigated conditions (Table 11), indicating that these entries are promising to both favored upland and irrigated ecosystems.

The observational nursery (VIOAL) constituting 190 entries was planted in favored upland locations of Guatemala, Costa Rica, Panama, Honduras and El Salvador. Cooperators evaluated the reaction of germplasm for their major diseases, blast, leaf scald, brown spot and sheath blight.

Performance of germplasm varied within and among countries. In Guatemala, 11 entries had a high yield potential (7.5-8.2 t/ha) and resistance to blast, leaf scald and brown spot. In El Salvador, a different set of 10 lines yielded 4.3-5.0 t/ha and were resistant to leaf scald and brown spot and tolerant to neck blast.

In five locations of Honduras, 11 lines yielded 6.1-7.2 t/ha and showed resistance to blast, leaf scald and brown spot. These lines yielded 2-3 t/ha more than local checks (4.3 t/ha)

Similarly, in four locations of Panama 10 lines were outstanding with an average yield of 4.6-5.2 t/ha and resistance to blast, leaf scald, brown spot and sheath blight. Likewise, for Costa Rica, other set of 10 lines performed well with a yield range of 5.5 to 7.0 t/ha and resistance to blast and brown spot and tolerance to leaf scald.

Although the performance of germplasm varied from one country to another, there were several lines that performed well with high yield potential, and tolerance to blast, brown spot and leaf scald in 13 favored upland ecosystems of Central America (Table 12).

3. UTILIZATION OF GERMPLASM

From germplasm distributed in the IRTP nurseries of 1983, National Programs selected several entries for further yield trials and some as parents (Table 13).

National Programs of six countries released six varieties in 1984 and 1985 (Table 14). The released variety in Brazil is recommended for irrigated conditions in Santa Catarina State. This variety is tolerant to blast and iron toxicity.

Oryzica 2 in Colombia is recommended for both irrigated and favored upland ecosystems. It is a high yielding variety and tolerant to fungus diseases.

PA-2 and PA-3 are recommended for the irrigated areas of Tarapoto and Bagua, Peru, respectively. PA-3 is tolerant to hoja blanca virus, a major constraint in Bagua.

The varieties released in Honduras and Costa Rica are recommended for the favored upland ecosystem.

Araure 3 and Araure 4 in Venezuela are recommended for favored upland and irrigated ecosystems, respectively.

4. BREEDERS WORKSHOPS

In 1983 and 1984 breeders workshops were held in Panama for breeders from Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama and CIAT. The purpose of these workshops was to evaluate, select and harvest promising materials in F_2-F_4 upland populations planted in Tocumen and Rio Hato. The participants were very enthusiastic and considered that this was useful excersice to select appropriate materials for their needs and to exchange information on better selection methodologies for their breeding programs.

5. MONITORING TOURS

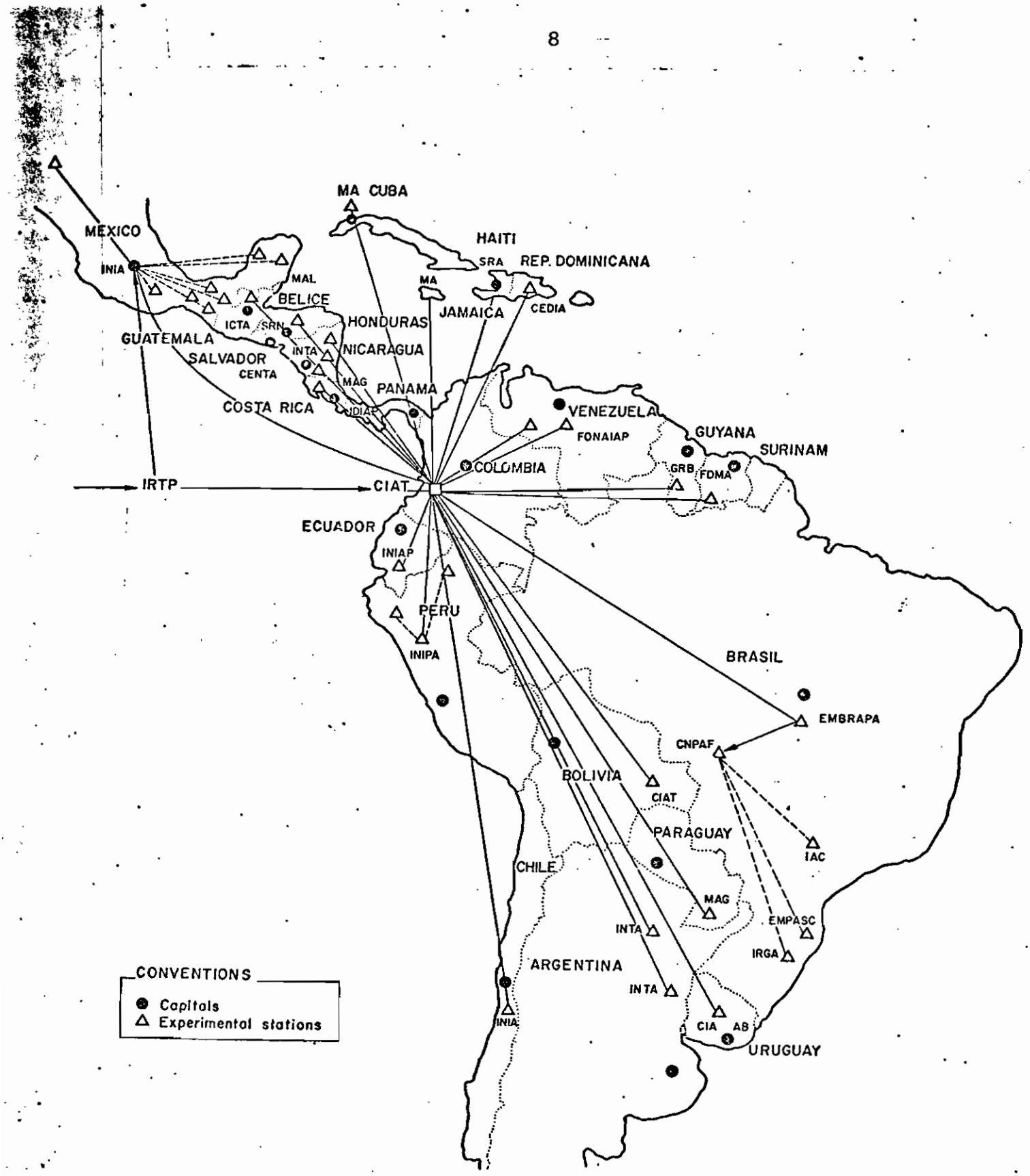
A monitoring tour was made in August 2-16, 1984 to observe the rice research status of National Programs, performance of germplasm of IRTP nurseries and constraints of commercial plantings in Venezuela, Colombia, Ecuador, Panama and Costa Rica. Ten scientists participated, one each from Venezuela, Ecuador and Dominican Republic, two from Costa Rica and Colombia, and three from IRRI, including the IRTP coordinator for Latin America.

Participants observed rice research activities of the National Programs visited as well as constraints in commercial crops in irrigated and favored upland ecosystems.

TABLE 1. AREA DISTRIBUTION FOR DIFFERENT RICE PRODUCTION ECOSYSTEMS OF LATIN AMERICA AND THE CARIBBEAN, 1981/1982 HARVEST. a/

ECOSYSTEM	AREA (000 HA)	%
IRRIGATED	2.095.77	23.76
RAINFED	381.96	4.33
FAVORED UPLAND	947.97	10.74
MODERATELY FAVORED UPLAND	1.107.54	12.55
UNFAVORED UPLAND	3.382.36	38.35
MANUAL UPLAND	904.07	10.25
T O T A L	8.819.60	

a. Data provided by National Program cooperators for the Fifth Conference of IRTP in 1983.



IRTP NETWORK FOR LATIN AMERICA

TABLE 2. DATA RETURNED FROM IRTP NURSERIES FOR LATIN AMERICA DISTRIBUTED IN 1983.

NURSERY [a]	NO. OF ENTRIES	NUMBER OF SETS	
		SEED DISPATCHED	DATA RETURNED
Yield			
VIRAL-T	30	59	31
VIRAL-F	21	6	1
Observational			
VIOAL	234	52	24
VIOAL-SNF	62	28	12
VIOAL-HB	90	13	5
Climate and Soil			
VIOSAL	36	9	1
VITBAL	52	12	5
T O T A L	525	179	79

a. VIRAL-T = International Rice Yield Nursery-Medium Maturity
VIRAL-F = International Rice Yield Nursery-Semi-Deep Water
VIOAL = International Rice Observational Nursery
VIOAL-SNF = International Rice Observational Nursery - Unfavored Upland
VIOAL-HB = International Rice Observational Nursery - Hoja blanca
VIOSAL = International Rice Salinity and Alkalinity Observational Nursery
VITBAL = International Rice Low Temperature Nursery

TABLE 3. AVERAGE YIELDS AND DAYS TO FLOWER OF THE BEST VIRAL-T 1983 ENTRIES PLANTED IN IRRIGATED AND FAVORED UPLAND ECOSYSTEMS OF LATIN AMERICA.

DESIGNATION	ORIGIN	FLOWERING (DAYS)	YIELD (T/HA)
IRRIGATED [a/]			
P 2231 F4-45-8-1B	CIAT	103	6.7
P 2231 F4-45-6-1B	CIAT	104	6.5
P 2231 F4-7-1B	CIAT	103	6.3
P 2025 F4-159-3-1B	CIAT	101	6.2
P 2025 F4-93-2-5-1B	CIAT	98	6.1
CICA 8 (CHECK)	Colombia	99	5.8
FAVORED UPLAND [b/]			
P 2231 F4-138-1-1B	CIAT	99	5.2
P 2231 F4-138-2-1B	CIAT	98	5.0
IR 4422-98-3-6-1	IRRI	103	4.9
P 2025 F4-159-3-1B	CIAT	104	4.8
P 2025 F4-48-5-1B	CIAT	99	4.7
CICA 8 (CHECK)	Colombia	100	4.8

a. Average of 12 locations.

b. Average of 11 locations.

TABLE 4. VIOAL 1983 ENTRIES TOLERANT TO LEAF AND NECK BLAST AND THEIR REACTION TO OTHER DISEASES IN SEVERAL UPLAND LOCATIONS OF CENTRAL AMERICA.

DESIGNATION	DISEASE REACTION [a] Bl (4)	NBl (8)	LSc (6)	BS (2)	ShB (2)	FLOWERING [b] (DAYS)	YIELD [b] (T/HA)
P 1274-6-8M-1-3M-1	4	4	5	3	2	96	5.4
P 3085 F4-31	2	3	7	4	4	106	5.3
P 2068 F4-116-2-1B	2	4	7	4	4	89	5.2
P 1358-5-19M-2-1B	2	3	7	4	3	100	5.1
P 3082 F4-4	2	3	5	5	1	102	5.0
P 2053 F4-88-2-1B	3	4	6	5	3	97	4.9
P 3083 F4-58	3	3	5	4	3	95	4.9
Araure 2	2	3	7	4	1	112	4.8
P 3299 F4-33	1	3	3	5	1	98	4.7
P 1377-1-15M-1-2M-3	2	3	7	3	2	100	4.7
P 2737 F4-7-1B	4	4	7	5	5	95	4.6
P 3082 F4-18	3	4	7	5	3	99	4.6
P 3084 F4-59	2	4	5	3	1	98	4.5
P 2198 F4-27-1B-1B-3-2	1	3	7	4	3	104	4.5
P 3083 F4-61	3	3	5	4	7	97	4.4
P 2058 F4-47-3-1B	3	3	5	6	3	95	4.4
P 2189 F4-27-1B-1B-1-1	1	3	5	4	3	102	4.3
P 2085 F4-35	2	4	7	4	1	101	4.2
P 3084 F4-34	2	3	5	4	1	104	4.1
P 3081 F4-22	3	3	9	3	3	100	4.0
IR 25586-45-1-2	4	3	7	3	1	99	3.6
PNA 46-25-1-31	2	4	7	6	3	106	3.5

a. Maximum severity observed under 0-9 scale: 0 = Resistant; 9 = Susceptible.

Bl = Leaf blast; NBl = Neck blast; LSc = Leaf scald; BS = Brown spot; ShB = Sheath blight.
In parentheses number of test locations.

b. Average of 8 locations where NBl was evaluated.

TABLE 5. PROMISING VIOAL 1983 ENTRIES IN FAVORED UPLAND LOCATIONS OF CENTRAL AMERICA AND MEXICO (YUCATAN).

DESIGNATION	DISEASE REACTION [a]		FLOWERING (DAYS)	YIELD (T/HA)
	BS	ShB		
P 3081 F4-58	3	1	94	5.6
P 3293 F4-54	3	3	91	5.1
P 1377-1-15M-1-2M-3	3	2	94	5.1
P 2053 F4-99-4-1B	3	3	97	5.0
P 3081 F4-2	3	1	93	4.9
P 3294 F4-48	3	3	96	4.8
IR 9852-22-3	3	4	92	4.8
P 3293 F4-96	3	1	98	4.7
P 3293 F4-15	3	1	92	4.6
P 3293 F4-21	3	1	88	4.4
PNA 237 F4-33-1	3	3	101	4.4
IR 21734-16-3-2-2-2	3	2	92	4.4
P 3081 F4-29	3	1	95	4.4
P 3081 F4-31	3	3	91	4.4
P 1496-7-7M	3	1	96	4.3
IR 25586-45-1-2	3	1	93	4.0

a. Maximum severity observed under scale 0-9: 0 = Resistant, 9 = Susceptible.

BS = Brown spot in Alanje (Panama) and Cuyuta (Guatemala); ShB = Sheath blight in Tocumen and Chepo (Panama).

b. Average of 10 locations, 2 in Mexico (Yucatan) and 8 in Central America.

TABLE 6. BEST VIOAL 1983 ENTRIES RESISTANT TO STRAIGHTHEAD IN CORRIENTES, ARGENTINA.

DESIGNATION	ORIGIN	STRAIGHT-HEAD [a]	FLOWERING (DAYS)	YIELD (T/HA)
Sinaloa A 80	Mexico	1	104	8.5
J-104	Cuba	0	106	7.9
P 2015 F4-128-5-4-1B	CIAT	0	108	7.9
P 3299 F4-61	CIAT	0	104	7.9
P 3081 F4-130	CIAT	0	86	7.9
P 3293 F4-19	CIAT	0	98	7.6
PNA 277 F4-247-1	Peru	1	109	7.5
IR 1529-ECIA	Cuba	1	104	7.5
PNA 246 F4-81-1	Peru	1	111	7.4
P 1044-86-5-3-1-2M	CIAT	0	92	7.3
P 1577-1-23M-5-1M-4	CIAT	3	107	7.3
P 3299 F4-33	CIAT	0	114	7.3
IR 841 (Local check)		9	113	-
Bluebonnet 50 (Local check)		7	103	-

a. Scale 0-9: 0 = Resistant; 9 = Susceptible

TABLE 7. VIOAL-SNF 1983 ENTRIES TOLERANT TO BLAST AND LEAF SCALD IN UNFAVORED UPLAND ECOSYSTEMS.

DESIGNATION	DISEASE REACTIONS [a]			FLOWERING [d] (DAYS)	YIELD [d] (T/HA)
	Bl [b]	NBl [c]	LSc [c]		
IR 2053-436-1-2	5	3	3	92	4.6
343 D.T.	4	3	3	91	4.6
IR 4744-295-2-3	1	3	3	90	3.9
IR 9852-18-1	3	3	3	99	4.6
IR 9846-23-2	4	3	4	103	3.9
P 2030 F4-235-1B-1B	3	3	4	101	4.6
IR 8098-41-3	1	3	5	102	5.7

a. Scale 0-9: 0 = Resistant; 9 = Susceptible

b. Leaf blast in Porrillo, El Salvador and Rio Hato, Panama, maximum severity observed in either location.

c. Neck blast and leaf scald in ICA-La Libertad, Colombia, and Cuyuta, Guatemala, maximum severity observed in either location.

d. Average of Porrillo, ICA-La Libertad and Cuyuta

TABLE 8. PROMISING VITBAL, 1983 ENTRIES PLANTED IN URUGUAY.

DESIGNATION	ORIGIN	FLOWERING (DAYS)	YIELD (T/HA)
Suweon 288	Korea	91	9.4
HPU 5101-NAG-1-2	India	95	9.1
IR 9201-91-2-2-1-3	IRRI	92	9.1
RP 1845-83-45-1	India	89	8.9
YR 1541-GH 59-7	Korea	95	8.8
IR 8608-239-2-2-3	IRRI	88	8.0
L 201	USA	87	7.3
YR 1805-17-3-21	Korea	94	8.0
Bluebelle (Local check)		88	6.3

TABLE 9. IRTP NURSERIES FOR LATIN AMERICA DISTRIBUTED IN 1984.

NURSERY [a]	SETS No.	ENTRIES No.	ORIGIN OF ENTRIES	
			CIAT	IRTP-IRRI
Yield				
VIRAL-T	45	24	22	2
VIRAL-F	6	21	-	21
Observational				
VIOAL	56	191	127	64
VIOAL-SNF	31	49	6	43
VIOAL-HB	11	83	62	21
Climate and Soil				
VIOSAL	8	61	-	61
VITBAL	10	37	-	37
T O T A L	167	466	217	249

a. VIRAL-T = International Rice Yield Nursery-Medium Maturity
VIRAL-F = International Rice Yield Nursery-Semi-Deep Water
VIOAL = International Rice Observational Nursery
VIOAL-SNF = International Rice Observational Nursery-Unfavored Upland
VIOAL-HB = International Rice Observational Nursery-Hoja blanca
VIOSAL = International Rice Salinity and Alkalinity Observational Nursery
VITBAL = International Rice Low Temperature Nursery

TABLE 10. AVERAGE YIELDS (T/HA) OF BEST ENTRIES OF VIRAL-T, 1984 PLANTED IN TEN FAVORED UPLAND SITES OF CENTRAL AMERICA.

DESIGNATION	COUNTRIES					AVERAGE
	GUATEMALA [a]	EL SALVADOR	HONDURAS	COSTA RICA	PANAMA [b]	
P 2053 F4-99-4-1B	7.7	5.8	5.7	5.1	5.7	6.0
P 2025 F4-159-3-1B	7.1	5.7	6.0	5.9	5.4	6.0
IR 25909-11-2-2-3-2	7.7	6.5	6.0	3.6	5.5	5.9
P 2231 F4-138-2-1B	7.4	5.0	6.2	5.2	5.4	5.8
P 2189 F4-27-1B-1B-1-1B	8.2	4.8	5.6	3.4	5.5	5.5
P 2231 F4-45-8-1B	8.8	4.3	5.4	4.5	4.5	5.5
IR 4422-98-3-6-1	7.3	4.6	5.9	2.2	5.0	5.0
Int. check (CICA 8)	8.2	5.2	5.3	3.1	4.5	5.4
Local check [c]	8.7	5.5	4.9	3.0	4.5	5.3

a. Average of two sites

b. Average of three sites

c. Different in each country

TABLE 11. AVERAGE YIELDS (T/HA) OF BEST VIRAL-T, 1984 ENTRIES PLANTED IN SEVEN IRRIGATED SITES OF LATIN AMERICA.

DESIGNATION	COUNTRIES						
	COLOMBIA [a]	NICARAGUA	CUBA	ECUADOR	VENEZUELA	SURINAM	AVERAGE
IR 4422-98-3-6-1	5.5	7.4	4.4	8.5	5.7	7.4	6.5
P 2189 F4-27-1B-1B-1-1B	5.8	7.4	5.0	7.0	5.4	8.0	6.4
P 2025 F4-159-3-1B	5.2	7.4	4.8	7.3	5.8	8.2	6.4
P 2231 F4-45-8-1B	5.5	7.7	4.7	7.2	5.3	7.9	6.4
P 2192 F4-39-5-1	6.0	6.4	5.2	7.5	5.8	6.5	6.2
P 2053 F4-99-4-1B	5.3	6.6	5.1	7.1	6.1	6.4	6.1
IR 2509-11-2-2-3-2	5.3	7.5	4.5	6.6	5.7	6.4	6.0
Int. check (CICA 8)	5.4	6.8	3.9	5.9	5.3	8.1	5.9
Local check [b]	5.4	5.4	6.4	5.4	4.9	5.8	5.6

a. Average of two sites

b. Different in each country

TABLE 12. AVERAGE YIELDS, DAYS TO FLOWER AND DISEASE REACTION OF BEST VIOAL, 1984 ENTRIES PLANTED IN 13 FAVORED UPLAND LOCATIONS OF CENTRAL AMERICA.

DESIGNATION	YIELD [a] (T/HA)	FLOWERING [a] (DAYS)	DISEASE REACTIONS [b]				
			Bl	NBl	LSc	BS	ShB
P 2231 F4-138-6-1B	5.6	99	3	5	3	5	3
P 2859 F4-97-6	5.4	100	4	5	4	3	5
P 3083 F4-61	5.3	101	4	3	5	5	4
P 3081 F4-78	5.0	102	3	4	4	3	5
P 3284 F4-5-1	4.8	97	5	4	5	5	5
P 1790-5-1M-4-5M-1B-3M-1B	4.8	100	4	4	5	5	5
P 3081 F4-58	4.8	102	5	3	3	5	5
P 2060 F4-49-4-1B	4.6	98	3	4	5	5	3
P 2053 F4-14-2-1B	4.5	99	3	5	5	4	5
P 3081 F4-58-3	4.2	107	5	5	4	5	5
P 2766 F4-36-2-4	4.0	103	5	3	3	5	1
P 3304 F4-58-1	3.8	106	4	5	5	5	5
P 2867 F4-1-3	3.5	108	5	5	5	5	5
Checks							
CICA 4	3.4	95	9	9	5	5	3
CICA 8	4.7	104	5	6	6	5	5
ORYZICA 1	4.8	96	4	3	5	5	1

a. Average of 13 locations.

b. Maximum score observed in one of the 13 locations under scale 0-9.

TABLE 13. UTILIZATION OF GERMPLASM DISTRIBUTED IN 1983. [a/]

COUNTRY/PROGRAM	YIELD TRIALS
ARGENTINA	
CORRIENTES	66
ENTRE RIOS	13
BRAZIL	
CNPAF	59
IRGA	41 [b/]
CHILE	13
COSTA RICA	17
ECUADOR	86
MEXICO	4
PERU	18
URUGUAY	4
VENEZUELA	165
T O T A L	486

a. Available information

b. Includes 39 lines as parents for the crossing program

TABLE 14. NEW VARIETIES RELEASED BY NATIONAL PROGRAMS IN LATIN AMERICA.

COUNTRY	INSTITUTION [a/]	COMMERCIAL NAME	DESIGNATION	YEAR OF RELEASE
BRAZIL	EMPASC	EMPASC 104	IR 841-67-1-2	1985
COLOMBIA	ICA	ORYZICA 2	P 2023 F4-74-2-1B	1984
COSTA RICA	MAG	CR 1821	P 881-19-22-4-1-1B-CR 1	1985
HONDURAS	SRN	YOJOA 44	P 918-25-15-2-3-2-1B	1984
VENEZUELA	FONAIAP	ARAURE 3	PR 106	1984
VENEZUELA	FONAIAP	ARAURE 4	P 2217 F4-30-4-1B	1984
PERU	INIPA	PA-2	P 2030 F4-88-1-2	1984
PERU	INIPA	PA-3	IR 4570-83-3-3-2	1984

a. EMPASC = EMPRESA DE PESQUISA AGRICOLA DE SANTA CATARINA
ICA = INSTITUTO COLOMBIANO AGROPECUARIO
SRN = SECRETARIA DE RECURSOS NATURALES
MAG = MINISTERIO DE AGRICULTURA Y GANADERIA
FONAIAP = FONDO NACIONAL DE INVESTIGACION AGROPECUARIA
INIPA = INSTITUTO NACIONAL DE INVESTIGACION Y PROMOCION AGROPECUARIA